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BLC Leather Technology Centre  
British Maritime Technology Ltd  
Building Research Establishment  
Brewing Research International  
The Building Services Research & Information Association  
British Textile Technology Group  
Campden & Chorleywood Food Research Association  
British Ceramic Research Ltd  
Construction Industry Research & Information Association  
The Central Laboratory of the Research Councils  
FIRA International Ltd  
HR Wallingford Group Ltd  
ITRI Limited  
Leatherhead Food International  
LGC  
Materials Engineering Research Laboratory Ltd  
The Motor Industry Research Association  
The Motor Insurance Repair Research Centre  
National Metals Technology Centre Ltd  
The National Computing Centre Ltd  
National Collection Industrial Food and Marine Bacteria  
National Physical Laboratory  
Pera Group  
The Paint Research Association  
QinetiQ  
RAPRA Technology Ltd  
SATRA Technology Centre  
The Steel Construction Institute  
The Scotch Whisky Research Institute  
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# airto

Association of Independent  
Research & Technology Organisations

Applied Industrial Research  
Trading Organisations

## Innovation, Knowledge-transfer and Fiscal Incentives

August 2003

AIRTO Policy Paper 2003/1

## **DESCRIPTION OF AIRTO**

AIRTO is a network of the United Kingdom's independent knowledge-transfer companies and promotes their role in strengthening industrial performance through consultancy, design, information management, knowledge transfer, research and development, skills provision, technology transfer and training.

AIRTO members are quality- and value-adding companies with a track record of success in knowledge transfer. They are driven by the desire for customer satisfaction and profitable success in a competitive market place.

AIRTO provides a point of contact between UK independent research and technology companies and government agencies, industry bodies and the European Community. It co-ordinates the views of its members and, by representing these to industry and government it provides policy leadership in the knowledge trading sector.

Member companies having between them a total turnover approaching £2 billion, AIRTO embraces a major portion of the growing industrial R&D effort of the UK. Members' activities span a wide range of disciplines. Their work includes consultancy, managed research, contract research, developing and designing innovative products or processes, instrumentation, testing and certification, programmes of best practice, and techno-economic consultancy. Most run comprehensive information services, conferences and seminars as part of the process for knowledge acquisition and dissemination. Many organise joint ventures including venture capital investment programmes. The majority trade in the global market place.

## **RECENT AIRTO POLICY PAPERS**

- 2001/3 Effective implementation of learning captured through Networking
- 2001/2 Innovation management processes for technology based knowledge transfer companies – the impact of the results of the ESRC Innovation Programme
- 2001/1 The contribution of Faraday Partnerships to growth in innovation intensity in the UK economy
- 2000/4 AIRTO response to OST consultation on research in Europe after Framework 5.
- 2000/3 Increasing UK innovation intensity and the solution to the problem of knowledge transfer to business enterprise
- 2000/2 AIRTO response to the DTI proposal for a network of regional centres for manufacturing excellence and productivity
- 2000/1 Summary of AIRTO recommendations for a Science and Innovation Policy

regulation, fiscal/tax regimes, European or wider international trends, policies, devolved administration and stakeholders, obstacles to innovation, international comparisons/benchmarking

- the Secretary of State for Trade and Industry establishing a new industry-led committee to determine the selection and work of Faraday Partnerships
- accountability for Faraday Partnership use of public funds by annual report of the Partnership auditors to the Secretary of State for Trade and Industry
- Faraday Partnerships being exempt from corporation tax.
- Research Council funding of research by Faraday Partnerships to include funding or the Partnership management to analyse problems, present them to academia and translate back the results to industry
- the focus on companies
- the focus on incentives for collaboration between the players – companies, intermediates and universities
- reducing bureaucracy
- changing a DTI policy of urging industry to do better with extensive bureaucratic mechanisms to that of providing simple financial incentives to companies to fulfil the aspirations described by Porter.

That the DTI review is comprehensive is admirable. The issues are simple. Porter has defined most of them. The question remains as follows: What can government do (schemes) to support private sector industry to engage more in higher value-added products and services through innovation? Many answers are simple and contained in the following proposals from the AIRTO community, offered to the DTI. The DTI should implement support schemes which

- provide financial support to a company willing to enhance its product or service offerings to a higher value-added level
- give financial incentives to the demand-side for co-operation in partnership between a company, academia and a knowledge-transfer company
- give financial incentives to partnership between knowledge-transfer companies and universities to exploit 'raw' knowledge by licensing or other application of output knowledge
- increase financial support to the management of Faraday Partnerships as a bridge between industry and academia (globally)
- give exemption or full tax credit to all organisations engaged in knowledge-transfer and make the eligible definition of science, embrace all aspects of the complex knowledge-transfer process needed to achieve increase in innovation intensity.

## **Innovation, Knowledge-transfer and Fiscal Incentives**

AIRTO PAPER 2003/1

August 2003

- Focus on innovation combined with creativity and skills in management of collaborative projects.
- Technology translators concerned with implementation of R & D.
- Unique and respected views by both industry practitioners and academia.
- Solution to the mis-match between communities with different cultures, jargons, motivations etc, eg industry and academia.

