Technology
Innovation Centres

Institute of Physics submission to a
House of Commons Science and
Technology Committee inquiry

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9 December 2010
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The Clerk
Science and Technology Committee
House of Commons
7 Millbank
London SW1P 3JA

IOP Institute of Physics

Dear Sir/Madam,

Technology Innovation Centres

The Institute of Physics is a scientific charity devoted to increasing the practice, understanding and application of physics. It has a worldwide membership of around 40 000 and is a leading communicator of physics-related science to all audiences, from specialists through to government and the general public. Its publishing company, IOP Publishing, is a world leader in scientific publishing and the electronic dissemination of physics

This submission was prepared in consultation with the Institute’s Business and Innovation and Science Boards.

The Institute welcomes the opportunity to respond to the Technology Innovation Centres Inquiry. The attached annex highlights key issues of concern to the Institute.

If you need any further information on the points raised, please do not hesitate to contact me.

Yours faithfully,

[Signature]

Professor Marshall Stoneham FRS CPhys FInstP
President
Institute of Physics

[Signature]

John Brindley
Director, Membership and Business
Institute of Physics
Technology and Innovation Centres

1. What is the Fraunhofer model and would it be applicable to the UK?

The Fraunhofer-Gesellschaft has operated in Germany since 1949, working in the space between academic research and the commercial exploitation of science and technology. It operates 59 institutes in Germany, along with a small number of international centres, covering a breadth of science and technology disciplines. The essence of the ‘Fraunhofer model’ is that each centre is dedicated to a specific, individual application area, such as applied polymer research or laser technology. The institutes are physical locations, established and typically maintained over decades, growing, evolving and, ultimately, closing as the technology matures. The institutes themselves are often located adjacent to, and strongly coupled with, universities with relevant interests. The numbers of people involved are usually a few hundred per institute, with relative autonomy from the Munich HQ but with some central specialist support in areas such as legal, commercial and IP.

Key features of the operation of the Fraunhofer institutes include:

- **People**

  The people working in the Fraunhofer institutes range from early career students, to mature researchers and also include, importantly, mid-career, experienced and high-quality technical staff. The latter, stable (i.e. not on short, fixed-term contracts) grouping in particular has no obvious analogue in the UK academic research system, but act as a vital link to industry. The Fraunhofer institutes have also shown some success in staff mobility. It could be perceived that the population of staff is static; in practice, it is natural and expected that careers develop so that people move voluntarily in and out of the institutes, to/from academia/industry. In some cases, there is almost complete integration of researchers and students between institute and university, not just serially from role to role, but throughout their studies and research (shared projects, facilities, common rooms etc). For example, researchers are able to take their concepts to use through the companies involved, moving flexibly from employment by the university, to institute to company. A key value-adding component is the facility for industrial researchers, identifying a demand for more fundamental studies, to choose to undertake research or move into the research institute later in their careers. In this case, the relative proximity of the institutes to universities and businesses can be seen as an asset, as there is less disruption of personal circumstances resulting from such moves.

- **Financing**

  The funding for individual institutes is relatively stable, drawn from local and national grants and government and industry contracts. The themes of the institutes are selected and championed by the researchers and companies jointly to meet both

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local and national needs. To gain funding, institutes are selected and costed properly against formal business plans and programmes are able to be stopped if the progress is not in accordance with goals. If novel outcomes emerge from the work undertaken, they can be pursued flexibly by local agreement. Projects are not peer reviewed by academics to gain funding but by business people alongside technical specialists; output is not measured by academic quality or publications but by industry relevance and support.

- **Market culture**

Each institute is strongly coupled with a small number of market sectors and/or business communities. As such, industry needs and drivers are accommodated automatically and research developments are transferred to the user communities. This arrangement also has the benefit that knowledge of supply chains and market cultures pervade the institutes. The institutes have been in place for several years, and the relative stability of the structure means that industry and business trust and rely on the Institutes.

In terms of how the model could be applied to the UK, there is a long-acknowledged ‘gap’ between the strength of research in universities and other institutions, and commercial applications within UK industry. The business-focused remit of the Fraunhofer Institutes is something that could be replicated in the UK to fill, at least parts of, this gap. However, for this to happen, it will be necessary to (a) determine which business sectors need such research support, and (b) what the scope is for this research to be co-funded in an appropriate way. Both of these decisions will need to be made following extensive consultation with both industry and academia.

However, it should be noted that there are many significant differences between the German and UK research ecosystems, ranging form the tax system to local geography, which must be understood and taken account of if such centres are to be of benefit to the UK. One important difference is that the German university sector is not nearly as research intensive as the UK system and the creation of new centres may have unintended detrimental impacts on this strength. An indirect effect of creating such Institutes may well be to put further pressure on the universities which use research contracts as alternative sources of funding. It will be important, in considering the Fraunhofer model in the UK, to determine such second order impacts on other research institutions.

