# Submission to Science and Technology Committee Inquiry into Technology Innovation Centres

From the Association of Independent Research and Technology Organisations (AIRTO) - November 2010

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

1.1. The Fraunhofer model is that used by 59 institutes operating in Germany under the umbrella of the Fraunhofer Gestellshaft. These institutes have an annual budget of €1.6 billion and employ 17,000 staff.

1.2. The funding of these institutes is ⅔ from industry and publicly funded projects, and ⅓ core funding from federal and state sources. The core funding allows the institutes to invest in infrastructure in the form of facilities, capital equipment, and underlying technology. This allows the institutes to support the strategic aims of the region or overall nation, and also to make significant changes in technical focus where this is required by regional/national strategy or the needs of industry. This core funding also allows Fraunhofer Institutes to participate in EU Framework research projects, where the level of funding from the EU project is a percentage of the full cost and the remainder must be met by the institutes' own resources.

1.3. Fraunhofer Institutes claim to work at every Technology Readiness Level[1] (TRL) from 1 to 9, but their main area of interest is between the academic work of universities and the production activities of industry - ie TRL 3 to 7.

1.4. Fraunhofer Institutes have a clear focus on delivering to an industry agenda, with project timescales and outputs that are specifically and carefully designed to be readily assimilated by industry.

1.5. Each Fraunhofer Institute has a specific technology focus, but operates across a range of industrial sectors.

1.6. Each Fraunhofer Institute is aligned with a specific university that has strength in the technology focus of the Institute. The head of the Fraunhofer Institute is a professor at the university, although the majority of their time is spent at the Institute.

1.7. The core, permanent staff are a minority at the institute (typically 20 - 25%) with the majority of researchers being PhD students or post-docs. The normal expectation for these latter researchers is to stay at the institute for ~ 5 years, and then move into industry. This has advantages in that there is a flow of qualified researchers into industry, but does limit the long-term core continuity and competences of an institute.

[1] Technology Readiness Level - a classification system devised by NASA, see *http://www.nasa.gov/topics/aeronautics/features/trl_demystified.html*

1.8. The overall Fraunhofer Gestellschaft has an independent institutional status, and provides cores services and interacts with the federal government. However, each Fraunhofer Institute has a significant level of autonomy. This can lead to overlapping of technical focus between institutes, but this is controlled and minimised by liaison between individual institutes and groups of institutes, and can be beneficial where specific institutes are serving their local or regional industry.

1.9. The "Fraunhofer" brand is strongly promoted. This has not always been the case, and the parallel Helmholtz Institutes in Germany do not have an equivalent strong branding.

1.10. The Fraunhofer model does require a major, continuing investment of public funds at both the state and federal level.

1.11. Attempts have been made to set up Fraunhofer Institutes or centres outside of Germany (in France and the USA for example). These have not achieved the success of the institutes in Germany.

1.12. There is a significant level of collaboration between UK research organisations and Fraunhofer Institutes, particularly through working together on EU Framework projects.

1.13. Adopting the Fraunhofer model in its entirety in the UK is not appropriate, as it would replicate an already existing, successful infrastructure of applied research organisations.

1.14. What is needed is a set of measures to increase the effectiveness of existing UK applied research resources to meet the strategic aims of the UK and its industry. This will be achieved by implanting the core funding component of the Fraunhofer business model and the activities that it entails with the best of the existing UK applied research organisations. In these instances, access to a core funding stream will significantly increase the impact which these existing bodies can make on industry, wealth creation and economic growth.

1.15. Public investment in the best of the existing UK applied research organisations will be far more cost effective than introducing a new network of Fraunhofer type institutes. Furthermore, the highly organised and strongly branded German model is not appropriate in the UK, where industry needs for applied research vary from sector to sector, and no "one size fits all" model will give optimum efficiency.

1.16. However, there are some elements of the Fraunhofer model that are the same as those used in UK applied research organisations, and some Fraunhofer Institutes did consult with UK research organisations early in their development to understand how to work with industry. Common elements are effective collaboration with industry and working with relevant universities for the provision of underpinning academic research. The missing component in the UK applied research organisations is the ⅓ core funding, which in Germany comes from federal and state sources .

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

2.1. There are no direct equivalents of the Fraunhofer institutes in the UK, but there is a network of applied research organisations that undertake a similar role.
2.2. This UK network comprises organisations based on a range of business models:

- Public Sector Research Establishments (eg NPL).
- University "spin offs" (eg Warwick Manufacturing Group, AMRC).

- Independent Research and Technology Organisations configured as companies limited by guarantee or charities, governed by industry (eg BRE, Campden BRI, TWI).
- Privately owned, commercial research and development organisations (eg QinetiQ, Cambridge Consultants, PA Technology).
- Corporate research functions and laboratories (eg ARUP, Tata, IBM, GSK).

2.3. The first three categories are driven by an overall mission to support their specific technology or technologies, and to work to the long-term benefit of industry in general. They also maintain a strong symbiotic relationship with UK academia.

2.4. Many of these organisations are extremely successful, working with industry worldwide. A report from Oxford Economics commissioned by AIRTO[2] demonstrated the economic impact of these organisations on the UK GDP. They are particularly good at linking up supply chains from which the aforementioned report and earlier reports show that much of industry's innovation is derived.