#### **AIRTO members can**

- support in-company innovation champions by in-sourcing expertise and the required business model plus underpinning technology to increase productivity
- translate 'raw' knowledge into applied opportunity, understood by company management at all levels, and manage the integration process
- work with universities to develop an idea or competence into a business proposition which will attract 'second stage' funding and subsequent investment
- work with universities to optimise licensing and manage the contracting process
- audit organisations for under-exploited innovative assets and bring them to market
- manage 'problem solutions' into higher value-added products or services by leading and managing Faraday Partnerships.

#### **In addition AIRTO members have**

- sold many thousands of best-practice guides and training packs
- held hundreds of meetings around the UK promoting knowledge-transfer and the concept of innovation
- taken a lead in the management of successful Faraday Partnerships and encouraged 'knowledge-sharing' by forming a Faraday Interest Group
- managed customer relationship management (CRM) with over 30,000 clients globally
- provided websites which attract hundreds of thousands of users each month.

The role of the DTI is important. No government department can bring about increased innovation intensity other than by partnerships with industry.

Government's role is as a motivator by 'pump priming' funds provision. The DTI should focus influence and funds on the demand-side (manufacturing and service industry).

#### **The DTI Innovation Review should concentrate on**

- the drivers of innovation that impact on UK innovative performance, eg business models and relationships, markets, investments, science and technology, skills,

It was therefore open to the DTI to allow "one-to-one" research under Section 508. At the time the scheme for setting up research associations was introduced, it was envisaged that "one-to-one" research would be permitted. AIRTO argues the DTI should include "one-to-one" research in Section 508 and that this would give a more natural meaning to the words in that section.

Companies engaged exclusively in activities, which may be described as knowledge-transfer and which are non-profit distributing, should be exempt from taxation. Evidence of the activities undertaken and the non-profit distributing characteristic should be obtained from the annual accounts audit. Tax exemption should be given for a period of five years, subject to monitoring the audited annual accounts and statement of activities. Companies that share an element of profit with employees on an inclusive basis as part of their remuneration, but who do not distribute a dividend to shareholders, should be included in this category, eg Employee Benefit Trusts (EBTs).

AIRTO believes that the Act could be amended in 508(1) sub-paragraph (b) as follows:

"The Memorandum of Association or other similar instrument regulating the functions of the Association precludes the direct or indirect payment or transfer to any of its members of any of its income or property by way of dividend, gift division bonus or otherwise by way of profit; amounts paid by an Association to an Employee Benefit Trust, to be used solely for the purpose of making payments to employees of the company, shall not be deemed a direct or indirect payment for the purposes of this section."

SSAP13 does not specifically include as research and development the provision for the dissemination of knowledge to UK industry. AIRTO believes that scientific research could be defined as all activities which are included in SSAP13 and which contribute to transfer of scientific knowledge and R&D results to industry. Without such change the solution to Porter's findings will never be implemented.

## CONCLUSIONS

AIRTO Members contribute to growth in innovation intensity by the following:

- Independent and trusted networkers which undertake needs analysis with better access to other organisations, eg emerging sectors and universities around the globe.
- Objectivity and continuity in the face of supply chain changes and acting as a 'community memory' for knowledge to broker new relationships.

## EXECUTIVE SUMMARY AND RECOMMENDATIONS

Professor Michael Porter of Harvard has confirmed that a significant gap in per capita productivity exists between the UK and its leading competitors. Also, he has identified a lack of knowledge-transfer between UK Business Schools and management, particularly middle and supervisory management.

Concurrent with the Porter study, and at the instigation of the Secretary of State for Trade and Industry, the DTI is undertaking an Innovation Review. The DTI Innovation Review is comprehensive and aims to reduce the number and complexity of schemes being offered as support services to industry and to make the relationship between government and industry more effective.

AIRTO members welcome the DTI Innovation Review and the implementation by HM Treasury of the Lambert Review investigating university-to-business relationships. AIRTO members are concerned with the current government concentration on the creation of commercial enterprises by universities when an increase in innovation intensity is already successful in knowledge-transfer organisations and will have a bigger economic impact in the medium term. AIRTO holds the view that the greatest contribution which universities can make to innovation intensity is to produce high-calibre students with an orientation towards employment in industry. The real problem to be solved is stimulation of the demand-side and proper support to the knowledge-transfer and applied research function. It remains to be seen, whether the Innovation Review will address this obvious problem.

For the productivity gap to be closed, there is need to stimulate and to provide incentives for partnership between companies, intermediate companies and academia, focusing on knowledge-transfer to increase innovation intensity and stimulate growth in the UK economy. AIRTO welcomes the HM Treasury pre-budget statement (3.74) and the government's willingness to re-examine fiscal incentives to intermediate companies by way of tax relief. It is a move in the right direction, which will stimulate the economy. AIRTO suggests, the development of Faraday Partnerships makes another contribution to innovation intensity growth and should be led by industry.

