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**Managing Intellectual Property in Universities:  
Patents and the Protection Failure Problem**

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**Managing Intellectual Property in Universities: Patents and the  
Protection Failure Problem**

**FINAL REPORT**

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**by**

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## Executive Summary

This report presents the results of a major investigation into the **entrepreneurial activities of UK HEIs**, focusing on the (1) the scale and extent of the ‘patent protection failure’ problem, which is about the issue of universities withdrawing and abandoning patent applications. In conjunction with this issue, we also investigate how researchers view the performance of their technology transfer offices (TTOs); (2) types of HEI commercialisation models and strategies; (3) utility of a regional grouping of TTOs and a “matchmaking” forum for unexploited university IP; (4) performance and impact of Government measures to promote academic entrepreneurialism and the use of indicators; (5) suggestions for Government to more effectively promote academic entrepreneurialism; (6) the impact of academic entrepreneurialism on researcher behaviour; and (7) suggestions for improvement of university commercialisation activities.

### Method

The study involved in-depth interviews with senior university administrators, directors and managers of technology transfer and practising researchers, across a representative sample of 40 Higher Education Institutions (HEIs) across the country. Our findings throw new light on **commercialisation models**, the **increasing selectivity of TTOs** with regard to patenting, **the “verdict” on TTOs performance**, the role of metrics in accounting for HEI performance in IP commercialisation and **the impact of academic entrepreneurialism on the behaviour of researchers**. The report also makes **policy recommendations** for Government to consider.

### Patent protection failure problem

Contrary to anecdotal evidence that suggested that universities were abandoning a large proportion of their Patent Cooperation Treaty (PCT) patent applications (60 per cent of applications), we have found that the majority of HEIs with high IP income are **withdrawing less than 30 per cent** of the total number of their patent applications. Two key reasons account for this: (1) selectivity concerning patent applications; and (2) the increasing professionalism of the TTOs.

TTOs have learnt to be **highly selective** in their patenting activity. This has evidently been a result of **learning** from past experience. TTOs are increasingly implementing **rigorous processes** for screening inventions/innovations to decide if patent applications should be made. Identification of **market opportunities** and **potential licensees** are key considerations for filing applications. The **number of non-software licenses has risen steeply** from 2003 onwards and the **number of spin outs running for more than three years** shows a steady growth, both suggesting an increase in the quality of patents.

The increasing professionalisation of the TTO was attested to by the majority of researchers who viewed the **performance of their TTO positively** in terms of their research being commercialised and in the way the TTOs are engaging with researchers. TTOs are increasingly explaining the commercialisation processes and options to academics, and in working with academics on appropriate IP ownership arrangements/policy and financial incentives. On an average, the performance of the TTOs was ranked as **“Good.”** This is largely because more than half of the TTOs are

continually reviewing and restructuring their strategies for more effective IP commercialisation. They are also energetically promoting themselves as a **service/interface organisation** between the researchers (and university) and external parties.

**Two approaches to patenting** were also identified. As the UK does not have a grace period nor allow filing of disclosures, UK TTOs adopt two main approaches to this activity. They are (1) go national directly or (2) file with the UK IPO (priority filing) followed by PCT applications. It is arguable that the PCT route is used as a grace period. This raises the question if **disclosure or a grace period** may help obtain potential benefits for universities in their patenting activities, such as allowing for better quality of the patent application and reducing the overall cost of patenting by universities. This issue however has to be further investigated.

### ***Regional Grouping of Technology Transfer Offices***

There is some **support** for a regional grouping of TTOs. Forty per cent of the respondents voiced support, about 20 per cent were undecided and another 20% opposed to it.<sup>1</sup> The main concerns with this idea relate to its **structure, resource requirements** and **maintenance**. Praxis was viewed positively by the majority of respondents for exchange and learning of good practice. AURIL and UNICO courses were also noted.

### ***“Matchmaking” Forum for Unexploited University IP***

An IP “matchmaking” forum received some **support** from HEIs but respondents again raised issues of **structure, resource requirements and trust-building** as key considerations. Forty per cent of respondents “voted” for it; 27.5 per cent were undecided and 12.5 per cent did not think it was a good idea.

### ***Commercialisation Models and Strategies***

We identified **four different models** of TTO organisation. Type I is an internal organisation managed by and part of, the university structure. Type II is an organisation operating outside of the university (not managed by the university), but reporting to the university. Type III is an external, generally non-profit making, commercial organisation wholly owned by the university but operating autonomously and reporting to a board for all decisions. Type IV is an external profit-making commercial organisation listed on the stock exchange. Interestingly, our evidence reveals that **strategies** toward commercialisation **do not differ significantly** across the four models. These strategies are: (1) licensing – the preferred route; (2) spin-outs and/or equity holdings; and (3) consultancy. Collaborative research is gaining significant importance as a route to IP commercialisation by the teaching-intensive and smaller universities.

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We wish to express our heartfelt appreciation to all the senior university administrators, TT directors/managers, IP managers and researchers who generously gave their time to speak with us, often for more than an hour. We also especially would like to thank IP managers and their staff for taking the time and interest in providing the patent data. All errors are our own responsibility.

<sup>1</sup> There were no returns on the additional 20 per cent.

### Indicators

The concern over the adequacy of patents as an indicator to show the extent of successful commercialisation continues. Although the majority of the universities declared that they use HEIF metrics for the purposes of reporting, there is a large cohort of cynicism in the use of these “agency-specific” metrics (e.g. for HEFCE, Scottish Enterprise, etc) to measure IP commercialisation. HEIF measures continue to be perceived as inadequate for capturing the range of activities instrumental to effective IP commercialisation.

Respondents offered a **range of hard and soft indicators for capturing genuine commercialisation**. One useful indicator is **the amount of research funding “spent” to create a licensed patent**. When combined with revenues accruing, this shows the “real” economic impact of research, and clarifies total spending (e.g. on the research funding and filing process) and incorporates returns from the licensed patents. Another useful indicator is the amount of **additional funding generated from the patent from external partners**.

### Performance and Impact of Government Measures

Government policies for fostering academic entrepreneurialism were generally **well regarded and overall had a positive impact on universities’ efforts to develop this activity**. About 61 per cent of respondents agreed that the policies were adequate. Overall **HEIF was viewed positively** but it needs to be increased and targeted to help bridge the “valley of death,” which refers to a situation in which university innovations are not commercialised/exploited because of a lack of university financial resources to support their potential commercialisation. Scottish Knowledge Transfer Grants have been perceived well. HEFCW (Wales) needs to be augmented.

The usage of **Lambert Agreements** is **high** across all university Groups. About 63 per cent of respondents confirmed use or reference to these Agreements. The Agreements were mainly used as models for licensing and collaborative projects and as references for tailored/customised agreements between the university and external party.

However, there were some **concerns** raised with current policies. All interview respondents pointed out that Government: (1) needs to realize that **university-industry engagement is a “segmented activity” – one size policy does not fit all**. (2) is **paying too much attention** to the handful of the “great and the good” universities which patent a great deal. (3) policies continue to focus on science and technology and **do not address the whole spectrum of disciplines**, many of which do not patent.

### Suggestions for Government to Promote Academic Entrepreneurialism More Effectively

Senior administrators and TTO directors/managers provided a useful list of recommendations for Government. These include (1) maintaining **long-term funding to minimize the valley of death problem**; (2) **reconsidering** the emphasis on science and technology; and (3) more systematic **encouragement for** senior university administrators **to embed entrepreneurial culture** across the HEI. The vital role of senior university administrators in promoting a cultural change in HEIs is especially relevant in Types I and II TTO models, as both require a champion to help grow and

promote academic entrepreneurialism. A change from a “pro-commercialisation VC” to one who is not can be a factor in a TTO’s performance decline.

### ***Suggestions for Universities to Improve Commercialisation Activities***

There is still **much room for improvement** of TTO management and operations with respect to commercialisation activities. Suggestions for better practice include: (1) expanding **TTO interaction with academics** (“you need to plug academics into the [commercialisation] process”); (2) constructing and maintaining a **data management system** that will facilitate patent and license audits; (3) introducing a **mentoring** system to promote commercialisation; and (4) at the university executive level, to consider the **inclusion of entrepreneurial performance** as part of the **promotion criteria**.

### ***The Impact of Academic Entrepreneurialism on Researcher Behaviour***

Our findings confirm that **commercialisation of research does not** affect the quality of teaching. Nor does it undermine the traditional missions of research and teaching. There is also little evidence of any diversion from basic to applied research as many researchers view commercialisation as a means of generating increased funds for all types of research. Overall, financial rewards are perceived as helpful for fostering commercialisation but they do not form the overriding reason for the pursuit of this activity. Indeed, most researchers are keen to see their research used in a variety of forms and IP commercialisation often provides useful input into research activity.

### ***Suggested issues for further investigation***

Four key issues were identified for further study:

- (1) investigating what the “30 per cent PCT abandonment” figure entails – proportion of poor quality application vis-à-vis the inability to locate a potential investor, lack of resources to proceed with application, other reasons;
- (2) the benefit of a grace period and/or disclosure;
- (3) the operational structure of a regional IP matchmaking grouping; and
- (4) the number of internal (university) disclosures translated into patent applications.

# Managing Intellectual Property in Universities: Patents and the Protection Failure Problem

## Introduction

Large investments in the science and engineering base by the various research councils and other bodies are resulting in a growing number of university patent applications. However, after these patents reach the Patent Cooperation Treaty (PCT) stage, it appears from anecdotal evidence, that Higher Education Institutes (HEIs) withdraw about 60 per cent of their applications from national Patent Offices either due to the costs involved or uncertainties over the strength and validity of the inventions submitted in the applications (Meyer and Tang, 2007). We describe this situation as the “protection failure problem” and it appeared to be occurring in the early 2000s within the wider context of major policy attempts to promote knowledge and technology transfer between universities and industry. Yet, university patenting is one of the most common indicators used to assess the commercialisation of university research outputs. Significantly, there has been no systematic research, which examines the extent of the protection failure problem. *This project seeks to investigate if this problem persists.*

There are also gaps in our knowledge on good practices in IP management in UK HEIs. Research by SPRU (Science and Technology Policy Research, University of Sussex) has shown that UK HEIs differ considerably in their aims, approaches and abilities to manage and exploit Intellectual Property (IP) to their advantage (Tang, 2008; Tang, Weckowska and Hobday, 2008).

Against the above context, the principles aims of this project were to:

1. assess the extent of the patent protection failure problem and their implications
2. investigate the different types of UK Technology Transfer Office approaches and present innovative strategies for academic entrepreneurialism with a focus on commercialisation-directed activities;
3. devise appropriate patent-based indicators to assess and compare the commercialisation activity across UK universities
4. provide policy recommendations for universities and policy makers concerned with patent protection, patent analysis and IP strategies within universities.

## Method

Universities in the UK are divided into several groups, such as the Russell Group and 1994 Group of research-intensive universities; the post-1992 Universities, the Modern Universities, etc. While this classification denotes the orientation of the universities within these groups, they are not sufficiently helpful in furthering our understanding of their strategies with regard to academic entrepreneurialism and IP commercialisation.

In 2007/08, for instance, the Russell Group Universities were allocated approximately 66% of the total quality-related research funding by the Funding Councils. A central objective of these leading Universities is to act, *inter alia*, as the focus “for best practice in the dissemination and application of cutting-edge research, including the commercialisation of research ideas and innovations” (<http://www.russellgroup.ac.uk/>). While this may be true in many cases, it cannot account for the poor Third Stream and IP exploitation activities that some universities in this Group exhibit. For instance, the London School of Business and



Economics (LSE), a “member” of the Russell Group, showed a rather poor performance with respect to Third Stream funding and income from IP commercialisation between the years 2002-2008, in comparison with other Russell Group’s universities. This may not be unsurprising because the LSE is a “Social Sciences and Humanities” university, and will realistically have less to patent.

On the other hand, Herriot-Watt and Oxford Brookes University, for instance, registered a sterling performance in their Third Stream and IP exploitation activities. In other words, a research intensive university need not necessarily provide “best practice” in the commercialisation of research outputs.

Based on these observations, we concluded that these groupings may not reflect a sufficiently clear picture of the IP commercialisation approaches of UK HEIs. Instead, we used various sources of data<sup>2</sup> to create a classification of the 158 HEIs that would assist us with the creation of a representative sample of HEIs for the interview program. The data covered a range of indicators, such as the number of disclosures, patent applications, patent grants, Third Stream income, IP income, number of licenses concluded, sale of spin-off shares, etc. From the 158 universities, we created a purposive stratified sample of 40 universities, that is proportionally representing Wales, Scotland, Northern Ireland and England. The period for our analysis was 2004-2006 as this period enabled collection of uniform data for the sample.

Our eventual sample of universities was stratified into six groups: They are:

- (1) **Group A** – Low Third Stream Funds and Zero IP income;
- (2) **Group B** – High Third Stream Funds and Zero IP income;
- (3) **Group C** – Low Third Stream Funds and Low IP income;
- (4) **Group D** – High Third Stream Funds and Low IP income;
- (5) **Group E** – Low Third Stream Funds and High IP income; and
- (6) **Group F** – High Third Stream Funds and High IP Income.

(See Annexes One and Two for the method used to create these groups and the full list of the Groups. For purposes of confidentiality we do not include the names of the 40 sampled universities.)

We then aimed to conduct interviews with (1) a senior university administrator/manager responsible for Third Stream and Commercialisation Strategy; (2) a Technology Transfer/Business Development Director; and (3) a researcher who had successfully commercialized his/her IP for each of the 40 universities.<sup>3</sup> Regarding the researcher, we sought to identify mid-career researchers on the assumption that mid-career researchers (for instance senior lecturers) will have different perspectives from successful senior researchers toward academic entrepreneurialism, including commercialisation of university research outputs.<sup>4</sup>

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<sup>2</sup> Other sources included HERO – categories of universities, RAE 2001; HEFCE – HEBCI 2007 survey, HEIF 3, HEIF 2; HEFCW - Third Mission Funding 2004-05 and 2005-06; HESA – Resources of HEIs 2004-05 and Resources of HEIs 2005-06.

<sup>3</sup> We were however only able to interview 95 respondents as the TT directors found it difficult or inconvenient to identify researchers.

<sup>4</sup> We were not consistently successful in obtaining interviews mid-career researchers as we were dependent on the recommendations of the Technology Transfer director/head. However, we have found insignificant differences of opinions between senior and mid-career researchers. Where there may be more significant differences they would likely be found researchers who have exploited and those who have not.

To conduct the interview program, we created three separate questionnaires, one for each of the three aforementioned groups of respondents. Where possible, interviews were held face-to-face; otherwise they were done over the phone. The questionnaires involved collection of qualitative and quantitative information and data.

The Report is structured as follows. **Part A** consists of an analysis of (1) the patenting trend of the HEIs; (2) the extent of the patent protection failure problem and (3) the reasons for the extent of the protection failure problem. **Part B** addresses (1) a description of the identified types of IP commercialisation models and (2) examples of innovative strategies. **Part C** consists of (1) an evaluation of ideas aimed at improving commercialization of university IP, such as TTO groupings and “matchmaking” of unexploited IP; (2) the discussion of the role of Government in fostering academic entrepreneurialism; and (3) an analysis of the impact of academic entrepreneurialism on the behaviour of researchers. Part C also makes recommendations for (1) policy makers on how Government can further help foster academic entrepreneurialism; and (2) for universities on how to improve IP commercialisation strategies.

## Part A

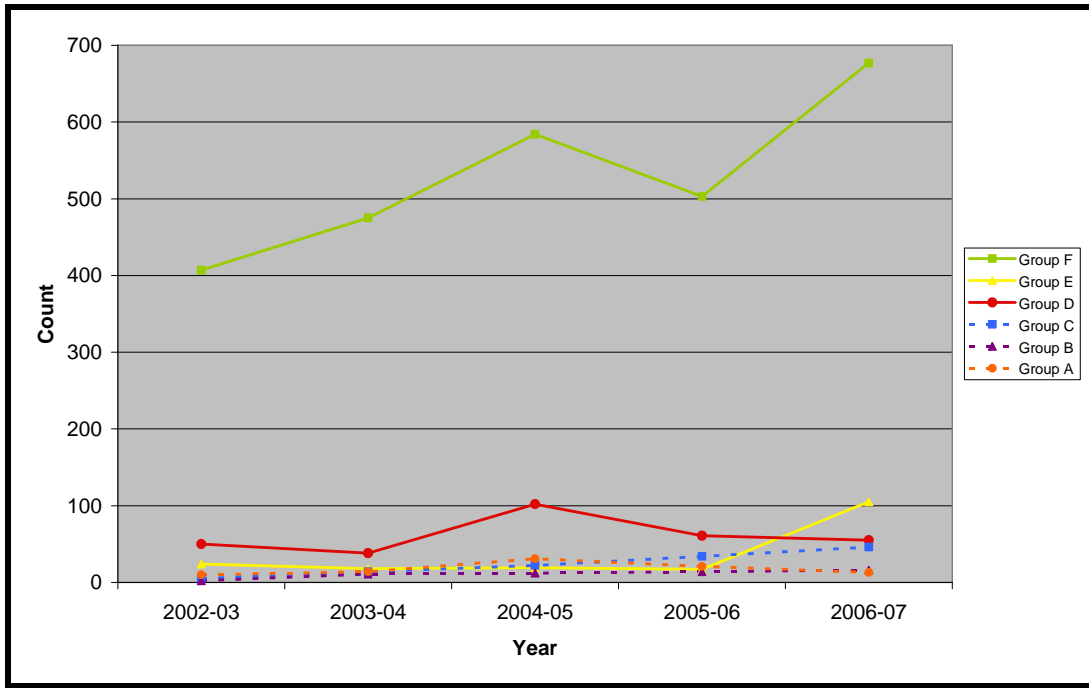
This section addresses (1) the patenting trend and strategies of the HEIs; (2) the extent of the patent protection failure problem and its implications; (3) suggested patent-based indicators and non-patent based indicators to capture academic entrepreneurial activities.