2.5. Where they differ from the Fraunhofer Institutes is the lack of core funding from government. This limits their ability to:
- Liaise with academia.
- Renew core knowledge.
- Invest in new facilities and equipment.
- Address the evolving strategic needs of the UK and UK industry.

2.6. None of these necessary and very important activities can be fully financed from margins on collaborative and single client industry projects alone. By their very nature, applied research organisations do not have product businesses from which profits can be taken to fund such core activities.

2.7. Some public sector research organisations do receive core funding from government, but this funding is not targeted at the strategic needs of industry. Rather it is to perform a national service, such as the responsibility for standards and measurement performed by NPL.

2.8. It is worth noting that the UK began to explore an equivalent of the Fraunhofer model with Faraday Partnerships in the 1990s. However, with a piecemeal approach and a variety of governance models, the initiative was not uniformly successful and was replaced by the more limited knowledge exchange focused activities of the Knowledge Transfer Networks (KTNs) from 2004. KTNs are now administered by the Technology Strategy Board, and have a very different mission from that of the Faraday Partnerships. Therefore, they are of limited relevance to the current debate on Technology Innovation Centres and the Fraunhofer model.

[2] "Study of the Impact of the Intermediate Research and Technology Sector on the UK Economy", Oxford Economics, May 2008, see *http://www.airto.co.uk/oxfordeconomics.pdf*

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

3.1. As discussed above in 2.2, there are a number of existing models for applied research centres in the UK. The generic term used for such centres in the UK (and particularly in Europe) is Research and Technology Organisations (RTOs).

3.2. A number of the independent research and technology organisations were originally formed as Research Associations in the 1920s and 1940s. As discussed above, they are now generally companies limited by guarantee or charities with specific constituencies of industrial interest. These are successful institutions operating in a commercial world, often with clients worldwide. Their involvement in research to support the needs of UK national strategy has declined over the last twenty years, with the move to concentrate core public funding for research on the universities. However, they are equipped and willing to resume this "national" role.

3.3. Industry owned research centres have been in decline, and many have been closed in favour of contracting with universities. An example of the latter is the Rolls Royce University Technology Centre (UTC) network. However, Rolls Royce has realised that this network does not fill its need for applied research, and has recently been developing organisations specifically to bridge the gap between academia and industry.

3.4. A number of new organisations have come into existence to address the need for applied research and for bridging the gap between academia and industry. These organisations have a similar role to the existing organisations discussed in 3.2, and are based mainly on new technologies or application domains. The setting up of many of these has been supported by the Regional Development Agencies (RDAs), but they are also often compromised in their strategic work by the lack of a core funding stream. Examples of these organisations are the Institute for Sustainability (London), the International Space Innovation Centre (Harwell), the Advanced Manufacturing Research Centre (Sheffield), the Manufacturing Technology Centre (Midlands), The National Composites Centre (Bristol), and TWI regional centres (Middlesbrough, Sheffield and Port Talbot).

3.5. There are also the commercial research and development organisations and consultancies. These are generally targeted at high TRL development projects directly for industry, and are not structured to operate as open research and application centres. They are therefore of limited or no relevance to this current debate on TICs and the Fraunhofer model.

## 4. Whose role should it be to coordinate research in a UK-wide network of innovation centres?

4.1. The logical organisation to undertake this role is the Technology Strategy Board (TSB). This would be congruent with government policy and the current role of the TSB.

4.2. This coordination could be undertaken by the Department of Business, Innovation and Skills, but this would represent a u-turn in policy and potentially cause a conflict in roles with the TSB.

4.3. A third party organisation could be set up to administer a UK-wide network of innovation centres, but again this would seem to duplicate and conflict with the role of TSB.

## 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?

5.1. There will be little or no effect on PSREs and other existing research establishments if the proposed investment in such institutes is based on the existing infrastructure to enhance the activities of organisations with an already proven track record of excellence. New organisations would only be required where there is no current provision.

5.2. The development of such centres based on the existing infrastructure could benefit other UK research organisations, as it will exploit the already existing collaborative links.

5.3. However, if a new network of Fraunhofer-type institutes was introduced, ignoring the capabilities of the existing infrastructure and duplicating resource, there would be a massive effect on the viability of both the new and existing research organisations, with a corresponding detriment to UK efficiency.

## 6. Summary

6.1. The Fraunhofer model demonstrates how the effective use of core funding for applied research organisations can support the national industrial strategy.

6.2. The UK has an existing, comprehensive infrastructure of applied research organisations working for industry worldwide, but maintaining strong links with UK academia. The combination of this existing infrastructure with core funding will enable the UK to meet the strategic needs of national industry in an effective and cost efficient way.

6.3. There is a similar situation in France, where they have developed a system of "Institute Carnot" which involves selected existing research organisations receiving core funding to allow them to address national strategic issues.

## 7. Declaration of interests

7.1. This submission is made by the Association of Independent Research and Technology Organisations (AIRTO). The organisation represents research organisations and technical consultants, operating in the space between the academic research of universities and the commercial needs of industry. AIRTO members undertake research and development, and knowledge and technology transfer. They are largely funded by industry, but do undertake competitively bid projects supported by UK and European public funding programmes. AIRTO currently comprises 37 independent organisations, employing more than 20,000 scientists and engineers, with a combined annual turnover in excess of £2billion.

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