The constitutional structure of an intermediate company is irrelevant compared to its function in promoting knowledge-transfer which leads to downstream growth. Thus, AIRTO argues that intermediate companies, which are non-profit distributing, those companies constituted as Employee Benefit Trusts (EBTs) or intermediate

companies which are profit distributing, should all receive full tax relief either by exemption or through a system of tax credits. This will stimulate growth in the economy and contribute to the downstream multiplier (evidence of which suggests it may be anything from ten to fifty times); thus achieving the dual objective of economic growth with an increase in tax-take by the Treasury. AIRTO has advocated independent investigation of this subject. AIRTO members recognise the potential benefits to be derived from the DTI Innovation Review and offer their services in co-operation with the DTI and HM Treasury to stimulate innovation intensity and economic growth. AIRTO recommends that government should implement support schemes which

- provide financial incentives and support to companies willing to enhance value-added products or services and give financial incentives to the demand-side for co-operation in partnerships with companies, academia and intermediate knowledge-transfer organisations
- offer financial incentives and support to partnerships between knowledge-transfer organisations and universities to exploit 'raw' knowledge by licensing or other application of research results
- increase financial support to the management of Faraday Partnerships as a bridge between industry and academia (globally)
- give incentives by tax exemption to organisations engaged in value-added knowledge transfer
- ensure the Secretary of State for Trade and Industry forms a new committee to determine the selection and establishment of Faraday Partnerships
- show accountability for Faraday Partnership use of public funds by annual report of the Partnership auditors to the Secretary of State for Trade and Industry
- legislate to make Faraday Partnerships' exempt from corporation tax
- arrange for Research Council funding for Faraday Partnerships to include funding for the Partnership management to analyse problems, present them to academia and translate back the results to industry
- aim at companies
- focus on incentives for collaboration between the players – companies, intermediates and universities
- reduce bureaucracy
- change a DTI policy of urging industry to do better with extensive bureaucratic mechanisms to that of providing simple financial incentives to companies to fulfil the aspirations described by Porter.

obvious conflict between this view of the DTI and the view of Porter on what constitutes innovation. AIRTO supports the Porter view, based on experience of the real world.

It seems strange that a different interpretation of scientific research is applied to Section 508 companies as compared to other parts of the Taxes Act. To this end, AIRTO draws attention to the Finance Act 2000, Schedule 19, headed "Meaning of research and development". In this section, a new definition was applied to Section 837a, 837b ICTA 1998 Scientific research and allowances were renamed research and development allowances in Sections 495, 82a, 82b and Schedule 18 ICTA 1988. Perhaps Section 508 was overlooked when these changes were made?

AIRTO believes that the definition of scientific research should be that used for the new R&D tax credit legislation being the same definition as that used in Section 837a of the Taxes Act 1988. In that an activity will qualify as R&D for tax purposes if it can be treated as R&D under normal accounting practice for companies in the UK (SSAP13) as qualified by the guidelines on the meaning of research and development for tax purposes which the Secretary of State for Trade and Industry uses.

Examples of activities that would normally be included in research and development are listed in paragraph 6 of SSAP13 A-G. Two other problems then remain as regards DTI Section 508 definitions. The first relates to "scientific research, which may lead to or facilitate an extension of any class or classes of trade". DTI have interpreted this as meaning that any research and development work carried out for single clients under a letter of confidentiality; giving that client some immediate initial commercial advantage will not be deemed to be expenditure that qualifies as scientific research for the purposes of Section 508. They have also applied this definition to Link programmes which involve more than one industrial client on the grounds that they also will obtain some form of commercial advantage by way of initial retention of intellectual property rights. This is illogical when the objective is to increase innovation intensity.

AIRTO believes, this is a fundamentally incorrect interpretation bearing in mind that commercial organisations will be unlikely to fund research and development projects without some form of intellectual property gain. This goes back to the issue of what drives innovation. AIRTO took Counsel's opinion on this point and felt that it would be impossible for the DTI to suggest that research for one customer or member never facilitated an extension of class or classes of trade. Counsel commented that there were plenty of examples of confidential ground breaking research for one company subsequently being used widely throughout an industry.

charities. The relief was granted annually, following application to the DTI (in no particular format). Obtaining the Secretary of State's approval to tax exemption was a relatively painless procedure.

In 1997 organisations were given notice of changes in the arrangements for granting approval under the Act which affected the eligibility of some to receive approval. Following lengthy and detailed negotiations by AIRTO with the DTI, new guidelines were introduced in 1998. A dispensation was granted by the Inland Revenue to allow those companies which had previously obtained Section 508 to continue under the old arrangements for all accounting periods, which began prior to 1 September 1999.

Intermediate companies use many mechanisms to achieve knowledge transfer to industry. Narrow definitions of "scientific research" for tax exemption purposes will inhibit the work of such companies.

Scientific research in this context should be defined as all activities which engage in, or contribute to, transfer of scientific knowledge and R&D results to industry. Industry beneficiaries should be defined as either single companies or multi-client groups of companies. Single client work often results in a changed pattern in an industry sector that stimulates uptake of innovation across the entire sector. An example of this was the work of one AIRTO member working with a car manufacturer to develop ABS braking. The technology moved rapidly to the whole automotive sector. This is often the means by which disruptive or breakthrough technologies are introduced.

In Section 508, sub-paragraph 3, scientific research means any activities in the fields of natural or applied science for the extension of knowledge. This has been interpreted by the DTI and its advisers as meaning that there must be a pushing back of the boundaries of what is known or application of what is known to new areas.