### Patenting trends

This section presents an overview of the patenting trends of the sample of 40 HEIs. Despite the common comment by TTOs “you get what you want to measure,” it appears that while the number of patent applications remains an indicator in HEBCI surveys, the majority of universities in Groups A (Low Third Stream Funds/Zero IP Income), B (High Third Stream Funds /Zero IP Income), C (Low Third Stream Funds /Low IP), and D (High Third Stream Funds /Low IP Income) have consistently low numbers of patent applications. . Some increase in a number of patent applications is observed only in the case of Groups E and F. Group F, in particular, increased their number of patent application from about 400 in 2002-2003 to about 700 in 2006-2007. Figure 1 illustrates these trends. Our fieldwork largely confirms this observation (more below).

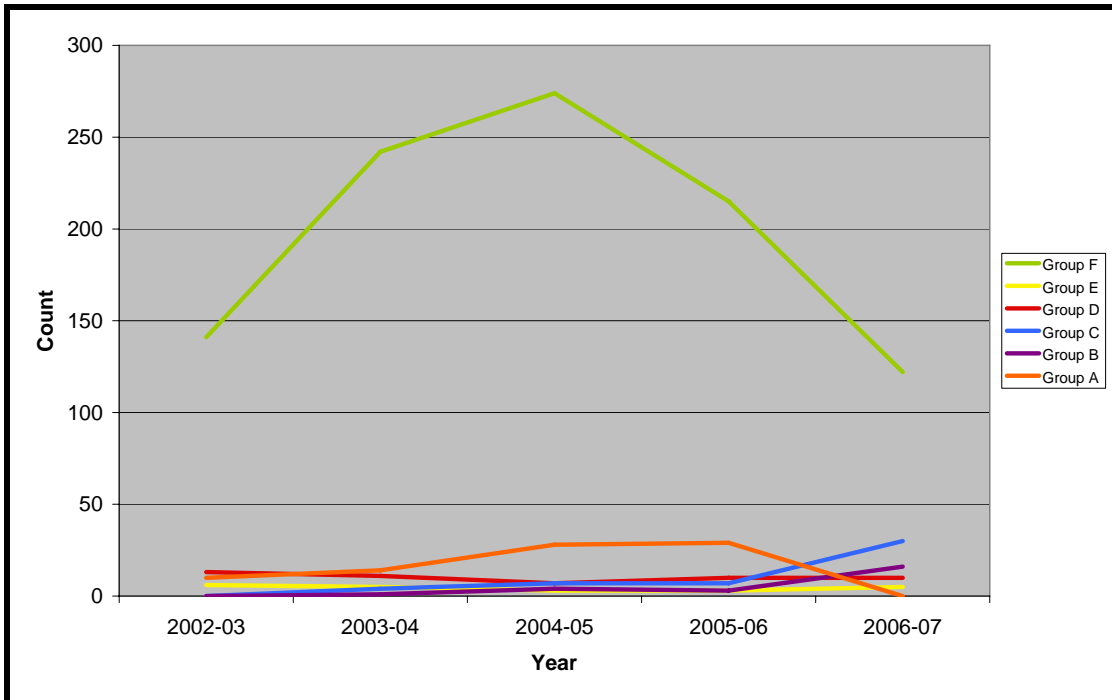
In Figure 1below we see that Group E (Low Third Stream Funds/High IP Income), which had a stable low application performance from 2002 shows a marked application activity from 2005-2006. Group D universities (High Third Stream Funds/Low IP Income), on the other hand, exhibit an increasing trend of patent applications from 2002-2005 but declined from thereafter. Our field work suggests that this increase comes in large part continues to come from the biomedical field. Figure 2 below gives some indication of the results from the applications made between 2002-2007, bearing in mind that the patents granted may not all come from the applications made in 2002-2007 because, *inter alia*, of the time lag between application and grant.

**Figure 1. Patent applications in the period 2002-2007 for 40 selected HEIs.**



Data Source: HEBCI surveys 2008, 2007, 2006

**Figure 2 Patent granted in the period 2002-2007 for 40 selected HEIs.**



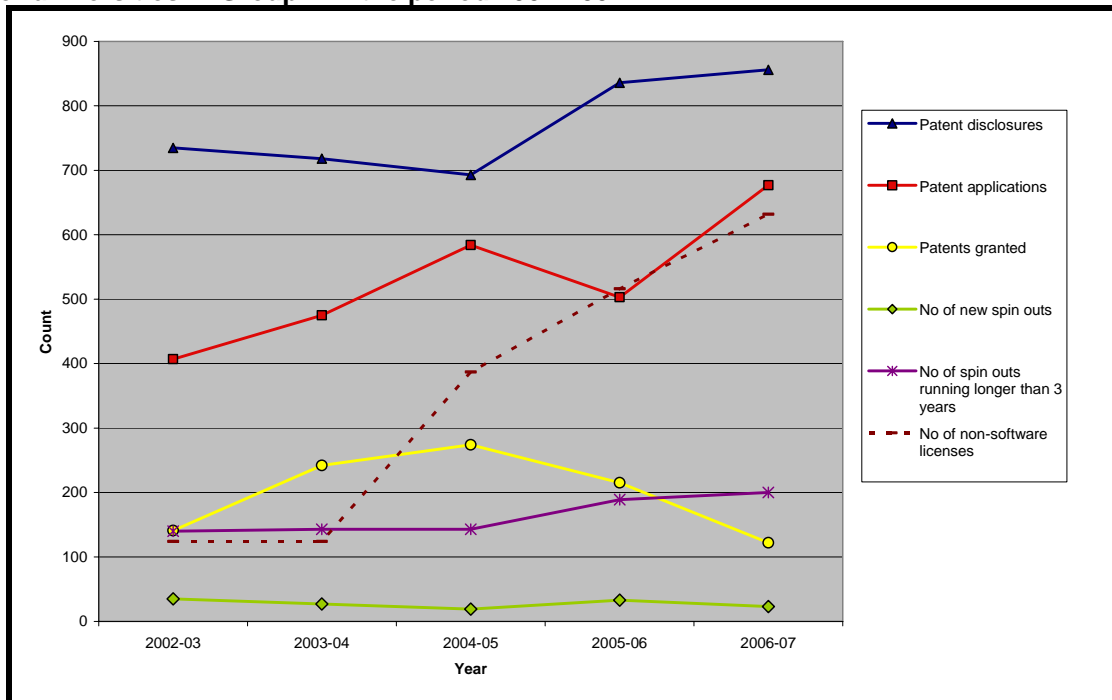
Data Source: HEBCI surveys 2008, 2007, 2006

In particular we observe a sharp decline in granted patents during 2005-2007 for Group F (High Third Stream Funds and High IP Income), which could suggest that the decline in the number of granted patents was possibly due to withdrawal or rejection of the applications.

*A caveat:* it is worth noting here that a low number of applications recorded by Groups A and B universities, in particular, is partly, a result of lower HEIF funding that they have received, which could partly affect their patenting activities. Instead, we have learned that these universities often have a large number of collaborative projects with industry and the ensuing patents are owned by the company. Such a situation presents another problem with HEFCE indicators as will be elaborated below.

As Group F (High Third Stream Funds/High IP Income) forms the main group that patents the most, we show below its patenting and IP exploitation activities.

**Figure 3 Patent disclosures, patent applications, granted patents, spin outs and licenses for universities in Group F in the period 2002-2007**



Data Source: HEBCI surveys 2008, 2007, 2006

In Figure 3 above we observe that particularly between 2005-2006, the number of disclosures rose steeply while the number of applications for the same period declined sharply (approximate difference between disclosures and applications is about 330). Between 2006-2007 the gap between disclosures and applications narrowed (about 150). These trends arguably suggest a steady trend of selective application.

The number of non-software licenses (that is, licenses from mainly patented technologies, as software is generally not widely patentable in the UK) has risen steeply from 2003 onwards. Could this also suggest “better commercialisable patents?” The growth of spin-outs has remained stable and the number of spin outs running for more than three years shows a

steady growth. This suggests that existing spin-outs have become more resilient over time, arguably from additional investment from “better commercialisable patents.”

## Patenting strategies

The majority of the universities “go the PCT route.” This is because the additional 18 months that the PCT international preliminary examination takes allows universities’ TTOs, for instance, “breathing space” (after UK priority filing) to locate a potential investor or use this time for other tasks. In the absence of the possibility to file a disclosure, as previously available in the U.S.<sup>5</sup> and a grace period (as provided in the U.S.), there is an apparent tendency for universities to use the PCT as a grace period. Whether this period is also used to further develop the technology is not uniformly undertaken across the universities interviewed. Pertinently, a TT Director of a Group F university (High Third Stream Fund/High IP Income) also remarked that it could be beneficial to universities patenting activities if the UK had a grace period as it would give universities an opportunity to “seriously work the technology” before filing (and by implication, avoid the PCT route), while at the same time reducing the university’s patenting costs.

As the UK does not have a grace period nor allow filing of disclosures, it appears that with regard to patenting, UK TTOs adopt two main approaches to this activity. They are (1) go national directly or (2) file with the UK IPO (priority filing) followed by PCT applications. A handful of universities go directly to PCT applications but this approach is less common among the sampled universities.

*This thus raises the question if disclosure or a grace period may help obtain potential benefits for universities in their patenting activities, such as further improving the quality of the patent application and reducing the overall cost of patenting by universities.*

## The patent protection failure problem: Is there one?

### **Available data show that there is no patent protection failure problem**

Table 1 below suggests that there does not appear to be a significant patent protection failure problem, when compared to a previous impression based on anecdotal evidence of about 60 per cent abandonment rate by high IP income universities (Meyer and Tang, 2007). The data in the Table shows that the majority of Group F (high IP income) universities registered less than 30 per cent abandonment rate. University 3 of Group F has an exceptionally high abandonment rate (100%) as it has abandoned its one and only PCT application<sup>6</sup> when the TTO was eventually informed by patent agents that the application needed to be withdrawn because of lack of novelty.

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<sup>5</sup> This has been discontinued since 2007 and disclosures are now replaced by provisional patent applications. It allows filing without a formal patent claim or any information disclosure (prior art) statement. It provides the means to establish an early effective filing date in a subsequent patent application. It also allows the term “Patent Pending” to be applied in connection with the description of the invention. A provisional patent application has a pendency of 12 months from the date that it has been filed. See <http://www.uspto.gov/web/offices/pac/provapp.htm>.

<sup>6</sup> However it must be noted that it only had one UK priority filing on which the abandoned PCT filing was based.

We were unable to obtain the patent data on PCT applications from nine universities, three of which were from Group F (High Third Stream Funds/High IP Income). The inability to produce these data was from a combination of reasons, which are:

- the absence of a well-designed data management system that allows the extraction of patent data;
- the difficulty of extracting such data possibly from their existing data management system;
- the TTOs are in the process of overhauling their data management system;
- staff shortage that prevented the extraction of this data;
- patent data are recorded on a project by project basis within schools and not made accessible to the TTO.

We also surmise that in some cases, the relatively newly appointed TTO director/manager (appointed in the last couple of years) was committing his/her time to either overhauling, formulating or implementing a new IP commercialisation strategy. These tasks had thus precluded them from spending additional time to obtain such data from an apparently data management system that was not “user-friendly.”

**Table 1. Applications abandoned at international phase of PCT.**

University	Number of PCT applications filed in 2004 - 2008	Number of PCT applications going national out of these filed in 2004-2008	Number of PCT applications abandoned out of these filed in 2004-2008	Numbers of PCT applications which are still pending, out of these filed in 2004-2008	Current percentage of abandoned PCT applications (filed in 2004-2008)
<b>Group A (Low Third Stream/Zero IP Income)</b>					
University 1	6	2	0	4	0%
University 2	1	1	0	0	0%
University 3	0	N/A	N/A	N/A	N/A
<b>Group B (High Third Stream/Zero IP Income)</b>					
University 1	0	N/A	N/A	N/A	N/A
University 2	0	N/A	N/A	N/A	N/A
University 3	6	1	1	4	50%
University 4	5	4	0	1	0%
<b>Group C (Low Third Stream/Low IP Income)</b>					
University 1	0	N/A	N/A	N/A	N/A
University 2	11	8	0	3	0%
University 3	0	N/A	N/A	N/A	N/A
University 4	2	1	1	0	50%
University 5	1	1	0	0	0%
University 6	5	1	1	3	50%
<b>Group D (High Third Stream/Low IP Income)</b>					
University 1	11	2	2	7	50%
University 2	31	19	5	7	21%
University 3	21	12	9	0	43%
University 4	0	0	0	0	n/a
University 5	14	7	7	0	50%
University 6	6	3	2	1	40%
<b>Group E (Low Third Stream/High IP Income)</b>					
University 1	4	4	0	0	0%
University 2	36	16	6	14	27%
<b>Group F (High Third Stream/High IP Income)</b>					
University 1	23	9	3	11	25%
University 2	95	50	14	31	22%



University 3	1	0	1	0	100%
University 4	39	18	7	14	28%
University 5	35	24	6	5	20%
University 6	77	42	17	18	29%
University 7	48	30	3	15	9%
University 8	27	27	0	0	0%
University 9	28	13	5	10	28%
University 10	78	36	20	22	36%

*Note.* The data from 9 universities was not available. Current percentage of PCT applications abandoned is a percentage based on PCT applications which either went national or were dropped. For instance, for University 5 in Group F: 6 applications were abandoned out of 30 (24+6) equals 20%. It is NOT a percentage of abandoned PCT applications out of all PCT applications filed in the period 2004-2008. Some PCT applications filed between 2004-2008 are still pending and there is a chance that some of them will be abandoned. Therefore, the final percentage of PCT applications which were filed in the period 2004-2008 and then abandoned will be smaller, equal or greater than the percentage reported in the last column.<sup>7</sup>

Whether an approximate of 25-30 per cent abandonment rate on its own can be regarded as a “failure problem” is difficult to judge as there is little empirical research on this specific issue.<sup>8</sup> However, if one uses the analogy of the 97 per cent failure rate for commercialisation of all patents (Allison et al. 2003)<sup>9</sup>, then perhaps one could plausibly argue that 25-30 per cent abandonment rate does not indicate “failure protection.” Instead, it could be perceived as further awareness of the disutility of “patenting everything that can be patented.”

The use of rejection and withdrawal figures by patent offices may also be used as a “proxy benchmark” to assess failure. Figures suggest that that in 2007 about 50 per cent of applications with the USPTO were allowed (granted), thereby suggesting that about 50 per cent were rejected or withdrawn by the applicant, down from about 70 per cent in 2000 (USPTO <http://www.uspto.gov/web/offices/com/annual/2007/2007annualreport.pdf>). On the other hand, Lemley and Sampat (2008) argue that the grant rate actually lies in the range, as of April 2008, between a lower bound of 71.8% to an upper bound of 75.9%.<sup>10</sup> Ebert (2004) also shows that the grant rate is less than 75 per cent. Lemley and Sampat argue that about 28 per cent are abandoned for a number of reasons, the main one being the quality of the patent application (69 per cent of the 28 per cent abandonment rate) (Lemley and Sampat 2008, 115).

We were unable to obtain details from the TTOs on whether the above 25-30 per cent abandonment rate is a result of “rejection” (poor PCT examiner’s report<sup>11</sup>) or withdrawal/abandonment because, for instance, the inability of the TTO to locate a potential investor. However if we assume that half of the 25-30 per cent (that is about 12 per cent) is a result of a poor application, and hence abandonment, we can then also plausibly

<sup>7</sup> We have also been advised by a couple of universities that their number of PCT applications for the requested period 2004-2008 may not include all UK priority filings, from which PCT applications are made. This is because PCT applications from priority filings filed between 2004-2008 can only be filed between 2005-2009 and priority filings filed between 2007-2008 will still be in their priority year and so will be unlikely to have entered PCT phase by the end of 2008, “unless by anticipation.”

<sup>8</sup> There are no available data on abandonment of applications by HEIs or industry.

<sup>9</sup> The authors found that only about three per cent of patents issued over a period of more than 20 years had been commercialised.

<sup>10</sup> They however caution about the difficulty of establishing USPTO grant rates, the discussion of which is beyond the ambit of this study.

<sup>11</sup> This is the International Preliminary Report on Patentability.

conclude that there is an insignificant patent protection problem with the majority of the sampled universities.

In addition, Katznelson (2009) contrasts abandonment rates of patent applications at the European Patent Office (EPO) between priority filings and second filings (with U.S. priority).<sup>12</sup> Those filed under the priority-dependent system are dropped at a much higher rate than the U.S. priority filings, suggesting that the former applications are of lower quality compared to the latter. For instance, Katznelson shows that 25.7 per cent of priority filings are abandoned versus 2.6 per cent of second filings before the Search Report<sup>13</sup>; 32.2 per cent versus 9.5 per cent, respectively, after Search Report and before the examination process.

In addition if we use the EPO's traditional allowance (grant) rate of about 56-60 per cent with about 30-35 per cent abandonment and five per cent or so rejection (Zura 2008; Lazaridis and van Pottesberghe de la Potterie 2007), we could also argue that our PCT abandonment figure is not any worse on the assumption that the majority of EPO applications generally come from companies.

Note the comment of a TT manager of a Group F university (High Third Stream Funds/High IP Income) on the abandonment of PCT applications.

I think it [patent protection failure problem] happens. It's true that very few patents that are filed by the universities are granted but I fully expect that to be the case. But I don't necessarily regard that as a problem. I think you have to be very speculative in the early days and we do need to be selective. All universities will be under pressure to do good business and that means focusing resources where it is most likely to be impact. So I don't see it as a problem as itself. .... I don't think that the fact that there are a number of applications filed which then are dropped is itself a major, major issue. Of course anything which could be done to reduce that would be much appreciated but I just don't think that UK universities ought to be judged on the number of patents granted. So yes, anything to reduce spend [patent spend] is important but I don't think there is a need to increase the number of granted patents.

Compare the above with the explanation of another TT director of a Group F university.

I don't see failure to protect IP as an important problem. We are able to protect IP that we need. .... We don't drop because of lack of funding, but because of lack of commercial opportunity of appropriate scale or because the time frame is not adequate. It may be a failure of the system, that is, if funding is just justified by a commercial opportunity of a particular size, and left out for commercial opportunities below that size. It's a fine distinction. I don't see a failure of the system or an inability from our part to protect IP as being a major problem. I may be wrong.