The coalition government has recently announced\(^2\) that it will create UK analogues for the Fraunhofer institutes: ‘Technology and Innovation Centres (TICs), proposed and described by Hermann Hauser in his review\(^3\) earlier this year. These centres are expected to be allocated £250 million over a four-year period. This level of funding suggests that there will be around five new centres created, at least in the first instance. In contrast, the 59 Fraunhofer Institutes have an annual research budget of €1.6 billion; €1.3 billion of which is generated through contract research with both industry and government. The remainder of the budget is in the form of state grants. When considering the appropriate level of funding for the new UK centres, it should


\(^3\) The Current and Future Role of Technology and Innovation Centres in the UK, a Report for the Department of Business, Innovation and Skills by Hermann Hauser. [http://www.bis.gov.uk/assets/biscore/innovation/docs/10-843-role-of-technology-innovation-centres-hauser-review.pdf](http://www.bis.gov.uk/assets/biscore/innovation/docs/10-843-role-of-technology-innovation-centres-hauser-review.pdf)
be remembered that one of the reasons that industry goes to universities for collaborative research in the UK is because they are relatively well-equipped. The costs of reproducing some of these facilities in the institutes should not be underestimated. Additionally, given the relatively small number of centres likely to be created, and the stated aim of the new TICs to support high-growth sectors where the UK has the potential to be a world player it is essential that there not be too much co-ordination, which would run the risk of stifling new ideas through the establishment of ‘clubs’ which have a vested interest in following a single path and fixing research at a single point in time.

Related to the funding allocated to each centre is clearly the size and sustainability of the centres. In the past, initiatives such as the Research Associations have suffered from being too small to survive in the longer term, being unable to fund research to renew their intellectual competitiveness which had knock-on effects on the industrial sectors they supported. Additionally, it should be emphasised that the success of the Fraunhofer Institutes in engaging with businesses was not instant.

2. Are there existing Fraunhofer-type research centres within the UK, and if so, are they effective

The UK has had in the past, and has currently, many successful research facilities which have tried to fill the gap between academic research and the commercial sectors. The coordinated nature of the Fraunhofer institutes, and also their direct industry focus, have not been defining features of current UK centres. What has now become the Harwell Campus has a strong history in developing technologies for commercialisation, and retains much of this expertise across broad fields. In the past, defence research centres such as the Royal Signals and Radar Establishment (RSRE) at Malvern have shown demonstrable result of developing technologies such as LCDs and semiconductors which were subsequently brought to the commercial market.

There are many newer excellent research centres across the UK, such as the Southampton ORC4 and the NaREC renewable energy centre in Blythe5, and, while these are not ‘Fraunhofer-like’, they, like many others could make a case for being ‘converted’ into TICs. Additionally, other models such as the Warwick Manufacturing Centre may come close to being an industry-focused centre, additionally some science parks, though it could be argued that theirs is a very different model.

3. What other models are there for research centres oriented toward applications and results?

Hermann Hauser’s review describes many of the current programmes operating around the world, such as the ETRI centres in South Korea and particularly the role of DARPA in the US. Closer to home, the “Competence Centre” model which is being used in Northern Ireland and the Republic of Ireland, comprises collaborative centres tasked with performing industry-facing research and development. A slightly different approach that should not be neglected is that of the Rolls-Royce University Technology Centres6 which have shown considerable success in linking academic research with the demands of corporate development.

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4 [www.orc.soton.ac.uk](http://www.orc.soton.ac.uk)
5 [www.narec.co.uk](http://www.narec.co.uk)
6 See, for example: [http://www.shef.ac.uk/systemsutc/index.html](http://www.shef.ac.uk/systemsutc/index.html)
4. Whose role should it be to coordinate research in a UK-wide network of innovation centres?

For the TICs to succeed, they will need to be trusted by the business communities. To foster this, the centres should have strong business elements in any leadership structures, and there is a need for high-profile appointments, rather than secondments. Additionally, there is a need to have a clear idea of business sectors in the UK and their needs in terms of technology translation. The Technology Strategy Board has been suggested to operate the TICs, and we would agree that it is well placed, both in terms of its own expertise, but also, perhaps more importantly, its ability to draw together figures from relevant industries and also its ability to work with the research councils.

5. What effect would the introduction of Fraunhofer-type institutes have on the work of Public Sector Research Establishments and other existing research centres that undertake Government sponsored research?

In Germany there are other national and corporate labs in addition to the Fraunhofer institutes which have distinct roles and all work well together within the broader innovation ecosystem. Similarly, in the UK, there are several stand-alone and ‘arm’s length’ research centres which may be able to work alongside TICs in the same way (though any refocusing of existing funding will undoubtedly have some impact). However, as mentioned previously, a significant difference between the German system and the UK version is the research strength of UK universities. The role of the TICs with respect to these must be carefully examined. While the briefs and main objectives of the two bodies will be different there may well be significant overlap in activity – or even on occasion with TIC based within a university itself -- and also conflict for public funding.

It should be remembered through any implementation of TICs that their success, and, more widely, a significant proportion of UK economic growth is ultimately predicated on the strength of the research base. The funding and governance of the TICs should not impact deleteriously university research and any new model should be considered in the whole.
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