Thus, the Secretary of State takes the view that activities are likely to involve scientific research if they consist of

- a) the application of new scientific principles in an existing area of research or
  - b) the application of existing scientific principles in a new area of research.
- Those advising the Secretary of State do not regard the application of existing principles in existing areas as scientific research but rather as technological development. It is a nicety which ignores the need for change defined by Porter. Nor, in their view, does the definition include simply passing on the research of others, since this does not involve an extension of knowledge by pushing back the boundaries of what is known or applying what is known to new areas. There is an

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**AIRTO WORKING PARTY ON INNOVATION, KNOWLEDGE-TRANSFER  
AND FISCAL INCENTIVES**

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transfer to industry, and by so doing to increase innovation intensity and wealth creation in the UK economy. This will produce increased tax revenue for government and enable it to meet its social objectives. Fiscal policy must encourage growth of the intermediate knowledge-transfer sector. Success will be manifest as increased industry activity, which yields greater returns to government through corporate taxation. The challenge is to use tax relief to motivate growth in the economy by stimulation of both not-for-profit and profit distributing intermediate organisations.

**THE INTERMEDIATE SECTOR**

The intermediate sector has not been recognised as a wealth creation stimulator in fiscal policy by any recent UK government. In other European countries (eg Germany and Finland) the intermediate sector has been recognised and utilised. It has produced benefit through growth stimulation in industrial activity. The evidence is growth in GDP and R&D spend per capita (OECD Study).

The intermediate sector consists of companies with different constitutions. Some are non-profit distributing, some share profits with employees (Employee Benefit Trusts EBTs) and others are profit distributing to shareholders.

The tax status differences between these categories is incidental in the context of creating growth and nurturing downstream leverage. The downstream multiplier from intermediate companies to industry is anything from ten to fifty times the investment made in the intermediate company activity (evidence from TWI etc). However, the investment is not recoverable by the intermediate company. It goes to the government through tax. Thus the highest yield for tax revenue is from downstream corporate taxation. The higher the level of investment in the intermediate company, the higher will be the downstream tax revenue. This point has been recognised by R&D tax credits in UK fiscal policy but ignored as far as the knowledge-transfer multiplier downstream is concerned.

It is beneficial for government, and the implementation of progressive social policies, to stimulate intermediate companies. They will act also as a stimulant to industry for greater investment in R&D as well as for the take-up of university research results, both leading to increased wealth creation and innovation intensity.

For many years so-called 'scientific research associations' (SRAs) operated under the provisions of Section 508 of the Income and Corporation Taxes Act 1988 which gave exemptions from income and corporation tax equivalent to those available to

Public bodies (RDAs, Business Links etc) consume wealth. Wealth creation is the result of innovation in efficiency, productivity and new products; it yields competitiveness.

These facts demand focus of any Innovation Review to be on private sector companies and that which will stimulate demand-side investment in research and development. Published data indicates too much spend on research and insufficient on development (CEC COM (2003) 58 – The role of the universities in the Europe of Knowledge). Public funding support for development would raise the level of industry spend and increase 'intensity'. Innovation is not driven by academia or government. In general academia will not produce 'champions of industrial innovation'. The record of university spin-outs proves this claim.

Innovation is driven by 'champions'. They may be inside a company (for example – the marketing director who defines a new demand area) or the champion may be an entrepreneur (for example Michael Dell) or they may be a company which has a vested interest in managing change for the better (improved competitiveness) and is likely to be found in the 'knowledge-transfer universe'.

Innovation in a company requires integration of change with the existing business model (reporting procedures etc). 'Raw' knowledge from academic research must be translated into a 'problem-solution' compatible with on-going company performance. 'Disruptive technology', which changes the business model, must be managed comprehensively to include finance, marketing and production. It may involve creation of a subsidiary and possibly its disposal for asset gain in due course. Thus innovation must be understood to be complex. The management of innovation is in itself a skill, it is understood by knowledge-transfer intermediate companies.

## **THE MECHANISM TO MAKE THE MOST OF FISCAL INCENTIVES**

AIRTO welcomes the development of tax credits and their application to both large and small enterprises. However, the issue of providing incentives to intermediate companies needs to embrace tax credits, tax relief or tax exemption under clause 508. Loss of 508 status may prevent an AIRTO member being eligible for support from a Research Council – an outcome overlooked by the DTI. What follows is the AIRTO view on need for change implemented through a Finance Act.

The challenge is to stimulate greater innovation in industry. The task is to provide incentive to intermediate (knowledge-transfer) companies, dedicated to technology

## **INNOVATION, KNOWLEDGE-TRANSFER AND FISCAL INCENTIVES**

### **Introduction**

The Department of Trade and Industry (DTI) and the Economic and Social Research Council (ESRC) commissioned Professor Michael Porter to examine issues of productivity in the UK. This was the result of concern that UK productivity did not equal that of its leading competitors.

Porter reached conclusions which may be summarised as follows:

- There are legitimate concerns about UK competitiveness centred around the productivity gap with the US.
- Far reaching policy reforms over the last two decades have not eliminated the gap, and there is a search for explanations.
- The quality of British management has been identified as a potential problem, triggering a contentious discussion between business and government, in which each side blames the other.
- The previous point over-simplifies the UK's current position while not giving adequate recognition to the progress made.
- There is a growing need to move to a new constructive view on the future agenda of the UK; this agenda should be seen as a necessary transition to the next stage of economic strategy, not a failure of past strategy.
- The role of management cannot be separated from the overall competitiveness issues facing a country.
- Innovation is more than just scientific discovery.
- There are no low-tech industries, only low-tech firms.
- The UK has a lower share of managers with advanced formal education compared to peer countries.
- UK management schools are equal or better than European peers.
- Problems with management in the UK seem likely to be concentrated at the low and middle management levels.