The two comments in large part reinforce the observation that HEIs are increasingly careful about patenting. Many HEIs now have processes in place to decide if a patent application should go the PCT route. For instance, a staged "gateway" process has been implemented. Regular meetings are held to review the disclosures, which include a prior art search. Then decisions are made to proceed with priority filings by the TTO, the criteria of which include the strength of the invention/technology, its commercial viability and the interest of the

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<sup>12</sup> It must be noted that Katznelson was discussing the first-to-file vs. first-to-invent issue but we argue that the abandonment figures he has presented can be used as a proxy measure for our PCT abandonment discussion.

<sup>13</sup> A Search Report is a list of published items showing patent and non-patent literature, issued by the patent examiners checking the novelty of the patent application.

researcher to work on it. After a UK priority filing has been made, it is again reviewed about ten months after the filing to decide if a PCT application should be made.

The decision to go PCT is much determined on either to “buy more time” for identification of a potential licensee or for more research to be undertaken after the initial priority filing. Such a process implies that (1) there may not be many PCT applications and possibly less abandonment; and (2) that TTOs are increasingly more selective in their priority filings. Importantly, this increasingly common practice by TTOs is an indication of *learning* in the last decade or so. Furthermore, universities are beginning to trademark their IP more than they did before, raising the issue of the continual emphasis on patents<sup>14</sup> (more on this below).

The above discussion addressed universities from Groups E and F which have high IP income. The abandonment rate for some universities in Groups A, B, C, and D (zero or low IP income) is about 40-50 per cent. However, the absolute numbers of abandoned applications are very low, ranging between 1 and 9 (most frequently 1-2 applications are abandoned). As the absolute numbers are so small the approximate of 40-50 per cent abandonment rate also may not be regarded as a “failure problem”.

In sum, we can preliminarily conclude from the data that there is an insignificant patent protection problem. What may account for this?

## **TTO Selectivity: First key reason for “no patent protection failure problem”**

### **TTOs have learnt to be increasingly scrupulous about what to patent**

“...we do it [patenting] thoughtfully. We avoid dissipating resources, energy and commitment...we don't want a patent just for the sake of it, we try to be objective” pronounced a TT Director of a Group D (High Third Stream and Low IP Income)<sup>15</sup> research-intensive university. In another instance, a Group F (High Third Stream Funding/High IP Income) has also changed its previous targets of 50 invention disclosures to 20 disclosures and 10 new priority patent applications to 7-8. The TTO manager explained “We won't just file things because they are patentable. We need to feel that potentially there is a great market opportunity.... I am not worried about how many national applications we have. What I am concerned about is how many inventions we get out there to commercialize.” A Group C (Low Third Stream Funding/Low IP Income) TT manager agreed that “it [the TTO] has to be more selective” in improving the university's IP commercialisation performance.

Another TTO director of a Group F (High Third Stream funding/High IP Income) university stated:

We can abandon patents anywhere in the process. There is a tendency for not protecting at the beginning if we don't think it's worth protecting. It's a cost issue. After 12 months, before PCT, we have to ask the question whether the underlying activity (what we know about the space we're moving into) justifies continuing at

<sup>14</sup> This observation is based on interview data from TT directors/heads.

<sup>15</sup> An argument can be made that this Group D university has low IP income because it is overly careful about patenting. On the other hand, a counter-argument to this is “what's the point of having a large number of patents if you can't exploit it?”

that point, because there is another cost implication. The largest cost implication is when we hit the national phase (the 30 months)..... So ideally we would like to have a licensee in place by national phase. As a minimum we need a feeling that there is a process in place that will yield a licensee in the foreseeable future. Otherwise we would pull out.....It may be that in certain circumstances the best thing to do is not to patent anything. The earlier we identify that something is not as good as it appears or yields an opportunity the quicker we drop that, the quicker we can focus our resources on the things which are good.”

*Thus a key reason is that TTOs have learned to be selective in their patenting activities.* Learning has evidently underpinned this selectivity, accompanied by a stronger conviction that patenting for the sake of patenting, despite the importance of patents as a HEFCE indicator, does not always yield returns from them.

As an illustration of what some universities with low or zero IP income are doing to improve their IP commercialisation performance, we present an example of a Group B’s (High Third Stream Fund/Zero IP Income) strategy. While apparently in the past it was less discerning with disclosures, which did not result in much commercialisable IP, decisions are now made either to pursue them actively or return them to the academic. We present this example to illustrate the observation that HEIs, including those with poor past performances, have learnt to be more selective, recognising that there is little merit in having a patent portfolio that has not been successfully exploited.

This University has just introduced an “invest-divest” strategy, which entails a careful scrutiny of the disclosures the university receives from the academics to determine if a patent application should be made or a license to be sought. A positive decision results in a patent application or active search for a licensee. “Special purpose vehicles” will be created to assist with the commercialisation of the patented technologies.<sup>16</sup> Prior to this new strategy, academics were seldom aware of the fate of their disclosures. Financial returns between the university and the inventor, when the technology is licensed, are made on a case-by-case basis to “show the personal treatment.”<sup>17</sup> This university has also invested half a million pounds in its data management system in order to capture the university’s entrepreneurial activities efficiently.

The above examples are a snapshot of the generally more careful attitude of the majority of TTOs toward patenting. Box 1 below summarises examples of selectivity.

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<sup>16</sup> How these special purpose vehicles will work are still being decided.

<sup>17</sup> This process, however, is only possible in the case of a small number of licenses; otherwise the process will need to be routinised.

## Box 1. Institutional learning underpins selectivity

Examples of selectivity are:

(1) that TTOs have become more aware of market conditions and what patents will have potential licensing opportunities – this could explain the notable rise in licensing as depicted in Figure 3 above;

(2) that TTOs have developed a keener sense of what patents can be used constructively to spin out and maintain the longevity of spin outs. The stability in the number of new spin-outs in the last three years could also suggest the commercial viability of the patents. The number of spin outs running for more than three years shows a steady growth. This suggests that existing spin-outs have become more resilient over time, arguably from “better commercialisable patents.” (See Figure 2.)

(3) that TTOs have become more scrupulous about what disclosures should proceed to UK priority and PCT filings;

(4) that TTOs through an increasing pro-active strategy of engaging with academics have made the latter better aware of, and interested in, seeking out market opportunities for their inventions or innovations. This has resulted in the better identification of patentable results, which in turn conceivably lead to more potential commercially patents, yielding more licensing and longer-life spin outs.

## TTO Professionalisation: Second key reason for “no patent protection failure problem”

### The majority of researchers view the performance of their TTO positively

Another reason that accounts for “no patent protection failure” is the performance of the TTO as perceived by researchers. Importantly, TTOs are perceptibly professionalising and performing well as judged by the responses of researchers to the question “how do you think the TTO is performing?” Table 2 shows the views of academic respondents. Table 3 further shows the breakdown of responses according to each group. The Tables below show that TTOs of a majority of the sampled HEIs are, on the whole, becoming more professionalised and savvy about the (dis)benefits of “non-discriminatory” filing. The generally “good” grade academics have given to the TTOs’ performance attests to their professionalisation.

On average the performance of the TTOs in the sample was ranked as **“Good.”** Although it is a very positive result, there is still room for improvement. The performance of TTO in Groups A, C, E and F was ranked as **“Good,”** in Group B as **“Quite good-to-Good,”** in Group D as **“Quite good.”** However, due to the rather low response rate by researchers, the reliability of the results is limited, in particular for Groups A, B, D and E.<sup>18</sup> It is worth

<sup>18</sup> The high number of non-academic respondents is explained by (1) the unavailability of academics from Groups A, B, and D, in particular, either because there were few who had successfully exploited their IP or had

noting that despite generating zero IP income (Groups A and B) or little IP income (Groups C and D), academics from these HEIs nonetheless regard their TTOs as performing well.<sup>19</sup>

The above analysis reveals that Government policies are indeed buttressing the efforts of TT directors/managers to increasingly make a concerted effort to raise the visibility and services of the TTO compared to what it had done about ten years ago. Yet it must be noted that we have interviewed a number of woefully inadequate IP commercialisation practices that are primarily a result from lack of institutional interest, support and funding, and motivation.<sup>20</sup> However, in most cases universities are beginning to invest in and organise their TTO, for instance, coordinating/centralising commercialisation and knowledge transfer activities that are separately performed by Schools/Faculty in order to offer a one-stop shop for commercialisation and knowledge transfer activities.

**Table 2. The performance of TTOs, assessed by academic respondents, on a scale from 1 to 5 (1-poor, 2-quite poor, 3-quite good, 4-good, 5-very good)**

Groups	TTO performance	Number of respondents
Group A - Low HEIF Zero IP Income	Good (4.00)	25% (1)
Group B - High HEIF Zero IP Income	Quite good/Good (2.50)	40% (2)
Group C - Low HEIF Low IP Income	Good (3.67)	86% (6)
Group D - High HEIF Low IP Income	Quite good (3.20)	55% (5)
Group E - Low HEIF High IP Income	Good (4.00)	50% (1)
Group F - High HEIF High IP Income	Good (3.91)	85% (11)
<b>Total</b>	<b>Good (3.62)</b>	<b>65% (26)</b>

*Note.* Values presented in parentheses, in the column “TTO performance”, are averaged scores for each group. The low response rate (N=26) is due to the fact that 1 researcher did not answer this question and 13 researchers were not available for an interview. The right column presents the percentage of respondents from each group that rated TTO performance.

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retired or left for another university; (2) a few instances of IP commercialisation that were based on students IP or “successful” students who had left; (3) the reluctance of the TTO to suggest an academic respondent on the basis that academics were overstretched; and (4) recommended academics who declined to participate for a number of reasons.

<sup>19</sup> One could hypothesize that the good rating given by academics in low IP-income performing universities indicates an appreciation of their TTOs work, despite the lack of commercialisation success. However, this would require further research.

<sup>20</sup> We think that more investigation of Groups A (Zero Third Stream/Zero IP Income), B (High Third Stream/Zero IP Income) and C (Low Third Stream/Low IP Income) needs to be undertaken.

**Table 3. Detailed academic respondents' opinions about the performance of TTOs, assessed on a scale from 1 to 5 (1-poor, 2-quite poor, 3-quite good, 4-good, 5-very good)**

Groups	Poor	Quite Poor	Quite good	Good	Very Good	No response	Total no in each group
Group A Low HEIF Zero IP Income	0%	0%	0%	25%	0%	75%	4
Group B High HEIF Zero IP Income	20%	0%	0%	20%	0%	60%	5
Group C Low HEIF Low IP Income	0%	14%	14%	43%	14%	14%	7
Group D High HEIF Low IP Income	11%	0%	11%	33%	0%	45%	9
Group E Low HEIF High IP Income	0%	0%	0%	50%	0%	50%	2
Group F High HEIF High IP Income	0%	0%	23%	46%	15%	15%	13
<b>Total</b>	<b>5.0%</b>	<b>2.5%</b>	<b>12.5%</b>	<b>37.5%</b>	<b>7.5%</b>	<b>35.0%</b>	<b>40</b>

For those who have been progressively improving its commercialisation practices, we have found that from a previously reactive stance, more TT directors/heads have embarked on a more pro-active strategy. This primarily focuses on making their services widely available to the university, and in particular, in “educating and enticing” academics to engage in entrepreneurial activities. A PVC of a Group F (High Third Stream Funds and High IP Income) university emphasised that it is “important to plug researchers into the process and they need to have a say in how things are done.” A mid-career researcher in a Group F university and described as a highly promising inventor admitted that he and many of his colleagues were quite unaware of what commercialisation is about. However, seminars on IP commercialisation had been increasingly organised by the university’s TTO and as a result, he and his colleagues now know more about the commercialisation process and what to do with their inventions.

Helping to change the mindset of academics for one that is more commercially oriented is a central difficulty TTOs face. In recognition of this, a TT Head of a Group C (Low Third Stream Funding/Low IP Income) succinctly captured the importance of spending more time with academics. He said “what we have to do is to create and sell a good brand – which is [HEI X] – to our academics. They have to see that part of the reason that they have skills is because they have been with us for long time and that part of the reason that they have the profile that they have is that they have been with us. Part of the reason that [HEI X] is, what it is, is because they are here. It’s a mutual thing. .... There is a symbiosis between [HEI X] and the leading academics and we need to sell that a bit harder.” In other words these TTOs also *are promoting themselves as a service/interface organisation* for academics and external parties.

In conjunction with a pro-active strategy, it is also notable that a large proportion of Group D (High Third Stream Funding/Low IP Income) TTOs are increasingly adopting a demand-

led strategy in its attempt to enhance its entrepreneurial activities. “Our [TTO] role is to identify business opportunities that meet the expertise of the university,” declared a Group D TT Head in charge of an office of 21 employees. These universities do not have a significant patent portfolio but the interview data show that this has not inhibited them from vigorously increasing their business engagement activities. On the contrary, their “patent deficit” has arguably spurred these HEIs to be more energetic in identifying potential business opportunities that require skills, know-how and specialised knowledge. Such behaviour also indicates the importance of capitalising on the university’s strengths instead of attempting to emulate or compare them, as some tend to do, against research-intensive HEIs. Governments policies are perceived as a “one size fits all.”

We have also observed that many Groups B (High Third Stream Funding/Zero IP Income), C (Low Third Stream Funding/Low IP Income), and D (High Third Stream Funding/Low IP Income) TTOs, in particular, are continually evolving, reviewing, or restructuring to improve their operations and to respond to academics’ needs and Government policies. Institutional learning underpins a large part of the restructuring as universities begin to learn the requisites that IP management and commercialisation demand. Others have created a special “commercialisation panel” or “enterprise and knowledge transfer directorate,” as examples, to focus on identification of IP and commercialisation. Others have consolidated their once discrete units, for instance, for consultancy, business engagement and Knowledge Transfer Partnerships (KTPs).

Several are trying to adopt a more flexible licensing and “IP ownership” policy, particularly with SMEs, although this is proving difficult (see below under Section on Government measures). Policies to clarify IP ownership in full recognition that academics are “fussy” about who owns their IP with regard to potential commercialisation are also being implemented. The majority interviewed have provided more attractive financial incentives for academics to engage in consultancy work.

From a one to two-person office in the late 1990s, the majority of dedicated TTOs now employ about 10-12 people on an average, with some HEIs having as high as 20 plus employees, and a handful as low as three. Growth has been substantially facilitated by HEIF in most of the cases. Where it has not, the financial support of senior management, for instance, the Pro-Vice Chancellor of Research and Enterprise or Finance Director (hence central funding) has been instrumental.

Previous studies (for example, Tang, Weckowska and Hobday 2008) have discussed doubts about the “value” of using patents, applications and disclosures by HEFCE to indicate commercialisation performance. Below are the views on alternative patent-based indicators that could be considered to expand the range of patent-based indicators. This is then followed by suggestions of non-patent indicators from TT directors/heads who almost uniformly argue that they could be closely considered to capture commercialisation performance.

## **Suggested alternative patent-based indicators to measure IP commercialisation**

**There is a consensus that there could be other patent-based indicators in addition to the number of disclosures, applications and patents**



The number of patents continues to be a key indicator of a university's ability to commercialise its research outputs. However it is arguable that number of patent filings, disclosures and granted patents do not intrinsically show that there is any value to the patents from the perspective of their commercialisability.

There is a wide body of literature that has suggested that there are other plausible patent-based indicators that could be considered to indicate the value of the patent, and hence its potential commercialisability (Trajtenberg, Henderson, Jaffe 1997; Sapsalis and Van Pottelsberghe 2003; Priest and Klein 1984; Bebchuk 1994; Lanjouw and Schankerman, 2001, 2002; Allison and Lemley 1998; Allison et al., 2003; Pakes and Schankerman 1984). Further, many TTOs argue that patents are not a sufficient indicator of the entrepreneurial or knowledge transfer activities of HEIs. For instance, commercialisation of university IP in the creative sector or in the Social Sciences is seldom covered by patents but by non-disclosure agreements, contractual agreements or registered designs.

This section discusses the relevance of the following alternative patent-based indicators: number of licenses, licensing income, patent citations, number of patent families, number of patents granted in the US and Japan, renewals, litigation of infringed patents. Figure 4 shows what TT Directors think about appropriateness of each of these indicators. Number of licenses, renewals and licensing revenue were perceived as the most appropriate indicators whereas the patent citations were rated as the least appropriate indicator.

**Figure 4. The opinions of TTOs on how appropriate each of the following indicators would be for representing the value of academic patents, on a scale from 1 (highly inappropriate) to 5 (highly appropriate).**

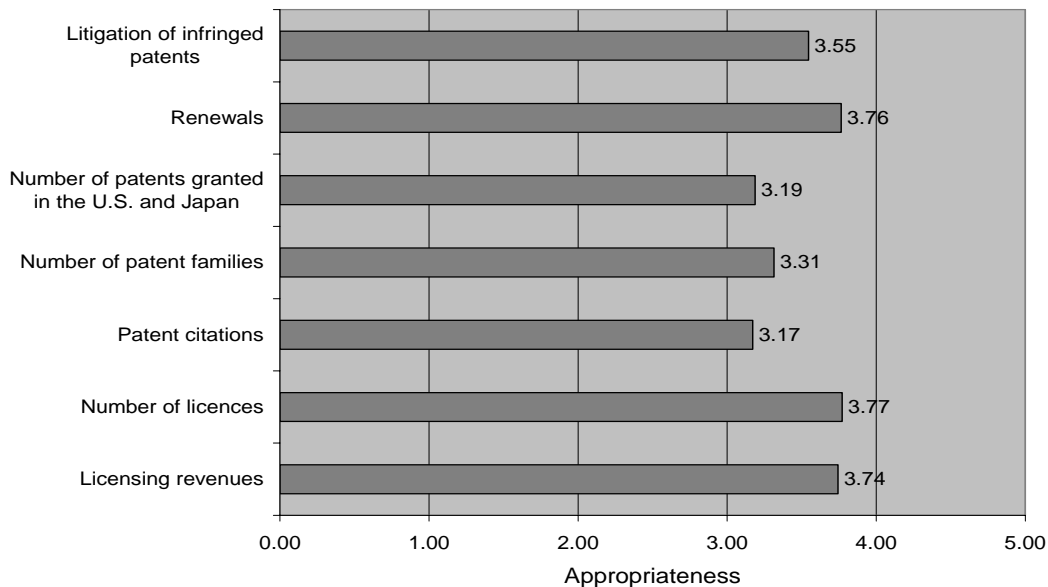


Table 4 presents an analysis of the set of indicators illustrated in Figure 4 reduced to three components.<sup>21</sup> We introduce this Table because it shows the relationship between each

<sup>21</sup> In order to explore patterns within the set of indicators, the principal component analysis was carried out. Indicator based on patent citations had to be excluded from the analysis as it was not significantly related to any other indicator. The assumptions of the principal component analysis were met. The assumptions of factor

indicator and each component. There are very clear patterns in these relationships. Licensing revenues and the number of licenses are related to component 1 which is labelled “**Indicators reflecting a scale of commercial potential.**” The number of patent families, Renewals and Patents granted in US, Japan, China and India are related to component 2 which is expressed as “**Indicators reflecting a scale of protection.**” The litigation of infringed patents is related to component 3 and it is referred to “**Indicators reflecting a scale of infringement.**”

**Table 4. Relationship between each indicator and component.**

Indicators	Component 1	Component 2	Component 3
	Indicators reflecting a scale of protection	Indicators reflecting a scale of commercial potential	Indicators reflecting a scale of infringement
Number of patent families	0.91	0.12	-0.23
Renewal	0.84	-0.08	0.01
Number of patents granted in the U.S. and Japan	0.75	-0.05	0.30
Litigation of infringed patents	-0.04	0.07	0.97
Number of licences	0.01	0.81	-0.28
Licensing revenues	0.00	0.93	0.29

*Note.* The values presented in the table are factor loadings. They show how much each indicator is related to each group of indicators (to each principal component). The indicators with factor loadings bigger than .3 should be interpreted as related to a given group. The method of factor extraction: Principal Component Analysis. The method of factors rotation: Promax with Kaiser Normalization.

To sum up, according to our respondents the number of licenses and renewals are the most appropriate indicators whereas the patent citations are the least appropriate indicator of patent value. The analyses also revealed that there are three underlying scales in set of questions that potentially might represent different aspects of patent value. These aspects are: a scale of patent’s commercial potential, a scale of patent’s protection, a scale of patent’s infringement. However, further study, examining more indicators and a larger sample of respondents, is required in order to fully explore the nuances of the measurement of patent value.

### **...but others could be considered to make indicators for measuring more meaningful**

**These indicators are non-patent based and address a comprehensive range of commercialisation activities**

Respondents were quick to suggest other indicators that could better capture the range of IP commercialisation activity. They are:

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analysis were tested: 1) data is roughly normally distributed; 2) sample size is acceptable given quite high communalities (larger than 0.7); 3) All indicators are correlated significantly with at least one other indicator. The exception was the indicator based on patent citations and therefore it was excluded from the final analysis; 4) There was no problem with multicollinearity (determinant statistic = .19; all  $r < .7$ ); 5) The overall KMO measure of sampling adequacy (KMO=.6) had an acceptable value and Bartlett’s test of sphericity was significant, which indicate that a factor analysis is an appropriate method of data exploration.

1. The amount of research funding received by a university and attributed to a licensed and patented IP. This was argued to show the “real” economic impact of research. A key question posed was “how can we capture the financial returns from IP commercialisation?” This could be a revealing indicator as it shows a “financial” investment or payback from the ratio between issued and licensed patents. Alternatively it indicates a “financial” result of the share of disclosures that resulted in issued patents and licensed patents. It can also show the number of licensed patents generated from in relation to issued patents.
2. Number of undergraduate and post-graduate entrepreneurial-oriented activities, for instance, providing incubators for students.
3. Number of strategic alliances with firms.
4. Funds obtained to undertake business engagement, such as structural funds from the European Commission.
5. Equity holding in spin outs.
6. Private investment generated by spin-outs.
7. Evidence of impact of policy reports, for instance, how a policy report has helped in the shaping of a policy or how a policy report has informed a policy.
8. Number of “good practice” case studies showing engagement/knowledge transfer with the non-academic community
9. The amount of additional research funding generated from the patent from external partners for related (or new) research.
10. The number of collaborative arrangements between the university and companies. This will be hard to monitor unless there is a central information database, which universities often do not create one for such activities.
11. Number of jobs created or saved in the TTO.

In summary, our findings illustrate that the patent-based indicators must be treated with care as the mere scale of patenting does not reflect the commercial value of patented IP. Moreover, it has been suggested that a wide range of non-patent based indicators could help to capture the commercialisation of academic research in a more comprehensive manner.

## Part B

Part B presents (1) the different types of TTO models and (b) examples of innovative strategies.

### Establishing the different types of TTO models

**We identified four models of technology transfer offices. However the strategies toward commercialisation do not differ significantly across the four models**

To reiterate, our sample of HEIs was stratified into six groups: They are:

- (1) **Group A** – Zero Third Stream Funds and Zero IP income;
- (2) **Group B** – High Third Stream Funds and Zero IP income;
- (3) **Group C** – Low Third Stream Funds and Low IP income;
- (4) **Group D** – High Third Stream Funds and Low IP income;
- (5) **Group E** – Low Third Stream Funds and High IP income; and
- (6) **Group F** – High Third Stream Funds and High IP Income.

We found that stratifying the HEIs into these groups facilitated better sampling of the 158 HEIs. Importantly, interviews based on a number of HEIs in each of the stratified groups helped to shed light on the different models and IP strategies employed by these HEIs, regardless of whether they are research or teaching intensive. We then used the collected data to identify a preliminary taxonomy of IP commercialisation models based mainly on their governance structures.<sup>22</sup> None of these models is however exclusive to any of the six stratified Groups. The types of commercialisation models are:

- (1) **Type I** – an internal organisation managed by and part of the university structure, in much the same way that Finance is part of the structure;
- (2) **Type II** – an organisation operating outside of, not managed by the university, but reporting to the university;
- (3) **Type III** – an external generally non-profit making commercial organisation wholly owned by the university but operating autonomously and reporting to a board for all decisions.
- (4) **Type IV** – an external profit-making commercial organisation listed on the stock exchange (shares).

### Commercialisation approaches

While there are different TTO<sup>23</sup> models, the approaches to IP commercialisation are largely common among the three Types. *They are: (1) licensing – the preferred route; (2) spin-outs and/or equity holdings; and (3) consultancy.* The key factor that underpins the success of these approaches is close interaction with academics, a point we were told may not be underestimated (more below).

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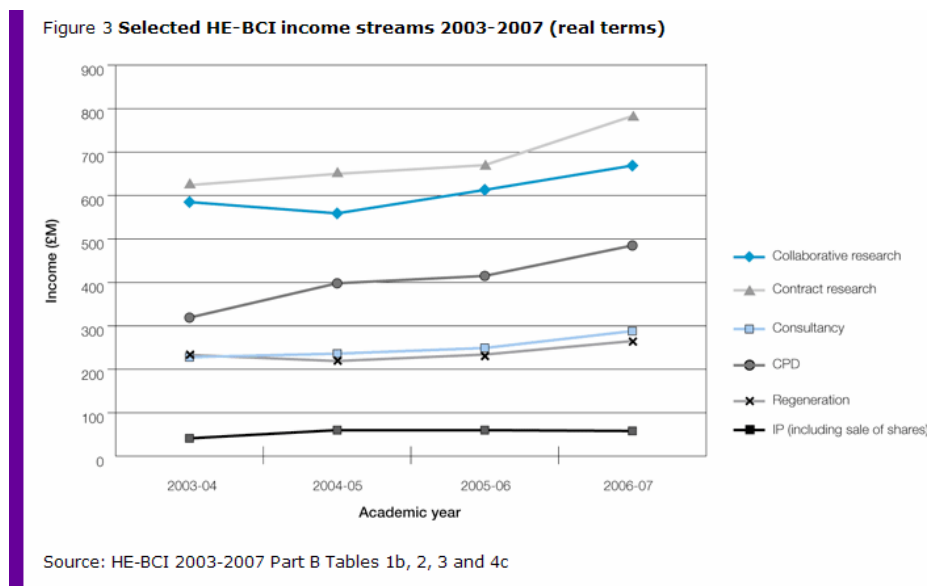
<sup>22</sup> A taxonomy based on governance structure was prompted by a presentation by Carolyn Quest, Managing Director, Queen Mary Innovation Ltd. At INGENIO, University Polytechnic of Valencia, March 2008.

<sup>23</sup> We use the term Technology Transfer Office (TTO) generically for the purposes of simplicity although these units are called differently across the HEIs.

The role of consultancy, including contract research have been emphasised as an increasing route to commercialisation because academics obtain the opportunity to use their knowledge and know-how, as well as receive new ideas/knowledge, and possible further funding for their research.

We also have, significantly, identified the continually increasing role of collaborative research with industry (including SMEs) as a means to potential commercialisation across all six HEI Groups. In addition, we have also observed a growing focus on “harvesting” the work of undergraduates as a basis for potential commercialisation. Figure 5 below confirms these increasing trends, although it shows *research income* rather than as *a means of commercialising university IP*

**Figure 5 Selected HE-BCT Income Streams 2003-2007 (real terms)**



## Type 1. An internal organisation of the university

This is the most common model. It faces the problems of (1) commitment of the university; (2) flexibility; (3) constrained decision-making; and (4) profile. Its main advantage lies in the financial support it receives from the university as technology transfer is regarded as an administrative function of the university.

This is the most common model found among the universities interviewed. Here, the staff is subject to university employment regulations and Human Resources practices and the TTO generally reports to a PVC (or VC), finance, corporate/external affairs, research or administrative services.<sup>24</sup> Its main advantage, as perceived from the vantage point of the university, arguably, lies in the fact as the TTO is treated as an administrative function of the university, it will always be supported by university finances. Yet as will be shown below, the

<sup>24</sup> Type 1 expands on the “internal model” presented in *Exploiting University IP in the UK*, a Report prepared for the UK IPO, February 2008.

TTO is also subject to university priorities, financial constraints and control, which collectively have the potential to constrain its activities.

A main feature with Type I is its financial management reliance on the university system. Despite external sources of funding, such reliance has made it somewhat difficult for the growth and expansion of entrepreneurial activities in many HEIs, given the wide variety of financial commitments of a university. “It is very difficult to coordinate all these activities [commercial activities] without pro vice chancellor or deputy vice chancellor support. Getting these people on board is fundamental,” a TTO Director lamented. For instance, it can be difficult for the university to see beyond its need to raise additional monies from various sources for the purpose of channelling resources toward the development of academic entrepreneurialism.

As a result, many universities tend to “maximise” their share of overheads rather than to devise an incentive structure to foster academic entrepreneurialism. This arguably discourages academics to embark on commercialisation, as noted by a senior university administrator, who said “Previously the concern of amongst the researchers could have been the university will simply clean off the benefits from their hard labours. Now we have more compatible share of rewards through successful exploitation of research outcomes.”

Associated with this characteristic (or problem) is, therefore, the lack of, or reluctance to, direct resources to further develop the technology transfer/business development unit, such as for hiring qualified personnel. Also Finance departments are ill-equipped to undertake commercial exploitation and have been argued to license too early without doing “due diligence” of the market. This situation is found in both research and less-research intensive HEIs.

The above two aspects show that Type 1 is subject to university priorities and financial control, which in turn leaves the TTO much less flexibility in making decisions for the TTO and in formulating its strategies. University financial control also will constrain the TTO’s ability to be innovative in performing its activities especially if its performance depends on additional financial resources. As already noted above the “valley of death” of technology transfer is often a result of inadequate university financial resources.

This Type can also suffer from the resistance or lack of support for IP commercialisation from heads of departments and deans, which can make “life difficult” for an “entrepreneurial” finance director. The “degree of embeddedness” of academic entrepreneurialism with teaching and research, according to a TT director, is a critical factor in the success of a technology transfer/business development division of the university. Hence a low degree of embeddedness often results in conservative and slow decisions, for example, in making new investments in the IP commercialisation activity. Such lack of support can also come from a view that is antithetical to commercialisation. Note for instance a comment from TTO director of a Group A (Low Third Stream Funding/Zero IP Income): “If you define a technology transfer function in terms of traditional measures such as spin outs and licenses than it is not necessarily what post-1992 universities do.”<sup>25</sup> The persistence of such an attitude can be detrimental to the development and subsequent profile of a TTO within the university structure. Couple with this university financial control, the TTO will likely find “little room for manoeuvre.”

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<sup>25</sup> This comment however does not always imply that there is no interest in engaging with business. Instead, such engagement is seen in the broader context of knowledge transfer.

Overall, the success of this type is to a large degree, dependent on the support of a powerful sponsor, such as the Director of Finance/Research, or whoever the unit reports to in order that Type 1 may receive the necessary funds to promote and perform commercialisation activities. Similarly the active support of the Vice Chancellor can help to bolster the performance of the unit.

*To sum up Type I faces the problems of (1) commitment of the university; (2) flexibility; (3) constrained decision-making; and (3) profile (branding of the TTO).*

See the comment of a senior administrator of a Group C (Low Third Stream Funding/Low IP Income):

Although we are supported by the VC, the university hasn't quite worked out how commercialisation fits with the organisation. The longer term concern is e.g. if the funding dries up or there is a change in the attitude of the VC then would we institutionalize our activities in a satisfactory way? So the concern is whether commercialisation is really embedded into a culture of the university and I think it's not yet.... Changing the culture has to be done, in my opinion, by the change of university management. From the top-down.

### ***Examples of innovative strategies***

Here we present examples of innovative strategies pursued by two Group C universities – Low Third Stream Funds and Low IP Income. We present these because they are teaching-intensive, but more importantly, they both have assiduously attempted to become entrepreneurial in the light Government policies and funding, and the stark awareness that more improvement can be made in their IP commercialisation activity.

**Goldsmiths<sup>26</sup> (Group C)** faced initial resistance from senior management and academics when, during HEROBAC, the College was required by HEFCE to set up the office. Senior management argued that universities should not be engaging in business development. The office grew from two to six employees during HEIF 2. However, there was continued scepticism from academics at that time. Fortunately for this Business Development Office, the Pro-Warden Research and Enterprise helped develop better relations with academic departments, and a new Warden, who was more "business savvy" than his predecessor, also supported the office very clearly. A culture of change had already begun to be inculcated in the College and it continues to the present.

Aware of some continuing academic resistance to commercialisation, this office has begun actively developing relations with the various departments. From almost a zero base before 2005, the office now has good working relations with at least 10 per cent of Goldsmiths College's academic community and is aiming for 15 per cent by the end of the year. It has also cultivated close relations with 5 out of 14 Goldsmiths' academic departments and is seeking to increase the number to eight soon. Importantly, these measures have yielded significant revenue returns to Goldsmiths, as measured in the annual HEBCI Survey. Again from an insignificant revenue return since 2002 from its entrepreneurial activities, the office recorded £3 million in 2008 and aims to increase this to £4.5 million by the end of the HEIF 4 period.

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<sup>26</sup> We have been authorized to attribute. The details here have also been previewed and contributed by Michael Metelits, the Director of Business Development Office, Goldsmiths, University of London.

An instrumental measure for this increase was based on working with academics and departments on their projects, for instance, participating in proposals and projects, and establishing contacts for collaborative (university-industry) projects. A novel way of engaging academics in commercialisable activities was by forming interdisciplinary project teams, which was unprecedented. For instance, the video control software project involved Computing, Psychology and Design academics at one stage, and these relationships have persisted through other projects. This apparently worked out very well, judged by repeated projects requiring these collaborative teams. These actions have materially helped awareness-raising among the academics/departments of the "utility" and role of Business Development Office.

The second mechanism that the Business Development Office is implementing at the moment is a financial incentive system for academics, which was not done before. There is arguably a positive benefit to engaging academics, whether through financial incentive systems or any other incentive, such as buy out from teaching and revamped promotion criteria to include entrepreneurial performance. This cannot be underscored in persuading academics to engage in commercialisation activities.

Goldsmiths, however, does little patentable research. Instead it focuses on exploiting the research methods and skills developed at Goldsmiths, and "through the magic of knowledge transfer," revenue generating opportunities are created, for instance, license revenues from an evaluation methodology developed by some College's social scientists there and general economic and social impact. The Business Development Office also actively encourages the sharing of ideas among the academics and "we are much more concerned with collaboration across the disciplines and trying to find ways to facilitate people to spark the ideas of each other." Associated with this is the Business Development Office's emphasis on working with the needs of commercial partners, "rather than pushing out technologies."

The **second Group C** University is focusing on undergraduates as a key plank of their entrepreneurial strategy. Working on an assumption that a good place to foster entrepreneurialism is at the undergraduate level, this university assigns the IP rights to the undergraduate instead of owning the rights as it is done at the researcher level.

The university introduced a commercialisation program in 2008, which totally supports the nurturing of entrepreneurial undergraduates. Taking about 6-12 a year, this program entails managing and protecting the IP, seeking for commercialisation opportunities, licensing and returning the monies collected back to the undergraduates who would by then have graduated. Training is provided to the undergraduates with regard to entrepreneurial skills – how to get involved in licensing, how to present the product, how to set up a company, how to secure funding etc. "So it not only about finding a license we also train them to develop these other skills," explained the TT Director.

The TTO also attempts to keep up with the course projects that undergraduates have to complete by the end of the course. For instance, within design engineering and computing, students have to present "a design of innovation" at the end of June. The TTO then investigates if there is a possibility of taking these project outputs further for development. An interesting case was a product that an undergraduate had designed. This was eventually patented, licensed and development of a second generation (for which a patent application has been filed) of this product is underway.



This university also actively pursues a “demand-led” strategy in its commercialisation activities. To quote the TTO:

So what we are looking for is ideas and concepts which have commercial legs, good commercial potential and we look at ways to work with industrial partners. We have lots of contacts with industry ranging from large stores such as TESCO, ASDA, Sainsbury’s of course, DIY stores and we look with them to identify opportunities and outputs from the university. If it’s of interest for them we then work with their suppliers and look at the ways to bring these ideas into market.

We ask companies whether they have areas where they think they could benefit from research into new areas and we had a lot of interest from companies. Lots of companies gave as proposals for projects they would like to see and when we do that the success rate is much higher. Then our undergraduates do some work, and if it works then the company can license it but if it doesn’t work then the company does not pay anything as the undergraduate does the project for their course anyways.