The findings of Porter indicate that productivity and innovation are linked. Porter expresses the view that UK industry must move quickly to higher value-added products and that this will be achieved only by an increase in innovation.

Porter is careful to give a broad definition to innovation which embraces the creation of new enterprises as well as incremental development in a process system or business.

AIRTO has empathy with Porter's findings. Such findings pose questions. They are:

- Should the focus of government schemes be on companies (demand side) to achieve change in economic performance as opposed to the current concentration on academia?
- Which organisations are dedicated to assist companies in diagnostics and processes leading to higher value-added products?
- Where will be found the motivation and ideas to bring about change in middle management?
- Who are the players most likely to enhance the UK economy?
- What will stimulate synergy (infrastructure) between the players, leading to enhanced economic performance?

This paper sets out to provide some answers to the above questions. It proposes positive ways forward to close the productivity gap and encourage growth in innovation intensity in the UK.

#### **INDEPENDENT RESPONSE TO THE FINDINGS OF PORTER AND THE WAY FORWARD**

The ESRC has taken a commendable initiative in setting up AIM – the Advanced Institute for Management. This initiative is under the leadership of Professor Anne Huff. On 29 April 2003 AIM held a Management Research Forum which debated the findings of Porter and sought to develop proposals for the way forward. The major points reported from that Forum may be summarised as follows:

1. It is people and organisations that innovate, not sectors.
2. There is need to consider intra-firm issues as well as extra-firm issues when formulating policy. Much analysis has been carried out on extra-firm issues, thereby ignoring the role that intra-firm issues play in translating policy into action.
3. Evidence suggests, the UK can be described only as moderately innovative at best, both in terms of product and process innovation. Particular areas of concern include exploitation of technology and management process innovations.
4. There is widespread agreement that the UK cannot continue to compete on the basis of low cost; companies have to shift their focus to higher value products and processes through innovation.
5. There are numerous exemplars which illustrate how government interventions can be targeted to help economies to grow - Acer Computers in Taiwan, Nokia in Finland etc.

- Open awards by Research Councils to all – it has been suggested that LINK etc does this already but this is incorrect.
- Allocate, say 10%, of all Research Council funding to professionals to change the attitude of parents and students towards the study of SET; invest to change attitudes, as a long-term strategy.
- Give financial incentives to industry and commerce to engage in partnership with knowledge-transfer companies and universities for value-added knowledge transfer into companies.
- Give tax relief to knowledge-transfer companies and utilise the multiplier (10-50 times) downstream to increase the tax-take for social benefit.
- Make radical reform in the DTI Innovation Review to make more effective its leverage by focus on the demand side and the intermediate sector.

Knowledge-transfer companies do not seek subsidy from UK public funds. What they seek is a dynamic marketplace and 'level playing field' which supports competition. Focus on demand-side attitudes related to R & D is the priority. False distinctions concerning the size of companies should be avoided. While SMEs are important in the economy, they often operate as part of a supply chain. Such chains form part of what Porter has described as 'clustering'. Evidence exists from AIRTO surveys that demand in the home marketplace for value-added R & D and innovation is weak, thus stimulation of the demand side is essential.

The DTI Review should examine carefully present expenditure on support policies and refocus efforts on incentives to the demand side and address areas of high technology risk, leaving companies free to choose where they enter into partnerships for R & D services on a competitive basis (see Conclusions).

#### **THE NATURE OF INNOVATION**

The following are drivers of innovation. Porter's five forces, new regulations, the attitude of individual senior executives, disruptive technology implemented by a single player, fear of missing an opportunity and government fiscal policy. Many companies consider innovation to be the enhancement of an existing product or service. Few companies seek 'disruptive technology' (as defined by Hamel and Prahalad), because this is difficult to integrate with existing (profit sustaining) business processes. Yet there is need to encourage the use of new technology to increase higher value-added products or services.

Innovation is not a one-to-one (single university to single company) process, except in a few cases involving science-based sectors (pharmaceuticals), but even there the influence of the demand market (NHS) is overriding. Companies create wealth.

the performance of economies. The Internet would not exist if it had not been for the defence driver in the USA. Thus it may be concluded that state-aid, when properly used, provides leverage to economic performance. It follows that, if state-aid is at a low level, its use becomes critical in choice of application. Something which the DTI Review must address and turn into real action taking heed of industry responses, such as only 17% of SMEs using Business Links as reported in *The Times* of 5 August 2003.

The present policy of concentrating on universities as the main source of innovation and encouraging them to become traders by consultancy to the local community and creators of spin-out companies may result in irreversible adverse damage in the unique track record of UK universities in research. Nobody opposes enterprise in the academic community. The issue is: how it may be translated into value-added wealth creation? Recently the Cambridge Entrepreneurial Centre (CEC) opined (in the *Financial Times*) that the UK model with its focus on university spin-outs was different, and less successful, than that employed by leading academic centres in the USA.