This approach arguably helps to overcome a lament of industry about universities being “out of sync” with industry wants. This and its extensive KTP (Knowledge Transfer Partnerships) participation have helped the university to engage productively with industry and to facilitate opportunities for its undergraduates to be exposed to the needs/interests of companies.

## **Type II. An organisation operating outside the university but reporting to the university**

**This is the second most common model and generally experiences the constraints of Type I.**

This is the second most common type among the HEIs interviewed. This type operates outside the university structure, can be a subsidiary of the university or need not be a separate legal entity, and ultimately reports to the Director of Finance or Pro-Vice Chancellor in charge of commercialisation or research.

As with Type 1 above, the role of finance is paramount in the support and growth of commercialisation activities. As one director quipped, “universities tend to channel additional monies the university may get (referring to HEIF funding, for instance) into “fatuous administrative functions” instead of allocating them to the development of technology transfer/commercialisation activities.

This Type also suffers from other problems that Type I experiences, particularly in the need for a champion at executive level to drive the exploitation activity and to integrate academic entrepreneurialism as an integral part of the university mission.

Nonetheless we have found that despite these constraints, particularly with the issue of financing the commercialisation activities, some universities have been able to overcome them through in large part, the perseverance and innovativeness of the Director of the unit and the support of the Vice Chancellor.

### ***Examples of innovative strategies***

Here we present an example of a Group F university – High Third Stream and High IP Income.

The University of Bath<sup>27</sup> (**Group F**) appears to have dealt with the fostering academic entrepreneurialism in an imaginative way with its recently awarded EPSRC Knowledge Transfer (KT) Grant. To continue fostering this activity and attempting to integrate this activity with teaching and research, the University of Bath has designed an approach to maximise the impact of its EPSRC research portfolio. This comprises

- 1) establishment of an Impact Assessment Group
- 2) establishment of multidisciplinary “Project Exploitation Teams”; and
- 3) the encouragement of commitment to early adoption by end users, or financial investment from commercialisation/development partners via proof of concept and or partnership development awards.

The Impact Assessment Group is composed of staff from Bath’s Research Development Support Office, Bath Ventures and the CPD (Continuous Professional Development) Support Unit along with external members from the business community. This group will invite EPSRC funded academics to present their understanding of, and to discuss the future impact of their research on business or society and select a number of high-impact projects to which they will mobilise the following resources in the form of a “Project Exploitation Team” and proof of concept (POC) or partnership development awards (PDA).

The “project exploitation team” which will consist of:

- (1) KT Mentors: successful entrepreneurs from businesses who will assist and mentor the exploitation teams (action learning) and participate in training workshops for the team
- (2) KT Champions: an academic mentor from within the University, successful in the transfer of knowledge arising from research to business; and
- (3) KT Fellowships: A fellowship either buying out academic time from within the University or engaging someone from a third party (business and or research institution) to work at the University of Bath directly on activities required to exploit EPSRC funded research.

The POC and PDP funding pots will be deployed on projects evaluated by the Impact Assessment Group. The POC fund, in particular, will enable project exploitation teams to carry out a small amount technical development or marketing to help understand or test a particular market and scope further, partnership development projects.

The partnership development award is aimed at researchers partnering with a company. Bath Ventures will match the company’s contribution through a “teaming agreement.” The advantage of this award is to help overcome a company’s risk of taking on new innovation, a concern that is not uncommon with companies in adopting new unproven technologies. Equally importantly, through this agreement, the university retains its IP.

The Knowledge Transfer Grant will be particularly useful in mitigating academics’ anxieties over the potential impact that engagement in entrepreneurial activities may be detrimental to their career, for instance, resulting in time taken from their publications and research. Furthermore academics are not particularly keen to be sent on training courses “to be

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<sup>27</sup> We have been authorized to attribute. The details here have also been previewed and contributed by Dr. Malcolm Cross, Director, Bath Ventures.

entrepreneurial,” for the same reason that this will be time-consuming. A third concern is the availability of the right resources at the right time to help with the exploitation process.

This Knowledge Transfer Grant will assuage these concerns by assigning an experienced “entrepreneurial” academic as a mentor to help mature the potentially exploitable technology/idea through working closely with the researcher(s) and developing their business and management skills. Through this kind of action-based learning, aspiring entrepreneurial academics “learn by doing” with resources provided from the Grant as well as facilitating potentially faster exploitation of the technology/idea. The mentor ultimately acts a role model in the sense that being entrepreneurial need not necessarily jeopardise an academic’s career.

### **Type III. An external commercial organisation owned by the university but reporting to a board operating autonomously from the university**

**This is a new model and its effectiveness is yet to be tested. However it is illustrative of innovative thinking. The potential problem with this model is its inability to generate sufficient revenues to sustain its operations.**

Type III is the most uncommon and we have identified only one case in which this model is being adopted. We include it here because a preliminary conclusion drawn from interviews with Type IIs shows that this model could be a preferred model because it allows the TTO to control and manage its operations. We include it here also because we argue that it illustrates innovative thinking in how TTOs may operate differently and potentially successfully. On these bases, we do not present an example of an innovative strategy as we have done above as Type III is of itself an example of innovative strategy.

Type III operates on the axiom that it facilitates greater flexibility for decision-making than possible in either Type I or Type II. Another characteristic of Type III is that it is bound by “separate finance acts” with the university, which allows for flexibility and financial management for the broad range of knowledge transfer, including commercialisation, activities. The third dimension of this model is its freedom from university Human Resources policy, which importantly allows flexibility in salary and recruitment policies. The recruitment and retention of well-qualified personnel for commercialisation activities are together a *sine qua non* condition for the growth and performance of a TTO (more on this below). According to a Senior Administrator, experienced “KT staff” are eminently employable and therefore it is important that they be well paid in a TTO. The fourth aspect is that Type III is established with the university through a Memorandum of Understanding or similar arrangement, which allows it to operate autonomously from the constraints of university practices. The Type III we interviewed is a **Group F** university.

Type III reports to a management board of directors and as noted above, operates wholly outside of the university structure. This board comprises directors of the TTO (including a managing director), pro-vice chancellors and heads of departments, and external stakeholders. The inclusion of senior university personnel is aimed primarily at obtaining university “buy-in,” which in turn raises the profile of the TTO. We have learned from our interviews that acceptance by universities is central to the development of a TTO. A well-informed university of the importance and activities of a TTO paves the way for greater

engagement of university senior management and academics in driving academic entrepreneurialism forward.

The choice of senior university personnel to the board is paramount and is perceptibly dependant on the ability of the managing director to help make that selection AND the readiness of the university to commit to IP commercialisation and its related activities, free from the constraints that universities may impose on such activities. The independent thinking of board members is crucial as the board will be responsible for helping with the design of the TTO structure, strategy and priority setting, operations and processes/procedures.

The revenues base of this Type III we interviewed is solely from *management fees* for services rendered, be it for commercialisation of IP, assistance with formation of spin-outs, help with private sector contacts, support for increasing collaborative research, etc. Thus its revenues are not derived from overheads or recharges as is common in other Types; neither do they need to be dependent on institutional (central university) funding. Type III also has the flexibility to determine its fee structure, unlike universities' overheads or recharges, which are often fixed. However the potential downside of this Type is the inability to continually generate sufficient revenues to sustain or grow its portfolio of activities.

It is worthwhile noting here that we also identified a *hybrid Type III*, in which the TTO is a commercial subsidiary of the university, has a managing director and reports to a board comprising university personnel and business representatives. The difference between this hybrid and Type III is that here the board need not or does not always operate autonomously – there is a tendency for the university board members to “confuse how a company should operate with the operations and priorities of a university.” This results in decisions that can potentially run contrary to how a profit-making TTO should operate.<sup>28</sup> So while this hybrid Type III's governance is akin to Type III, it in effect operates like a Type II in which it is subject to the priorities of the university.

## **Type IV. A profit making organisation operating outside the university**

**This model is uncommon and associated with high risk, but offers the best potential for profit from IP commercialisation**

As with Type III, this model is also uncommon and is represented by one such example.<sup>29</sup> It also remains to be seen if this model will have followers as it evidently requires substantial planning and investment in its creation, over and above university interest, and is potentially a high risk venture. Type IV offers shares (through initial public offering) and it is arguably the best route to profit making from the commercialisation of university IP. As an independent company there is much scope for flexibility in decision-making. It also provides better opportunities for raising its profile within the university because of the need to continually “brand” itself for investors (share holders). Furthermore, as a profit-making

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<sup>28</sup> For reasons of confidentiality it is not possible to provide examples of such measures because the university and respondent could be identified.

<sup>29</sup> The university which has this model was not part of our sample. However we have included this model here on the grounds that it presents another example for our taxonomy. The description of this model is based on previous research.

company the systems for risk management and the resources for hiring commercial expertise also will arguably be enhanced.

Clearly, Type IV will likely not be geared toward non-profit knowledge transfer activities and thus there could be a potential conflict between the interests of the university (despite Type IV's independence) and its share-holders. Therefore unlike the other Types, this model does not tend to engage in consultancy or outreach programs for knowledge transfer, for instance, although it does manage commercial agreements as Type III does.

Table 5 summarises the characteristics of four models of TTOs.

**Table 5. Summary of four TTO models.**

	<b>Type I</b>	<b>Type II</b>	<b>Type III</b>	<b>Type IV</b>
Resources	Allocated by a university	Allocated by a university	Independent of university	Independent of university
Decision making	Constrained	Constrained	Flexible	Flexible
Human Resources Management	Aligned with university HRM	Aligned with university HRM	Independent of university HRM	Independent of university HRM
Risk management	Low importance	Low importance	Medium Importance	High Importance

## Part C

This section **first** addresses views on proposals for: (1) a regional grouping of TTOs; and (2) a “matchmaking forum for unexploited IP. **Second**, (1) it assesses the impact of policies on academic entrepreneurialism; (2) it suggests how Government can further help foster academic entrepreneurialism; and (3) it assesses the use of Lambert agreements by HEIs. **Third**, (1) it discusses the impact of academic entrepreneurialism on the behaviour of researchers; and (2) presents suggestions for universities to improve their entrepreneurial activities.

### Regional TTO groupings: A good idea?

**Regional TTO groupings received qualified support but on the whole were considered an acceptable idea. The main problems with a regional grouping are its structure, maintenance and resource requirement.**

The idea behind regional TTO groupings lies essentially in the more experienced and larger regional TTOs helping the less experienced/smaller TTOs to conduct their IP commercialisation activities. This could be done through the exchange of good practices and information sharing, and assisting the smaller/less experienced TTOs to exploit their IP. This idea is a variation of the hub and spoke model presented in the Wellings Report (2008), in which the “hub” comprising of larger TTOs will obtain increased capacity for IP commercialisation from following up on IP leads from the “spokes” (smaller TTOs).

Senior university administrators were asked “Do you think that regional groupings of TTOs are a good idea for the stronger to help the weaker TTOs?” We posed this question to senior university administrators (not TT Directors as new mechanisms/measures require the commitment of senior university staff).<sup>30</sup>

Many respondents expressed qualified support for the idea of regional groupings of TTOs. In general, 60 per cent of the respondents thought that it is either a good or potentially good idea (40 per cent and 20 per cent respectively). The senior administrators who did not express support mainly belonged to Group F (High Third Stream Funds and High IP Income), which is not unexpected. This is largely because many of them feel that their resources are better served in ensuring optimal performance of their TTO and “do not want to be distracted from what they are already doing.” Moreover, some had noted the existence of such groupings although they were unsure of their performance.

It is interesting to note that Group C (Low Third Stream Funds/Low IP Income) stands out as the group that registers the highest percentage in “no” responses. This is explained by the fact that

- (1) there is little confidence that such a grouping can be maintained without the “bigger TTOs losing steam” after a certain period when the smaller TTOs may be just starting to benefit from the interaction.
- (2) there is a fear of imbalance of interests between the TTOs, for instance, the “stronger TTO” will focus on patenting whereas Group C commercialises its IP through consultancy, collaborative (with industry) projects and copyrighted works.
- (3) lack of understanding of or familiarity with the local (university and environment) culture can also be a barrier to the grouping working effectively.

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<sup>30</sup> A few opinions were given by Technology Transfer Directors who were designated by the Senior University Administrator to answer on his/her behalf.

- (4) importantly, the majority of Group C TT directors have identified the courses offered by Praxis, AURIL and UNICO as already an important forum for useful exchange and learning of good practice.

It is less surprising that a majority of Group F senior administrators did not largely support the concept. This is mainly because many of them feel that their resources are better served in ensuring optimal performance of their TTO. Moreover, some had noted the existence of such groupings although they were unsure of their performance. See Table 6 below.

**Table 6. The opinions on TTO groupings, reported by senior university administrators.**

Groups	Yes	No	Maybe	No response	Total number in each group
Group A - Low HEIF Zero IP Income	25%	0%	25%	50%	4
Group B – High HEIF Zero IP Income	40%	20%	0%	40%	5
Group C - Low HEIF Low IP Income	29%	29%	13%	29%	7
Group D – High HEIF Low IP Income	45%	22%	33%	0%	9
Group E - Low HEIF High IP Income	100%	0%	0%	0%	2
Group F - High HEIF High IP Income	39%	23%	23%	15%	13
<b>Total</b>	<b>40.0%</b>	<b>20.0%</b>	<b>20.0%</b>	<b>20.0%</b>	<b>40</b>

*Note.* There are missing responses as 7 interviews took place before this question was introduced into the questionnaire.

Below are selected examples of positive, undecided and negative reactions to a regional TTO grouping.

#### Positive responses

- “It is a good idea but we need to take the TTO out of university control because as long as it is part of the university structure, TT directors/managers will be reluctant to share information because of confidentiality.....universities are competitive today.”
- “Good idea because this enables cross-learning and sharing of resources, and importantly, large businesses will see the advantage of approaching one collective unit.”
- “A good idea but nothing new; here in Scotland, there are many of such groupings....we share information and we look for pooling opportunities in out technologies and I think that works reasonably well.”
- “It is important to establish TTO at individual institutions. Small TTO will not have the same resources like the big ones, but they are better embedded in the structure of the university. The informal or partly formal collaboration is very beneficial. The possible set up could be that small TTO are around the bigger TTOS.”

#### Undecided (maybe) responses

- “Technology transfer is a ‘contact sport.’ It requires “people on the ground to work with academics.” So if the regional grouping is centralised it will not work. But if it envisaged as an informal forum then TT staff can get together to learn specific skills, such as in legal matters. UNICO seems to work.”
- “One thing which could work is if the big organisations were funded to provide a service to other universities which want to tap into their capabilities. The concept of



having a lead university... maybe in a sectoral sense rather than regional could be an interesting approach.”

- “Yes it would be helpful. Particularly if it included sharing best practice, exchange of policies. We do not have many cases and we could learn from others who deal with more cases and develop our expertise. There could be also a place which would provide services to all universities involved in.”
- “Maybe if we can get buy-in from the university as it could mean diversion of some university resources;”
- “Depends on how it is structured, and the size and the outputs of the university. One of the things we struggle as an institution is with the size of the university. How do we make people feel that this is their TTO so that we get early stage buy-in to facilitate commercialisation.... It will be hard to work with other remote TTOs because the TTO will have to establish itself as an independent entity which will be worried with its own survival first.”
- “No I would prefer something half-way. One principle, whatever the size of your pipeline, every university needs some capacity to exploit its own resources. Because, a local team can understand the culture of the university. The hubs won’t have the trust; they will not be willing to disclose commercial ideas.”
- “If the TTO is part of the university, not a good idea. It will work better if the TTO is taken out of the university structure because the TTOs here know each other and need not be constrained by university politics.”
- One of the reasons we have reasonably successful at commercialising IP is because of relationships we have with other TTOs like Manchester, Imperial, Bangor, Swansea....[but] the problem with the concept of regional grouping is whether in that case we would be stopped from collaborating with Manchester and Imperial. IP commercialisation is a project driven process, and sometimes if you institutionalise that process you might limit the commercialisation capabilities.”

#### Negative responses

- “Not in favour, an absolutely awful idea because universities are different and have different processes – every process is so different even within 20 minutes of each other. Then you require lots of trust. An academic will walk into her own university and if it is a bad idea, it dies. But if the idea is good, then the university can keep it secret and exploit it. So I cannot see an academic going to talk to another university. And then who is going to run the grouping? There will be a big fight among who is the best. So what will happen is dilution of big university capacity and the smaller university will not make up for its dilution.”
- “No, because stronger TTOs are still learning their way through the process.”
- “No. Our experience is that one can only benefit from working with strong universities. You want to know that these people know what they are doing. Also local presence is necessary for fruitful collaboration. I do support exchange of best practice (...) however, the regional groupings suggested in Welling’s report are a bad idea.”
- “No, because I am not sure this can work among universities with different missions. It might be best to work with similar type universities. Here in XX Region, we have an association with nine or ten universities....they are all different. Whenever we try and include all ten in an initiative, we don’t get anywhere because we want to accommodate all in it, and nothing happens.”

- “Depends on the region. If it’s too big, then you’re introducing unnecessary competition among the universities and this is not a good thing for university collaboration, which is an important aspect of research.”
- “Regional makes no sense. Smaller universities should be free to get advice from anywhere they think best.”
- “No, as I do not believe that even the top universities have sufficient resources to effectively manage their own IP portfolio. Also specialized providers of TT services already exist, so the less-experienced university can outsource to these services, for e.g. ISIS (Oxford) offers this kind of consulting services.”

In summary, our respondents expressed qualified support for the idea of regional TTOs groupings. However, there is a need for careful consideration of the following issues:

- Its structure
- Its maintenance
- Resources requirements

## An “IP matchmaking” forum: Another good idea?

**This forum received much support from across all six Groups but structure, resource requirements and trust-building were seen as key considerations.**

Data provided by many TTOs show that some universities have large numbers of unlicensed patents. We posed the question “Do you think that a forum aimed at ‘matchmaking’ unexploited university IP with potential investors is a good idea?”<sup>31</sup>

Undoubtedly, to generate ideas and investment, organisations need to share proprietary information internally and externally. While the former presents fewer risks, sharing IP externally can lead to loss of intellectual property exclusivity or even the relinquishment of ownership rights to others.

Below are the responses we received from Senior University Administrators and Technology Transfer Directors (who were designated by the Senior University Administrator to answer on his/her behalf).

The idea of “IP matchmaking” Forum received quite substantial support. In general, 67.5 per cent of respondents agreed that it is either a good or potentially good idea (40 per cent and 27.5 per cent respectively).

It is worth noting here that HEIs in Groups A (Low Third Stream Funds and Zero IP income) and C (Low Third Stream Funds and Low IP income) reflect some skepticism. Three reasons account for this. (1) These HEIs do not generate a big patent portfolio to warrant consideration of matchmaking. Importantly, the TT directors here argue that IP commercialisation is not just about licensing patents, a view that is resonant of one of the reasons against a regional grouping of TTOs noted above. (2) There is a concern with the structure of this activity because of perceived intensity of resources. (3) There has to be trust for such a forum between the members, and particularly, between the forum members and potential businesses/companies.

On the other hand, Groups B (High Third Stream Funds and Zero IP income) and D (High Third Stream Funds and Low IP income), HEIs embrace the idea. Group E shows also

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<sup>31</sup> The idea of an IP-matchmaking forum was tabled in one of our project meetings with the sponsor and it was decided that we investigate the views of the sampled universities.

resounding support for the forum. Group F was generally positive about the forum but some scepticism was expressed. Overall, those who supported the idea stated that such a forum would largely help the TTOs to exploit their university IP. Such a forum also would be particularly helpful to SMEs as these companies are generally not “tapped into” universities. See Table 7.

**Table 7. The opinions on creating a matchmaking forum for unexploited IP, reported by senior university administrators.**

Groups	Yes	No	Maybe	No response	Total number in each group
Group A - Low HEIF Zero IP Income	25%	0%	25%	50%	4
Group B – High HEIF Zero IP Income	40%	0%	20%	40%	5
Group C - Low HEIF Low IP Income	29%	13%	29%	29%	7
Group D – High HEIF Low IP Income	56%	22%	22%	0%	9
Group E - Low HEIF High IP Income	50%	0%	50%	0%	2
Group F - High HEIF High IP Income	39%	15%	31%	15%	13
<b>Total</b>	<b>40.0%</b>	<b>12.5%</b>	<b>27.5%</b>	<b>20.0%</b>	<b>40</b>

*Note.* There are missing responses as 7 interviews took place before this question was introduced into the questionnaire

It is interesting to note here that a similar matchmaking idea was attempted by a TT Director in Group F several years ago. He describes it as a “lonely hearts club.” His research had shown that if you create a group of six regional universities together, set up a portal and then have each of the universities upload abstracts of their unexploited “sectoral” IP to the portal for companies to access, this club would generate revenues. Companies would be charged a fee to access this portal. Companies he had spoken to were keen to pay the fee to access this site. However the project did not get off the ground because (a) universities were afraid of losing their IP – an issue of trust; and (b) universities claimed that they had their own capabilities to exploit their IP and did not need such a portal.

It is interesting to note that some universities who had made comment (b) had a high number of unexploited patents in their portfolio. Perhaps the lesson learnt here is the importance of an efficient patent monitoring system, that is, if patents have not been unexploited for a number of years, they may not be renewed or given away for the “greater public good,” as companies are often keen to receive free IP and are also better placed in most instances to exploit these patents.

The following provides selected views on this forum.

Positive

- “Yes, the biggest challenge for universities is to make good decisions on where to license their IP.... licensing is a dark art. Often universities have a piece of IP but are not sure where to license it in order to optimise its return. So increased exposure of university IP is good.”
- “What is the benefit of having unexploited and lost IP, which could have good use. Yes, this could be useful for us.”
- “Yes, very helpful for us smaller universities to widen our contacts and networks.”
- It could be. We were talking about doing that for new IP, not exclusively unexploited IP, among the universities in West Midlands. We could create a database in the next 6

months. We are looking for funding at the moment. It will be up to each university what they want to put forward. The other reason to do it was to bring critical mass together because often there are little products that we have and they are not big enough to be attractive. Therefore grouping/packaging could help...”

- “Yes, considering the Social Sciences, there might be something to it like the idea of “pump priming” where we can have an open day and workshop to show what could have been done but we have not done.”

#### Undecided (maybe) responses

- “Theoretically this is a good idea. The question we need to ask is: is the IP unexploited because the TTO has allowed it to languish OR has it been tried for licensing but has not been successful?”
- “A good idea but there is one main challenge: if a university has a diverse portfolio, then effort needs to be put into targeting the right prospective clients. This needs specialisation of TT staff to separate the portfolio into their proper categories. “
- “It wouldn’t be a good ‘supply side solution’ but could be ok for ‘demand side solution’. However, I think it would be important to study licensees’ behaviour and then see what mechanisms can be put in place. For example, it would be important to know how having a contact with an academic or the university affects licensee’s decisions. Better understanding of licensing is necessary.”
- “Maybe. I think that if universities thought that IP was so good they would have done something to exploit it themselves so the first challenge would be identifying unexploited IP. The second one then would be – how much do you share and how much do you trust others with your IP which is exploitable. So it depends what the exact plans are, who is doing the brokering and at what kind of level that brokering is taking place.”
- “An excellent idea but its success depends on how it is structured.”
- “Great idea but I have not seen any similar attempt work. So I have a healthy dose of skepticism. Getting universities to pool their IP together will definitely not work. So you will need to aggregate the universities’ IP. Then you will need a dedicated person to do this and you end up with a catch-22 situation. How do you identify the person? How to identify the IP that may be aggregated?”

#### Negative responses

- “No, I think in theory that is nice. In practice it would be difficult, it is quite complex to articulate the market in this. The matchmaking occurs naturally a sectoral level, it sounds simplistic.”
- “Trust is essential and how do you develop this among a group of universities who don’t know each other?”
- “No because I don’t know what the structure will take. So it must be very well thought out and must be tailored. Universities who are savvy enough will know how to exploit their IP.”
- “Better to use the resources for this, if we have, to staff our office.”
- “We don’t need new things. There are a lot of networks around, for example, the Great Eastern Investment Forum in Cambridge. There are all sorts of “knowledge relays”; there are lots of places where you can put stuff. There are probably too many forums; actually pooling them all together one might be a good idea.”

- “There is often a reason why the IP doesn’t match with the end user, maybe because it is the best IP....the best has already been commercialised.”

Based on the interview input, there is quite a good support for the idea of “IP matchmaking” forum. However, it would appear that such a forum needs to consider

- Identifying and minimising disclosure risks;
- Communicating clearly with investors, universities, partners, etc.;
- Ensuring the use of protection tools like attorney/client privilege, confidentiality agreements, employee contracts, and trade secrets effectively to promote trust
- Making clear that the forum aims to ensure that there is a balance between the legal risks and business benefits of disclosure.

These considerations apply to all Groups as they uniformly reflect their concerns.

## **Role of Government in fostering academic entrepreneurialism**

This section focuses on (a) how universities regard current Government policies and measures; and (b) suggestions for how Government may further support academic entrepreneurialism.

### **Perceptions of Government policies/measures**

**Overall HEIF has been viewed positively but it needs to be increased and targeted to help bridge the “valley of death” in technology transfer. Scottish Knowledge Transfer Grants have also been perceived well. HEFCW’s Third Mission Fund (Wales) needs to be augmented.**

**Government needs to realise that university-industry engagement is a “segmented activity” – one size policy does not fit all. Government is paying too much attention on the handful of the “great and the good” universities that are patenting a lot.**

#### **Usage of Lambert Agreements is high across all university Groups**

A remark here by a senior university administrator of a Group F (High Third Stream/High IP Income) university suggests a growing appreciation of what Government means when it talks about economic impact.

Stressing the economic impact is very important as we get to realise that when research councils and government talk about economic impact, it is the economic impact in UK plc which might mean that other companies will have financial benefits from it. We have the responsibility to make sure that this flow happens and that it is not about making money for universities.

An opinion voiced by a researcher on how Government’s policies on academic entrepreneurialism can benefit the university also hints at the positive impact of current policies. He stated: “commercialisation promotes applied research and supports interaction with industry. The combined effect allows rapid exploitation.”

Figure 6 below provides a snapshot of the responses to the question “Do you think that current Government measures at supporting the development of academic entrepreneurialism are adequate?” The majority of respondents perceived Government measures as adequate (60.53%). However, one third of respondents reported that current Government measures do not adequately support academic entrepreneurialism.

**Figure 6** The responses of senior university administrators to the question: “Do you think that current Government measures at supporting the development of academic entrepreneurialism are adequate?”

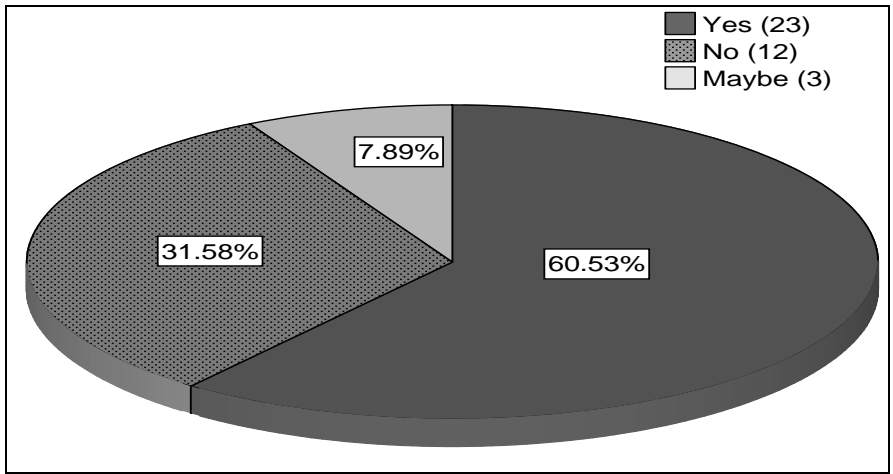
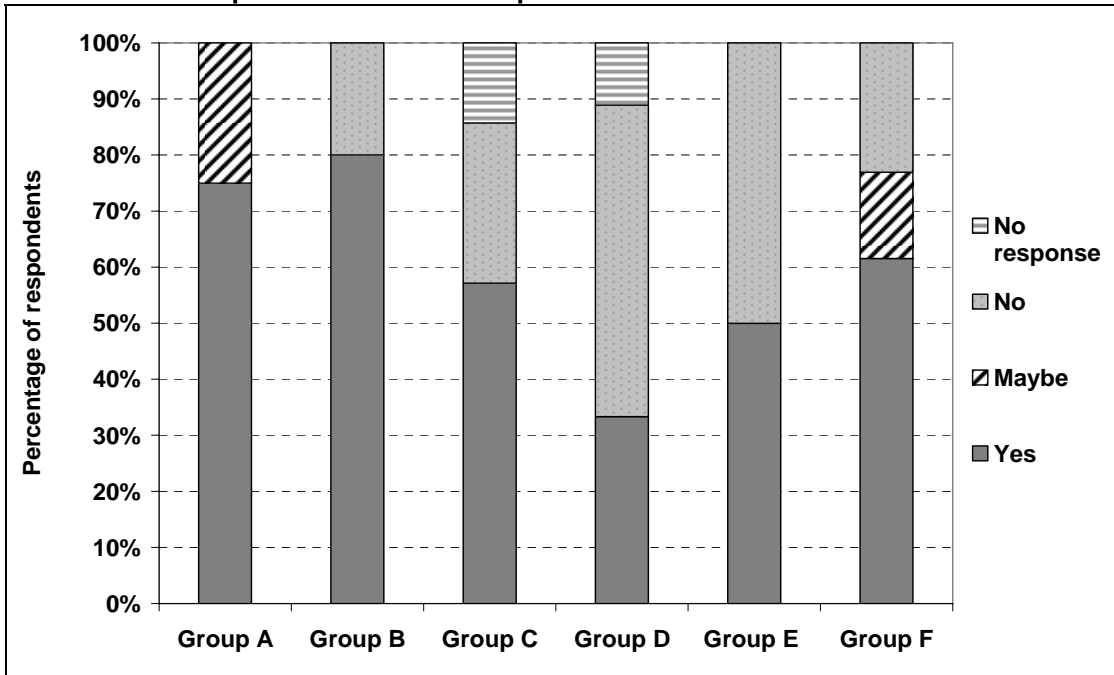


Figure 7 provides the percentage of the responses by each Group. Interestingly, respondents from Group D (High Third Stream Funds/Low IP Income) gave the most negative judgment of the adequacy of current Government measures. An explanation for this lies in the common view that there are insufficient funds *targeted specifically* for IP commercialisation activities, as opposed to other knowledge transfer activities. Another general perception is that “if I had more money, I could do more good work and get projects to move quicker [activities and resources required for the commercialisation process].”

**Figure 7.** The responses of senior university administrators, across 6 groups, to the question: “Do you think that current Government measures at supporting the development of academic entrepreneurialism are adequate?”



Overall, HEIF has been applauded by the majority of HEIs interviewed as being instrumental to the growth of their TT office. Groups A, B, C and D (HEIs with zero and low IP income)

have uniformly remarked that HEIF should be continued. These HEIs fear that with the HEIF cap, much of their effort toward the building/improving of their commercialisation activities will be stymied and end up in the “valley of death.”<sup>32</sup>

However, a majority of responses from all Groups point to the need for HEFCE to increase its share of KT funding. Note the comment from a TT Director of a Group B (High Third Stream and Low IP Income) university: “[HEIF] should support development of links between university and industry. HEIF does this job but it is still relatively small.”

Another common remark on the overall assessment of Government performance in fostering academic entrepreneurialism was that university-industry interactions is a multi-segmented activity. Senior administrators, TT directors/managers and researchers explained that how a smaller university or teaching-intensive HEI would deal with business will differ from how larger or research intensive university conducts its activity. For instance, a smaller research intensive university may focus on local SMEs, whereas the larger university would normally deal with large international companies. Similarly, a research intensive university may have its strengths in Social Sciences research whereas another research intensive university may be strong in engineering and medical research. Associated with this is how research in the different disciplines can matter in the way that IP commercialisation is undertaken. Therefore their strategies toward commercialisation will be different.

TT directors and senior administrators, particularly those from smaller and teaching-intensive HEIs and mainly from Groups A, B, C and D, worried about Government’s continuing focus on “science and technology research.” They argued that the persistence of this emphasis would work against their performance, or even improvements, in their efforts to commercialise their university IP because of the comparison with the “science and technology universities.”

See Table 8 below for an estimation of HEFCE spend on knowledge transfer activities.<sup>33</sup>

**Table 8. HEFCE spend (2007)**

Spend	HEFCE spend £m	HEFCE spend %
Teaching and Learning	4,500	70
Research	2,000	28
<b>Knowledge Transfer</b>	110	2

At the same time, several HEIs have remarked that universities need to be reminded that this source of funding should be ring-fenced, channeled to exploitation and commercialisation activities and not diverted to other university functions.

Scottish universities receive Knowledge Transfer Grants from the Scottish Government, and on the overall, are well regarded as being beneficial to the development of university commercialisation activities. Proof of Concept funding also has been regarded as an important measure. However, a problem highlighted by a Scottish university is that while these Grants and other funding from Scottish Enterprise are a boon to academic entrepreneurialism, Scottish universities are expected to “respond to the Scottish agenda” (IT for regional economic development) but many Scottish universities are “an international university and play

<sup>32</sup> One of the biggest obstacles to technology transfer is what is widely known as the “valley of death.” This refers to the vast numbers of “carcasses of great innovations” that have been unexploited because of the lack of financial resources. See “Escaping the Valley of Death: Overcome the funding gap for early stage university IP” <http://www.technologytransfertactics.com/content/audio/escaping-the-valley-of-death/>

<sup>33</sup> Figures provided by an interviewed university Senior Administrator.

in the international game.” This TT Director encapsulated this problem as: “If this [TT] was football the government would like us to do well in the home games and we do well in the away games.” At the same time, Scottish universities also are subject to the UK RAE. This provides a difficult situation as while they have to respond to the “Scottish regional agenda” they are also governed by the RAE requirements. “So we have to play two political games and this is a problem.”

HEFCW’s (Higher Education Funding Council for Wales) Third Mission Fund supports Welsh HEIs entrepreneurial activities. It was established in 2004 and is an equivalent of the HEIF fund in England. Allocations consist of i) a foundation funding (now £75m) and ii) formula-based supplementary funding that takes account of past performance. A PVC in a Welsh Group A (Low Third Stream Funding/Zero IP Income) university said “our core funding through our Third mission fund is about 1/3 of what we would get if we were an English university.” Core funding in Wales is on average lower than in England.<sup>34</sup>

Overall there appears to be a suggestion of satisfaction with the HEFCW, despite several comments about the bureaucratic procedures required for other Welsh Assembly Government funding schemes, which collectively are still small and short-term, which inhibits capability building. But as with HEIF, “more is better.” A researcher of a Welsh Group F (High Third Stream Funding/High IP Income) university who apparently has a promising invention lamented that “nothing is being done with this as there are insufficient sources of funding and this invention needs further work.”

Some researchers, senior administrators and TT directors/managers expressed a doubt about the ability of “any government” to be in a position to fund the “traditional missions of teaching and research” in the future. Universities, it was argued, may have to be subsidised from academic entrepreneurial activities. Hence materially supporting these activities continue to be vital.

Below are some concerns raised by Senior Administrators and TT Directors/Heads regarding Government policies. We highlight these particular views because they underpin and reflect the majority of suggestions made by interview respondents on how Government can further support university entrepreneurial activity.

- “If you look at HEFCE spend on knowledge transfer activities, you wonder about its seriousness about promoting university entrepreneurial activities, and I don’t only mean the commercialisation of university IP. Entrepreneurial activities also involve other knowledge transfer activities, like networking, promoting collaborative research, outreach programs, etc.” (See **Table 8** above.)

<sup>34</sup> Table 1. Total funds for third stream activities in England and Wales

	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
England	92.5m	92.5m	108.5m (134HEIs)	108.5m (134HEIs)	112.0m (130HEIs)	134.1m (130HEIs)	150.1m (130HEIs)
Wales	3.1m (13HEIs)	4.1m (12HEIs)	5.1m (12 HEIs)	5.5m (11 HEIs)	?	?	?