The argument was that good ideas from academia require partnership with those familiar with the challenges of the commercial world. The fashion in the UK is to count the number of spin-outs but not their growth characteristics, let alone their characteristic of becoming a sector leader. Contrasting the UK academic spin-out companies with those listed in *The Times* as the fastest growing new companies demonstrates the difference. It suggests a need for change in emphasis and incentives which could be implemented through the DTI Innovation Review if out-of-date vested interests are overcome.

Reward-and-threat policies will not work with the academic community to bring about change in the national economy. If the solution were that easy, it would have been exploited years ago. The current administration is worthy of congratulation for giving more financial support to higher education. At a time when funds are limited, the Science Minister is entitled to acclamation for winning increased investment in higher education. However, that is not the issue in this paper. The issue to be addressed is, how to overcome the gap between academic knowledge and its value-added application to wealth creation in UK industry. That challenge has not yet been solved nor will it be solved, unless the role and incentives for a robust intermediate sector are recognised by those who can influence development of a 'British model' for wealth creation.

AIRTO suggests five actions which would make significant contribution to change for the better in the UK economy. They are as follows:

6. Factors which influence innovation can be conceptualised through an Innovation Dynamics Model, which consists of three inter-related components:

- intra-organisational dynamics covering strategy, culture, practices, skills, resources and incentives
- inter-organisational dynamics covering customers and market orientation, competitors, links, clusters, mergers and acquisitions
- environmental dynamics covering regulation and the business environment.

7. Policy recommendations can be made and must be implemented at each of these three different levels; although the communities that will have to enact them are different.

8. For government the focus should be at the 'environmental dynamics level' and the 'inter-organisational dynamics level'.

9. For managers the focus should be both at the 'inter-organisational dynamics level' and the 'intra-organisation dynamics level'.

10. There are also several areas where there is simply not enough consolidated evidence to make informed recommendation. The AIM Forum suggested areas that require further research including

- comparative data establishing the quality of UK managers against managers in other economies
- the best routes through which management education and development can impact on organisational performance
- how firms collaborate with universities, and the benefits that they derive from such associations
- the relative performance differentials of clusters
- the impact of stock market and fiscal policy – especially its impact on short-termism, the culture of acquisition and relative lack of innovation within UK firms
- the role that foreign direct investment plays in stimulating productivity and innovation
- national databases and studies that can be used to explore the most effective organisational practices.

AIM concludes that research has been conducted on some of these topics. A key question that remains is: why are more people not acting on what is known? This topic merits further research and will be the subject of a future AIM report. AIM sees

Porter as the starting point from which to gather more evidence on the drivers of innovation, knowledge-transfer and fiscal stimulation. AIRTO agrees with this response.

## **PLAYERS IN DEVELOPING INFRASTRUCTURE - THE DTI**

As part of the new vision and top-level objectives the DTI, together with the Treasury, is reviewing the contribution that improving the UK's relative innovation performance will make to closing the productivity gap. It is anticipated that the outcome of this will be a new forward looking and focused strategy for increasing innovation in the UK.

The Review, and resultant strategy, will encourage innovation in its widest sense with its focus on the successful exploitation of new ideas into new products, processes, services or business practices.

The Review is a key part of the two complementary business goals of performance and growth, which in turn will contribute to closing the productivity gap. The DTI Review is focused under the following topics.

**Customers:** intelligent and demanding customers among consumers, firms and the public sector put pressure on business to deliver better quality and value goods and services.

**Cash:** business needs sufficient finance to invest in exploitation and commercialisation of new knowledge.

**Capabilities:** the availability of relevant technological and scientific knowledge and business best practices from the science and engineering base, other businesses and international sources.

**Capacity:** motivation and ambition combined with the ability to absorb and use new knowledge and skills and the skills to implement change.

**Context:** a business-friendly environment, for example macro-economic stability, competition, regulation, standards and IPR.

AIRTO welcomes such a comprehensive study of that which drives innovation in the real market-place.

properly recognised in this infrastructure. It remains to be seen, whether the DTI Innovation Review and Lambert Review will remedy this obvious failure.

Every nation has a social model which describes its cultural drivers, its values. The challenge for the British is to define that model and encourage champions. An important element in the nation's cultural-business model will be its attitude towards, and support for, higher education and the means to achieve academic outputs as drivers of innovation in industry through the encouragement of partnerships by government.

## **THE NEED FOR ACCEPTANCE OF A BRITISH SOCIO-ECONOMIC MODEL**

AIRTO members are supporters of high quality and properly funded universities assisted by Research Councils nurturing fundamental research. University research should be fundamental in character, albeit in topic areas relevant to industry and commerce.

Such research involves risk and will not result always in positive success. Even when negative results emerge, they will add to the sum of knowledge of which the academic community must remain the guardian. University research (and thus Research Council support) should meet the following justification criteria:

- It must keep the UK at the 'high table' of knowledge creation; without such connectivity it will never be possible to create a knowledge-economy.
- It must extend the frontiers of knowledge, including the creation of 'disruptive technologies' which provide impetus for radical change in industry and commerce.
- Results must permeate teaching in higher education and produce graduates at the 'cutting edge' of their subject, thus invigorating the companies they join.