Note. Allocations in HEIF 3 (2006/07, 2007/08) includes £164.4m allocated to individual HEIs and £52.6m for collaborative bids. Data for yearly allocations during HEIF 2 (2004/05, 2005/06), and HEIF 3 (2006/07, 2007/08) was not available, therefore the two-year allocation was divided by two for the purpose of this comparison.

Table 2. Average funds per institution in England and Wales (in £000)

	2006/07	2007/08
England	809	809
Wales	425	500



- “As I said earlier these policies are focused on science and technology and do not address the whole spectrum of disciplines. They do not benefit creative industries [including the Social Sciences, for instance, psychology, and the Humanities].” The apparent bias toward the sciences and patenting is a common perception of many PVCs and TTO directors of the smaller universities, including research-intensive ones. Explained by another TTO, she said, “in the Social Sciences we think of ourselves as not having much IP [patentable IP] and not exploiting but actually we are doing it but policy focuses on the sciences, the arts and design....I suspect we get better value for money [through contract research and consultancy] compared to the administrative costs of ‘hard technology transfer’ [through patents].”
- “Because I don’t think that the Government policies are very good. The selective focus on the incentive side of the government policy on science and technology has weakened the whole spectrum of commercialisation across different fields.”
- “The main difficulty that these [Government] policies are of the type of ‘one size fits all’...they do not take into account that universities have different sizes, expertise, knowledge, activities.” As with the above, this remark reflects the IP commercialisation performance of our six groups, which shows that even leading research HEIs, such as Liverpool University and the London School of Economics (Group C – Low Third Stream/Low IP, also noted above), operate differently with respect to IP commercialisation and thus, Government may need to consider this differentiation.
- “Dealing with smaller companies requires different approaches and involves different expectations.”
- “HEIF funding could be reviewed. At the moment it concentrates on successful institutions and in this way it reinforces existing patterns. Institutions which have been less successful end up with limited resources. Also HEIF funding does not address the problem of unexploited IP.” This view is resonant of a widespread impression that Government’s focus is still concentrated on research excellence and not in the “knowledge transfer” and entrepreneurial activities in which less research-intensive HEIs are undertaking.

Another TTO of a Group B (High Third Stream/Zero IP Income) university expressed, “Lots of research funding goes to research intense universities....if you are not recognised as a research intense university, you have to get there in the first place. What I am saying is that they should not expect lots of commercialisation if they do not give us research money in the first place.... HEIF was good but it stresses that you have to have something good and sometimes it is enough just to reinforce the existing good practices. Companies exist by making incremental improvement in old products; they do not do new products all the time.”

- “Each round of HEIF fund there is different bunch of buzz words that everyone has to orient themselves to get the funding. Until very recently there has been no balance between capacity building funding and demand side funding....[capacity building is] giving a university money to hire people to do tech transfer and funding collaborative research so that companies will work with universities. The second is demand side, in which you are saying to companies ‘we want to stimulate you to work with these people’ and capacity building is ‘we want to make you better able to do that’.... They [Government] have tried to change the market instead of working with the market.”
- “[Academic entrepreneurialism] is a long-term project to do; to build it in the DNA of UK university academics....the Government should not think that the return for this is short-term. My worry is the support [for commercialisation activities] gets stopped.

They [Government] may ask, ‘what is the return of this?’ and then they may stop it [funding].”

- “Do not destroy the trajectory we are on – do not revolutionise...[and] continue to stress the importance of third stream activities. The research councils have already started putting more emphasis on economic impact of research.”

## Government could do more

**There is an exhaustive list of suggestions. Maintaining long-term funding, targeting funding for commercialisation activities, reconsidering the emphasis on science and technology and research excellence, and Government encouraging senior university administrators to embed the entrepreneurial culture across the HEI are some key suggestions.**

The following are the main suggestions.

- ***A reconsideration of its current emphasis on research excellence to the exclusion of other activities.*** Give more weight to knowledge transfer activities in the RAE. These suggestions reflect the perceived contradiction between the demands of the RAE and Government’s academic entrepreneurialism policies. Publish or perish (as publications are a main consideration of the RAE)? Or publish less and achieve more commercialisation and entrepreneurial successes, and be rewarded for them? The TTO of a Group B (High Third Stream/Zero IP Income) suggested that “to solve that paradox that academics are incentivised to do research and publish, and at the same time are expected to engage in entrepreneurial activities, there is a need for a different incentive scheme.” A PVC of a Group A (Low Third Stream/Zero IP Income) echoed a similar view: “If government is really keen on development of exploitation of IP across the [HE] sector what they need to do is to look at funding mechanisms that they currently have in place.”
- ***Review HEBCI indicators which are number-focused and reflect entrepreneurial activities in a narrow way.*** This is not an uncommon comment, although several TT heads and directors accept that they are fairly reasonable for HEIF purposes. However, some have suggested that some Research Councils and the Technology Strategy Board have a more realistic approach to impact and “it is not just in pound notes but include employer engagement. “[Economic] impact must not be measured by proxies about how much the universities have made. We need to scale up that sort of metrics.” Commentaries such as these on HEBCI indicators are not new (Wellings 2008; Tang 2008, Tang, Weckowska and Hobday 2008). Metrics that seem to focus on a certain type of HEI, mainly research intensive ones, are viewed as overlooking the diversity of UK HEIs and disciplines, “Metrics have to reflect the type of HEI,” said a TTO director. Another also suggested that “We would like Government to remember that Social Sciences research and management research are also important economically and [policy] should not always focus on these on the same terms as other subjects [the sciences].”

Furthermore, a TTO director of a Group F (High Third Stream Funds/High IP Income) university reckons that the patents granted in all territories by HEBCI are “pretty useless data.” He explained by saying:

for example, a university might report in HEBCI that they had 5 patents granted but it might mean different things. It could be that (i) there was one priority filing resulting in a patent family of 5 patents, or (ii) there were two priority filings and therefore two patent

families of 2 and 3 patents, or (iii) there might have been 5 different priority filings or iv) something else. So the number of patents granted and patent applications reported in HEBCI survey do not reflect well the number of new inventions. Maybe some questions of HEBCI survey should be reviewed.

➤ ***Increase and maintain long-term funding.*** Table 8 above has provided an estimation of what HEFCE had spent on higher education in 2007. Suggested reasons for increasing the funding are as follows.

- (1) **Increased funding for the TTO also allows the TT staff to spend more time with academics AND facilitates opportunities to buy out the time of lecturers for exploitation activities.** The time spent with academics is highly valuable as it can be used to help instigate a change of mindset (culture change), assist them with ways to maintain a commercial relationship and importantly, to help manage the expectations of academics of commercialisation. For instance, a commercial relationship cannot be productively maintained with an attitude of “here is the patent, now go away,” said one TTO director. Neither does commercialisation always mean that “I will make money from it – so how much do you think I can make?” Said another TTO “some of them [academics] think that they can sell their IP six or seven times! They tend to see things like that [commercialisation] as a nuisance.” A TTO manager of a Group A (Low Third Stream/Zero IP Income) university explained how she is attempting to educate academics to the advantages of commercialisation: “Education. What I have done in the past was to take 2-3 projects and show that the process is painless and that there are many advantages. This worked.”

Educating the researcher has also been corroborated by researchers. Note the following comment from a researcher.

Even here, where the TTO is excellent, I still think we miss a lot of IP. The IP may be disclosed without being protected. This happens because some people don't understand issues around IP, and their mindset – for me when someone brings me a results, I think ‘what we will do with it.’ Other people are more academic. E.g. in biology, they don't think that their results for instance in research about proteins may be useful in terms of applications, leading to a lot of loss.

Other people, are aware of it, but are nervous about what it involves to take those steps. Others yet can see the potential, but they make a conscious decision that is not what they want. There are also people that still give way without realising that they are doing so, e.g. if invited in a lunch by GSK.

I think that while some people discover things with potential for IP, the TTO can't develop without the engagement of an academic with the right mindset. If you discover something fantastic, you must not just leave it to the TTO. You have to tell the story and sell it to people. It's the call of the TTO to find where there is energy to make something happen.

- (2) **More financial resources to target the management of the commercialisation process.** TT directors suggested that such funding is NOT to hire more people but to hire BETTER qualified people to identify and pursue opportunities. The difficulty does not appear to lie in the technical aspects of the IP process (filing a patent, etc) as these services can be quite readily outsourced, if required, but in effective and efficient systems for supporting commercialisation. “When the paths of work become clearer and better the costs will go down and we will become more like account managers in advertising and hopefully make as much money.” Said another TT manager “[The] management team is probably more important than good IP, because if you don't have a good management team then it doesn't matter how good your IP is, it will just not get out there.” Stated yet another “we do have difficulty locally with regard to spin out

companies which is related to developing the management team as we are quite far away from urban areas. It is quite difficult to secure management teams.”

Associated with this suggestion is to encourage more universities to allow TT personnel to be outside the university salary scales. This was argued to be a surer way to hire “good people.” The “monkey and peanuts analogy applies here... salary is crucial.” Equally importantly, interview respondents argued that a better salary helps to retain TTO staff as they often have little prospects of promotion if they remain within the university structure.

- (3) **Funding for spin-outs to form management teams**, which business angels and venture capitalists require before considering their investment in the spin-out. “Government could give us another round of the Challenge Fund.”
- (4) **More financial resources to fund Proof of Concept projects** is a common suggestion – “to do that [proof of concept] you need small sums of money between £20-£100K to build a prototype.....to do that you need some larger funding, the Research Councils don’t cover that because it’s not research... so in terms of support for technology transfer, even with patents more research has to be done before it can be launched...so some patents are dropped.” A PVC also noted that “should the Government offer a £1 million to large universities, £30K to smaller ones, we would be getting about £600K per year which could help us to implement 10 or 20 projects...the Government has never understood the importance of this stage. This is something that is already being funded in Scotland.”

Large and small HEIs explained that business normally prefers to have some kind of prototype before deciding to invest. To quote a TTI director of a research-intensive university, “it is a challenge for the TTO to be able to put together a reasonable technical and commercially valuable proposition to potential customers, clients or investors.” Another TT manager of a Group A university (Low Third Stream/Zero IP Income) suggested that “if there are things, that can be done to help the risk of early stage, of seed investment, that would be incredibly helpful.”

Associated with the above is the suggestion by TT Heads and researchers to extend the EPSRC (and some other Research Councils) “Follow on” funding from one year to at least two years.<sup>35</sup> However, there is a fear that while follow on funding schemes are good, they will likely divert resources from the research allocation “as money has to come from somewhere.” Another common remark by researchers is the high financial cost that a researcher has to bear in attempting to commercialise. Witness for instance the view of a frustrated researcher:

My team is like a small firm. The university pays my salary and I have to obtain the funding to pay the salaries of my post-docs and the overheads for the laboratory space that I use in the University.....so I can’t invest money in new projects and the university is losing potential income. If the University had the resources to pay for one or two post-docs, I would be able to redeploy my funding to new technology and invest in new projects and new patents.

- (5) **Grants instead of loans.** TTO directors in Scottish universities suggested that Scottish Enterprise could consider awarding grants instead of the current loans it makes to universities, such as for company (spin-out) formation. It was argued that while on the one hand the Scottish Government “is trying to stimulate the economy with jobs [through spin-outs], it is also acting as a venture capitalist. You can’t have it both ways.” More funding for “enterprise

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<sup>35</sup> These support the development of the commercial potential of a concept. Other Research Councils that award Follow on funding include the BBSRC, NERC and STFC.

fellowships” should be considered as they would be helpful in growing the entrepreneurial culture in universities.

- ***Make explicit the objectives of IP commercialisation.*** “It would help universities and industries to know whether the government does want the universities to push their IP out of universities to create more companies, to create more jobs and more wealth and whether there is an expectation that the university should benefit from that as well. And I think that the government has been too silent on that.” “Yes, a lot [of unexploited IP]. Academics are not aware of IP issues and they do not recognise commercial potential of their research outputs. Moreover, academics are not rewarded for commercialisation but for publications, therefore there are no incentives to engage in commercialisation.”
- ***Government to encourage embeddedness of IP commercialisation activity.*** “The thing they could do is to help to embed this agenda to the agenda of teaching and research within the university. It would be helpful if the Government tried to raise the level of debate at the senior management level within universities on how we could go about having this culture changed. It might be slightly controversial point... the universities are run by academics who become senior managers but they could benefit from having senior managers from broader range of backgrounds. If you are looking to change organisation and then within organisation typically academics become managers of the organisation then you get a self-perpetuation of historical ways of doing things. So I would like to see more individuals from business or other organisations in top management position in universities. Especially senior managers who have worked through change management in other organisations could benefit universities.” A Group F (High Third Stream Funds/High IP Income) TTO manager stated:

they [RAE] are kind of hideous in many ways because they put pressure on academics in terms of publications. Basically they divert attention away from knowledge transfer.... I know that in departmental plans there is now a KT element but I don't truly believe that any department is being judged very critically on KT activities. I think that it can really happen only when the government sets out expectations for the universities.
- ***Allocate directly HEIF or similar kind of funding to university TTOs or ring fence these funds for TTO activities.*** It was argued that direct allocation to the TTO would (1) clearly signal the importance of the TT function; and (b) help prevent diversion of such funding to other university activities. “[Lack of funding] continues to be difficult for ‘enterprise staff’ to be treated in the same way as traditional research active staff by academic managers in status, relief from teaching or administration.” “HIEF money is still not regarded as core funding and no one takes people on permanent contracts. There should be a permanent stream of funding [for commercialisation activities.]” Many TTO positions are on a part-time basis or a fixed term contract. Such a situation does not promote stability and can be disruptive to a TTO that is either well on its way to being productive or in the process of improving its structure and performance.
- ***Consider a U.S.-like Small Business Act which has certain provisions to help small businesses.*** The U.S. Small Business Act 2004 commits Government to “aid, counsel, assist, and protect, insofar as is possible, the interests of small-business concerns.... to insure that a fair proportion of the total purchases and contracts or subcontracts for property and services for the Government.... be placed with small business enterprises....”<sup>36</sup> HEIs are finding it difficult to negotiate with SMEs because these companies argue that they “pay taxes” and should have free or cheaper access to

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<sup>36</sup> [http://www.sba.gov/idc/groups/public/documents/sba\\_homepage/serv\\_small\\_bus\\_act.pdf](http://www.sba.gov/idc/groups/public/documents/sba_homepage/serv_small_bus_act.pdf)

research results. But many universities want to recover “the full economic cost of the [commercialisation] activity.” Also there appears to be “a significant mismatch between the speed with which SMEs and HEIs work.....there are also significant restraints for SMEs.” For instance, SMEs require faster answers; universities need resources to provide the “fast answers.” Also, “when licensing is handled by SMEs often they are not strong enough on their own to defend the IP. So we also help SMEs to stand up for their IP and help them grow and provide resources in terms of students and advice.” In other words, Government procurement practices could be considered in favour, to some degree, of SMEs.

- ***Consider access for SMEs (university spin outs) to Government SME support measures.*** Since it is common practice for universities to have 50% equity in spin-outs, spin outs cannot be regarded as an SME because a university is a large enterprise. As a result it is difficult for spin-outs to take advantage of Government support measures for SMEs. As a result, the university has to sell shares to dilute its ownership to raise capital for the spin-out, which indirectly implies that the taxpayer is not getting a good return on investment (public funding of the research). Thus the position of university spin-outs needs, arguably, to be reconsidered and revisited with respect to its accessibility to Government SME support measures.
- ***Helping business to deal with universities.*** Universities should be “demonised less” (quoting a TTO Director) just because business tends to complain about university management/commercialisation of IP.<sup>37</sup> Interestingly, a promising researcher-inventor (according to his TTO) coherently argued the need for Government to “bridge the gap” between industry and academia because both parties “do not speak the same language...industry does not think that the university is a good place for IP, the university thinks that they have the best IP, so they want a good return. So industry needs help in bridging this gap.”
- ***Create a co-investment fund with venture capitalists (50/50).*** The venture capitalist will have the responsibility for identifying commercialisable IP and then investing in the technology. It would have to be accountable to Government.
- ***Develop a more “joined-up” thinking between the Regional Development Agencies (RDA), Research Councils and the Technology Strategy Board in the fostering of university commercialisation activities.*** A TT director of a Group F (High Third Stream Funding/High IP Income) said: “The RCs (Research Councils) and the RDAs they all want different things and it is difficult to report engagement to them..... it would be nice if government bodies could work together on common needs, and common delivery mechanisms. So that separate bodies won’t ask for the same thing in slightly different ways.” Some TT directors/managers have suggested that RDAs, in particular, should have a more structured approach to helping universities here, implying a policy failure in the lack of evenness of funding across the country. For instance, Government expects RDAs to deliver economic recovery programs. “But the problem is that the RDA funding does not take account of the

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<sup>37</sup> See Johan Brunel, Pablo D’Este, Andy Neely and Ammon Salter (2009). *The Search for Talent and Technology: Examining the attitudes of EPSRC industrial collaboration towards universities*. A Report prepared for the Advanced Institute of Management Research, January. This report listed “unrealistic expectations from TTOs” as one of the major barriers to industry collaboration. Although little detail was provided as to what these unrealistic expectations may be, anecdotal evidence suggests that TTOs are demanding high licensing revenues, without, apparently, knowing the market for said license. Could this barrier not be a consequence that TTOs are becoming more professionalised and therefore demanding the right value for the license? Could it also not be that businesses are not quite attuned to the increasingly professionalisation and market awareness of TTOs, having historically obtained university IP for free or cheaply?

knowledge base of the region that they are based in....its needs are dictated by the economic needs of the regions they are based in.” Yet a “knowledge economy” works on a “horizontal basis” and should not be constrained by locational characteristics.

- ***Give equal weight to other forms of IP.*** For instance, registered designs, trademarks as patents or publications in the RAE.
- ***Revise the law for IP infringement.*** One of the biggest problems, suggested some TT directors, is that entrepreneurs face is the “So sue me” threat from larger companies. Fear of such actions is known to inhibit entrepreneurial activities. “Government does not offer here any support of protection. “A change in law has to be put in place where people who are deliberately and maliciously infringing IP of other to make it a criminal offence [sic]. This is not criminal offence at the moment and they are encouraging IP theft.” “I have been pirated 4 times on my designs one of the company said ‘So sue me’ and I tried and they applied for the security of costs [damage costs]. I wasn’t allowed to sue them. That inhibits entrepreneurial activities.”

## Use of Lambert Agreements

### **More than a half of the responding universities use the Lambert Agreements.**

Table 8 below illustrates the use of the Lambert Agreements by TT directors/managers. These Agreements are a Government measure to assist TTOs in their collaborative and business relationships.

There are five Lambert Agreements, which are model agreements to assist universities and industry, particularly SMEs, to collaborate more effectively. Each agreement provides a different approach in the key area of ownership and the right to exploit the IP in, or license, the results or outcome of the collaborative project. These Agreements also suggest appropriate terms of use for commercial and non-commercial purposes.

Table 9 below shows that the highest users are those from Groups A, C and E. It is interesting to note that Groups B (Zero IP income) and D (Low IP income) show a rather even split of 60 per cent (use) to 40 and per cent (no use) and 56 per cent (yes) to 33 per cent (no), respectively, in the use of these Agreements. This is mainly explained by the observation that the TTOs who use these Agreements adopt them mainly for consultancy and collaborative projects, while the “no” use their own agreements. (Collaborative and consultancy outputs are not captured by IP income.)

While Group E (high IP income) registers 100 per cent usage of the Agreements, caution needs to be exercised here because there were only two universities represented in our sample of HEIs. Nonetheless, the Agreements are used as models and as “reference points” for the universities’ own agreements for licensing. Group F, on the other hand, is the lowest group of users. The expertise in concluding licenses and contractual agreements residing in the majority of Group F universities explains, in large part, the comparatively low usage. However, where they are used, the Agreements serve as models as well as “reference points,” the latter form of usage being the more frequent one.

Overall one could preliminarily conclude that the Lambert Agreements have been useful and continue to be used. Investigation of its use by a larger Group E and F (high IP income) could, however, be undertaken to provide a wider representation of the Agreements’ usage.

**Table 9. The frequency of using Lambert Agreements reported by TT managers.**

Groups	Yes	No	No response	Total number in each group
Group A - Low HEIF Zero IP Income	75%	25%	0%	4
Group B – High HEIF Zero IP Income	60%	40%	0%	5
Group C - Low HEIF Low IP Income	86%	14%	0%	7
Group D – High HEIF Low IP Income	56%	33%	11%	9
Group E - Low HEIF High IP Income	100%	0%	0%	2
Group F - High HEIF High IP Income	46%	54%	0%	13
<b>Total</b>	<b>62.5%</b>	<b>35.0%</b>	<b>2.5%</b>	<b>40</b>

## Does academic entrepreneurialism affect the behaviour of academics toward teaching and research?

**Academics and senior university administrators believe that the commercialisation of research does not affect the quality of teaching, does not undermine the traditional missions of research and teaching and there is little diversion of basic research to applied research.**

The response by a researcher to the question, among others (see below for more) “do you think that Government’s policies are undermining the university’s traditional missions of teaching and research?” encapsulates a common view.

Others, who may not be engaged in commercial activities, may say “a lot”. I think it’s critical that universities have people who are interested in enterprise and people who are only interested in academic research and teaching. Universities must have both. It would not be right not to exploit anything but it would not be right either to turn them into a factory for exploitation.

Academic entrepreneurialism doesn’t undermine because it brings as much as it takes away. In entrepreneurialism some of your energy is not sometimes in publishing papers but in doing applied work, but the real world is about applying things and to bring that experience contributes to the environment both academically and for our students. They just don’t want to know about the basic biology, they want to know about how is that used in that way. So it helps in their education and it informs teaching.

The view offered by a senior university administrator and TTO director also reflects a similar sentiment:

I and the VC would say no. It is rather enhancing teaching and research and it is making it relevant. It is feeding back into teaching students, doing research, generating new IP, coming back into education, coming back into research. It is a cycle..... the university is not only for the first degree. It is the relation for life. We also help our former students. It’s important that industry knows that we are aware of their problems and that we know how to play this game [commercialisation].”

Table 10 below analyses the significance of the questions posed to senior administrators. Table 11 reveals the differences between the responses of senior administrators and researchers who were asked the same set of questions.



**Table 10. Impact on academic behaviour on teaching and research. Assessed on a scale from 1 to 5 (1 – no, 2 – a little, 3 –quite a bit, 4 – a lot, 5- absolutely).**

Groups	Traditional missions of teaching and research are undermined	Attention is diverted away from basic research to applied research	The provision of public knowledge is compromised	The quality of education diminished because research results are kept "quiet" for commercialization	Financial incentives for researchers are important
Group A – Low HEIF Zero IP Income	1.00	2.00	1.67	2.00	4.00
Group B - High HEIF Zero IP Income	2.00	2.40	2.00	1.80	3.20
Group C – Low HEIF Low IP Income	1.33	1.67	1.67	1.40	2.50
Group D - High HEIF Low IP Income	1.44	2.22	1.56	1.33	3.22
Group E – Low HEIF High IP Income	1.00	3.00	1.00	1.00	2.50
Group F - High HEIF High IP Income	1.31	1.92	2.23	1.50	3.77
<b>Total</b>	<b>1.38 (no)</b>	<b>2.08 (a little)</b>	<b>1.84 (a little)</b>	<b>1.50 (a little)</b>	<b>3.33 (quite a bit)</b>

Note. Presented values are averaged scores for each group. Number of respondents is N=39, N=38, N=38, N=36, N=39 for each question respectively.

Please note that the researchers who contributed to this study have been engaged in commercialisation of their research outputs. Their opinions of researchers who have not engaged in commercialisation might differ in their responses from those presented above.

All differences across groups are not statistically significant. This indicates that senior university administrators have a unified opinion on the impact of governmental policies on academic behaviour toward teaching and research. In their opinion, government measures encouraging academic entrepreneurialism

- 1) **DO NOT** undermine the traditional missions of teaching and research,
- 2) **A LITTLE** divert attention of academics away from basic research to applied research,
- 3) have **A LITTLE** a potential to compromise the provision of public knowledge,
- 4) have **A LITTLE** a potential to diminish the education because of the need to keep research results “quiet” for commercialization.

The senior university administrators also reported that financial incentives for researchers are **QUITE A BIT** important for the development of academic entrepreneurialism.

**Table 11. Impact on academic behaviour on teaching and research - the differences in opinions between senior administrators and academic researchers. Assessed on a scale from 1 to 5 (1 – no, 2 – a little, 3 –quite a bit, 4 – a lot, 5- absolutely).**

Question	Senior Administrators	Researchers	Differences in opinions
Traditional missions of teaching and research are undermined	1.38	1.74	Not Significant
Attention is diverted away from basic research to applied research	2.08	2.52	Not Significant
The provision of public knowledge is compromised	<b>1.84</b>	<b>2.56</b>	<b>Significant</b>
The quality of education diminished because of need to keep research results "quiet" for commercialization	1.50	1.70	Not Significant
Financial incentives for researchers are important	3.33	3.44	Not Significant

Note. Presented values are averaged scores for each question. The differences were analysed with a non-parametric Mann-Whitney test. The difference marked as significant has a significance level  $p < .01$ . Number of respondents is  $N=39$  for senior administrators and  $N=25$  for researchers.

Overall, the opinions of academic respondents do not differ significantly from the opinion of senior university administrators, with one exception. The academic respondents are significantly more concerned than senior university administrators with the provision of public knowledge potentially compromised as a result of encouraging academic entrepreneurialism. In particular, senior university administrators reported that encouraging academic entrepreneurialism has **A LITTLE** of a potential to compromise the provision of public knowledge whereas academic respondents reported that there is **QUITE A BIT** of the potential. However, it is important to note that both groups of respondents are, in general, little concerned.

It is worth pointing out that while financial incentives are quite important (Quite a bit response, see Table 11 above) to both senior administrators and researchers to promote academic entrepreneurialism, these rewards are highly uncertain. While not explicitly expressed by all interview respondents, several senior administrators said that their universities were considering or had included entrepreneurial performance as part of the promotion criteria. Researchers, particularly mid-career academics, in pursuit of reputation and promotion, regarded this as an incentivising measure. We may even suggest that inclusion of entrepreneurial performance into the promotion criteria might be a more attractive incentive than financial rewards.

To sum up, concerns over the “marketisation” of university research are unfounded according to our interview data. Some scholars have argued that attempts at encouraging commercialisation of university research outputs have the potential to undermine the institutional roles of universities, namely teaching and research, possibly affect the quality of teaching and compromise the provision of public knowledge (Dasgupta and David 1993). Others have contended that such activity can interfere with teaching and affect the quality of teaching (Campbell and Blumenthal 1999). In contrast to the arguments against academic entrepreneurialism, a seminal paper by Jensen and Thursby (2004) shows that the active pursuit of commercialisation can actually promote basic research and scholarly education.

Our findings confirm that commercialisation of research does not affect the quality of teaching and the traditional missions of research and teaching are not undermined. There is also little diversion of basic research to applied research. And while financial rewards are considered favourably, they do not form an important reason for researchers to pursue commercialisation. Instead researchers on the whole want to see their research results used/applied.

## How universities can further improve their entrepreneurial activities

**Evidence indicates that TTOs are continually attempting to improve their commercialisation activities and are still learning to and improving their performance.**

Distilling from the interview data and in discussion with TT directors/managers, we have identified suggestions that could potentially help further improve TTO operations and performance. They are:

- ***Increase engagement with academics.*** TTOs that have not adequately interacted with academics could be encouraged to do so as potential exploitable IP, either in the form of patents or specialised knowledge may go undetected. As indicated above, the central role of close interaction with academics can yield significant returns from their research. Furthermore academics can often direct/suggest to the TTO where commercial opportunities may lie. This is one important way of creating networks of contacts.

An example provided by a Group E (Low Third Stream Funds and High IP Income) university reinforces the important lesson of cultivating close academic interaction. The TTO had approached several companies in two sectors, which it thought would be interested in a patented product, but with little success. The inventor was approached for ideas as to where else the TTO may attempt to license the invention. The academic suggested a totally different sector from which the TTO had approached. Major success!! Not only was it licensed for further development, the licensee is considering pursuing it further with another licensee for production.

- ***Play to your own strengths.*** HEFCE indicators, as the foregoing discussion has shown, raises a common complaint by less research intensive HEIs, in particular. They argue that their “knowledge exchange/technology transfer” activities involve to a large extent on little or no patents, such as advising or working with small companies. But the demand for these indicators propels some universities to try and emulate or compare with what research-intensive universities are doing. Universities who attempt to adopt the practices of universities, especially those who have not sufficiently taken into account their limitations and in some cases, even their strengths, may be driven by what one Director said: “the problem with our university is its tendency to confuse common practice with good practice....universities often develop a sheep mentality.” Such a comment can imply that some universities should focus on their strengths, such as in undertaking outreach programs or in business engagement activities, which may not necessarily result in generation of much revenues but more in knowledge transfer to the public.

Thus such universities need to be encouraged to capitalise on their expertise to generate “non-patent” business opportunities and participate more in KTPs, which provide a greater likelihood for identifying potential business requirements. For instance, Groups A (Low Third Stream/Zero IP Income), B (High Third Stream/Zero IP Income) and C (Low Third Stream/Low IP Income) could continue to focus more on working with smaller companies by giving them increased access to their research

staff and advice on the understanding that if the company incorporates any of the ideas presented, the university is paid a small royalty. Here IP exploitation comes not from a patent but from expertise. In other words, there could be a “diversification” of strategies.

- **Improve data management system.** A well designed and centralised constructed data management system is an essential component for effective monitoring of patents and all other forms of protected IP, licenses, spin-outs, etc. Such a management system facilitates two activities that can improve the effectiveness and efficiency of a TTO. These are to:
  1. conduct a patent audit for those with large patent portfolios. Renew which ones? Give away some? Pool them?
  2. conduct a licensing audit, which involves monitoring to see if licenses have been licensed to a third party without the knowledge of the university, if agreement has not been made to do so. We were informed of such a case. Frequent occurrences of this can result in lost income to the university.
- **Introduce a mentoring system.** A mentoring system could be considered for all Groups. This may be done by incentivising an experienced academic who has successfully exploited his/her IP to act as a role model and provide “personal experience” of the commercialisation process.
- **Publicise successful cases widely.** Showcase successful examples of commercialisation to “lure” potential academic entrepreneurs.
- **Reward entrepreneurial performance.** At the university executive level to consider the inclusion of entrepreneurial performance as part of the promotion criteria.

## Suggestions for further study

1. To investigate what the “30 per cent abandonment” of PCT applications includes – the proportion of poor quality applications compared to the inability of the TTOs to identify a potential investor, the lack of university resources to pursue the technology further or other reasons.
2. To obtain comprehensive views and data on what UK TTOs think about the utility of a grace period (disclosures).
3. To consider the elements of an effective operational structure for the IP matchmaking forum. For instance, what good practice can be adopted to communicate (publicise) the unexploited IP and to identify potential investors/businesses with the aim of acquiring the IP. Would dividing the unexploited IP into sectoral groupings facilitate the “matchmaking?” Should the IP be aimed primarily at small and medium-sized enterprises?<sup>38</sup>
4. The number of internal (university) disclosures translated into patent applications.

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<sup>38</sup> These suggestions based on the findings were prompted by the project’s Steering Committee.

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## ANNEX ONE

Figure 1. Group A: Low Third Stream Funds & Zero IP Income

1. Anglia Ruskin University	26. University of Northampton
2. Bath Spa University	27. Norwich School of Art & Design
3. Birmingham College of Food, Tourism and Creative Studies	28. School of Oriental and African Studies
4. Bishop Grosseteste University College, Lincoln	29. Ravensbourne College of Design and Communication
5. University of Bolton	30. RCN Institute
6. Arts Institute at Bournemouth	31. Roehampton University
7. Buckinghamshire Chilterns University College	32. Rose Bruford College
8. Canterbury Christ Church University	33. Royal Agricultural College
9. University of Central Lancashire	34. Royal College of Music
10. Central School of Speech and Drama	35. Royal Northern College of Music
11. University of Chichester	36. College of St Mark & St John
12. University College for the Creative Arts at Canterbury, Epsom, Farnham, Maidstone, Rochester	37. St Mary's University College
13. St Martin's	38. Southampton Solent University
14. Cumbria Institute of the Arts	39. Thames Valley University
15. Conservatoire for Dance and Drama	40. Trinity Laban Conservatoire of Music and Dance
16. Dartington College of Arts	41. University of Winchester
17. Edge Hill University	42. University of Worcester
18. University College	43. Writtle College
19. University of Gloucestershire	44. York St John University
20. Liverpool Hope University	45. University of Abertay Dundee
21. University of London	46. Glasgow School of Art
22. London School of Hygiene & Tropical Medicine	47. Royal Scottish Academy of Music and Drama
23. Manchester Metropolitan University	48. University of Wales, Lampeter
24. Middlesex University	49. University of Wales Swansea
25. Newman College of Higher Education	50. University of Wales Institute, Cardiff
	51. North East Wales Institute of Higher Education
	52. Trinity College Carmarthen
	53. Royal Welsh College of Music and Drama

Figure 2. Group B: High Third Stream Funds & Zero IP Income

1. University of Bedfordshire	7. Kingston University
2. University of Central England in Birmingham	8. Leeds College of Music
3. University of Derby	9. London Business School
4. University of East London	10. University of Portsmouth
5. Harper Adams University College	11. University of Sunderland
6. University of Huddersfield	12. University of Teesside
	13. University of Westminster
	14. University of Wolverhampton

Figure 3. Group C: Low Third Stream Funds & Low IP Income

1. Bournemouth University	11. University of Salford
2. Courtauld Institute of Art	12. Staffordshire University
3. Institute of Education	13. Leeds Trinity & All Saints
4. Goldsmiths College, University of London	14. Queen Margaret University College Edinburgh
5. University of Hull	15. University of Stirling
6. London School of Economics and Political Science	16. University of Glamorgan
7. University of Northumbria at Newcastle	17. University of Wales, Aberystwyth
8. School of Pharmacy	18. University of Wales, Bangor
9. Royal Academy of Music	19. University of Wales, Newport
10. Royal College of Art	20. Swansea Institute of Higher Education

Figure 4. Group D: High Third Stream Funds & Low IP Income

1. Birkbeck College	15. London Metropolitan University
2. University of Bradford	16. London South Bank University
3. University of Brighton	17. Loughborough University
4. Brunel University	18. Nottingham Trent University
5. University of Durham	19. University of Plymouth
6. University of East Anglia	20. Royal Holloway, University of London
7. University of Exeter	21. St George's Hospital Medical School
8. University of Hertfordshire	22. Sheffield Hallam University
9. Lancaster University	23. University of the West of England, Bristol
10. Leeds Metropolitan University	24. University of York
11. University of Leicester	25. Robert Gordon University
12. University of Lincoln	26. University of Ulster
13. University of Liverpool	
14. Liverpool John Moores University	

Figure 5. Group E: Low Third Stream Funds & High IP Income

1. Institute of Cancer Research	5. Glasgow Caledonian University
2. University of Chester	6. University of Paisley
3. Open University	7. University of St Andrews
4. Royal Veterinary College	



Figure 6. Group F: High Third Stream Funds & High IP Income

1. Aston University	20. University of Nottingham
2. University of Bath	21. University of Oxford
3. University of Birmingham	22. Oxford Brookes University
4. University of Bristol	23. Queen Mary, University of London
5. University of Cambridge	24. University of Reading
6. City University, London	25. University of Sheffield
7. Coventry University	26. University of Southampton
8. Cranfield University	27. University of Surrey
9. De Montfort University	28. University of Sussex
10. University of Essex	29. University College London
11. University of Greenwich	30. University of Warwick
12. Imperial College London	31. University of Aberdeen
13. Keele University	32. University of Dundee
14. University of Kent	33. University of Edinburgh
15. King's College London	34. University of Glasgow
16. University of Leeds	35. Heriot-Watt University
17. University of the Arts London	36. University of Strathclyde
18. University of Manchester	37. Cardiff University
19. University of Newcastle upon Tyne	38. Queen's University Belfast