Following decline in the UK economy (relative to other world leaders) from its peak of wealth creation at the end of the industrial revolution, the challenge is to recognise that not all subjects in academic research can be treated equally, a topic similar to that referred to recently by Minister Charles Clarke. The contrast between the value of Research Council funding for universities (over £1.5 billion each year) and total state-aid (around 0.66 as a percentage of GDP) should be a focus for policy makers and industry leaders alike.

The fact that the UK is bottom of the state-aid list in the EU Member States in 2001 may be argued as a healthy withdrawal of government from industry. However, global history indicates that government is uniquely able to change for the better

## STIMULATION OF THE INTERMEDIATE SECTOR THROUGH FISCAL POLICY

To enhance university and business collaboration will mean focusing on stimulation of the intermediate (knowledge-transfer) sector, so that academic researchers may continue to do what they are best at – fundamental research; while at the same time industry continues with what it is best at – wealth creation. The need is for the two to be connected. By stimulating the intermediate sector, innovation intensity will be increased, which leads to wealth creation, which in turn leads to a higher tax yield for the UK economy, which provides the means to fund more fundamental research. Government incentives for universities ‘to trade’ may distort the market place. A ‘level playing field’ is needed if real infrastructure for knowledge-trading is to prosper, as demanded by the aspiration of a knowledge-economy and the Porter findings.

Fiscal policy (tax relief) can be a powerful motivating tool. Other infrastructural mechanisms are also valuable, such as Faraday Partnerships. Faraday initiatives will succeed only if managed by an organisation which understands industry problem solving – that will not normally be an academic institution. Infrastructure such as Faraday Partnerships must be aligned with a mission to develop specific sectors likely to generate wealth in the UK economy – both ‘old’ and ‘new’. Present processes of Faraday Partnership selection and approaches to their sustainability will need to change for the future. There is a tendency to use mechanisms such as Faraday Partnerships and the resources of the RDAs to increase investment in the academic community (supply-side) instead of increasing investment in the intermediate knowledge-transfer community and the demand-side. In the long term that is not beneficial either to the academic community or to productivity or to the wealth creation processes of UK industry.

Porter has pointed to the gap between the business school community and industry. Porter proves his point by drawing attention to a comparison between UK per capita productivity and that of the main competitors. He is not alone in this conclusion. AIRTO members concur with his findings based on their own experience. Porter develops his findings by arguing for transition from low value-added manufacturing to higher value-added products and services.

His findings give independent support to the hypothesis that increased application of science, engineering and technology is critical to the health of the UK economy and the only way to the fulfilment of a ‘knowledge-economy’. The issue is to determine the infrastructure needed for this purpose in the UK economy. Faraday Partnerships and intermediate knowledge-transfer organisations have not been

## FARADAY PARTNERSHIPS AND THE UK ECONOMY

The Faraday Partnership is a model for knowledge-transfer superior to other models used in the EU. There is a danger that Faraday Partnerships will be distorted from the original concept envisaged by (Sir) Dr Alan Rudge when Chairman of EPSRC and Dr Bob Whelan when Director of CEST.

Rudge and Whelan recognised the need to bridge the different drivers of knowledge-transfer found in industry and academia.

When industry management implements the Porter proposal for higher value-added products or services, those concerned think in terms of performance criteria and the problems to be overcome in their attainment. Thus industry is primarily problem and performance orientated.

Academia is driven by intellectual challenge. This challenge is motivated by the need to extend fundamental knowledge using vigorous investigation supported by evidence. Often there will not be a specific end objective other than acclamation and a published paper. It is essential that academia retain this freedom to think the unthinkable. Thus academia is intellectual challenge orientated.

Both the above orientations are valid and proper for the two separate communities. They will converge or diverge according to the characteristics of the industry sector and the inclination of individual researchers.

The issue to achieve economic growth is to find a means to connect the two communities. The act of connection is a skill in its own right. Also there must be a caveat. The term ‘academia’ need not mean only UK academics. To serve the company of the future and to utilise modern communications, connection must be made with global academic sources.

When Rudge and Whelan described Faraday Partnerships as a bridge, there was recognition that the management of a Partnership required ‘intellectual’ distance from those engaged with industry (application driven) and academia (intellectual challenge driven). This suggests, a Faraday Partnership should be managed by an ‘intermediate’ company (which may or may not be a member of AIRTO).

The above conclusion leads to the need to define an ‘intermediate’ company. Such a company is any organisation of which the business purpose is knowledge-transfer and which is independent to trade with any company or deal with any academic institution in rendering knowledge-transfer services. These services may take the

form of applied or contract research, multi-client research, techno-business consultancy, training or the provision of information. Also, an intermediate company may be an investor in new technology, an incubation and spin-out agent or an early-stage funder of a new business enterprise. An intermediate company may be a wholly owned subsidiary of a manufacturing or service company. It may be non-profit distributing and collectively owned or it may be a quoted company which is profit distributing.

Having defined an intermediate company suitable to run a Faraday Partnership, the next issues concern the selection, funding and accountability of Faraday Partnerships as a significant entity in the UK infrastructure. The claim that Faraday is a superior model to others in the EU is based on its flexibility, modus operandi in the Partnership being driven by the private sector and its need to survive by being market responsive.

The management of a Faraday Partnership must be independent from vested interests of a university or a particular company. The influence of government or the Research Councils should not dominate selection and choice of programmes. To understand the unintended public sector influences, it is necessary to trace the development of Scientific Research Associations (SRAs). These were introduced by an excellent government initiative over the period between 1900 to around 1950. They were intended to transform craft practices into technology. This they achieved. Government support was financial with matching funds to those invested collectively by industry. The forerunner of the DTI simply had representation on SRA councils or committees. Industry members selected the research. Later the DTI introduced a project-based system, culminating in Requirements Boards which distorted research selection towards 'far from the market' topics contrary to the needs of industry. Finally, government terminated financial support to multi-client research. A similar trend may now emerge in relation to Faraday Partnerships. There is a real danger that this excellent initiative may be unduly influenced by government and Research Councils instead of the creators of wealth – industry; or be pushed into a predominately private sector funded role which will reduce their focus on market failures which they were intended to help correct. The solution is obvious if the DTI Innovation Review is as radical as claimed by the Secretary of State.

In relation to Faraday Partnerships, the role of the DTI and Research Councils should be as funding surrogates for the tax-payer, from whence they gain their monies. Faraday Partnerships should be directly accountable in use of public funds only to the Secretary of State for Trade and Industry. The Minister should appoint

Failure to reflect business requirements in academic research is illustrated by the results of a study undertaken recently through the Institute of Grocery Distribution (IGD) with support from AIRTO. Among its conclusions, this study found distortion in research due to lack of business influence. UK food and drink manufacturing contributes twice the GDP of farming but enjoys only 12% of the agrifood R & D spend. The Research Councils spend on agrifood and agricultural R & D in the year 2002 was £115 million. This compared in the same year to R & D in food from the Research Councils of only £17 million. This IGD research shows that drift may occur unconsciously through Research Council and peer review allocations influenced by academics, which fail to reflect industrial needs and potential value-added wealth creation (Porter).

Professor Porter's work on UK competitiveness states that UK business schools compare well with their counterparts in other competitive countries. At the same time Porter draws attention to the low productivity per capita in the UK.

This suggests either that higher education is irrelevant to business or that it lacks connectivity with wealth creating business and commerce. Evidence of this gap between the UK academic community and business leadership has been produced by the Chartered Institute of Marketing (CIM) study published through *The Times* Small Business Network reporting that business has little awareness of academic research in such practical spheres as marketing.

The above observations should not be interpreted as negative in relation to the UK academic community. The intention is to demonstrate the lack of connectivity between the UK academic community and the UK business community. It suggests the need for a vigorous intermediate sector concerned with the translation of knowledge from the academic community to business and vice-versa. This reciprocity is difficult to achieve, particularly if no infrastructure incentive is provided by government. A situation which exists in the UK and one which the DTI Innovation Review and the Lambert Review must address.

The output from the academic community will be 'raw research'. This will not translate readily into industrial practice except in a minority of sectors that are science-based, such as pharmaceuticals. In all other sectors there will be need to define industrial problems and then re-define those problems as challenges for intellectual solutions generated by the academic community. Synergising these two communities is central to the stimulation of innovation and wealth creation in the UK. This leads to discussion of how an intermediate sector may be engaged to play a role in the solution of this problem.

## **AIRTO VIEWS ON THE PURPOSE OF A UNIVERSITY**

The primary purpose of a university is education. Through this function the university makes a unique contribution to culture and business attitudes. At its best the university provides well-trained individuals who enter, and constantly revitalise, industry and commerce. This is the greatest and most important contribution of academia to innovation in business. Compared to this purpose – the production of well-educated graduates – business to university collaboration is secondary. Universities' activities range over a wide spectrum from education through 'blue-sky' research to industry collaboration. It is the policy towards the latter which AIRTO considers as flawed. Undergraduate education and curiosity-driven research are proper activities of a university. The influence of business on universities (and their programmes) is vital but often not fulfilled by business leaders and not accepted by universities. There is need for policy change in the national interest.

## **ACADEMIC RESEARCH AND ITS JUSTIFICATION**

The academic community receive in excess of £1.5 billion of taxpayers' money each year through allocation from Research Councils.

In addition, infrastructure funding to support research is provided from other public sources. This gifting of public funds to universities has two justifications, which are:

- a unique means to extend the frontiers of knowledge (fundamental research);
- the resulting inputs to the teaching knowledge-store, to ensure high quality and 'cutting edge' teaching content for undergraduates and post-graduates.

Extending the frontiers of knowledge cannot be 'time-bounded'. There are examples of research undertaken many years ago but only drawn upon recently by industry, eg, fundamental work leading to desktop ink jet printing.

It is proper to question the quality of academic research and to seek to direct it into the most likely areas of relevance for societal good and wealth creation. The Quinquennial Review of the Research Councils supported this viewpoint.

Thus Research Councils should interpret their role as critical purchasers of research, taking account of industry views likely to influence positively the social fabric and wealth creation of the UK economy. To achieve this objective, a better balance with industry inputs is needed in the structure of Research Councils and in their approach to selection of research most appropriate to the needs of the UK economy. A similar better balance is needed in the peer review process.

a new Faraday Partnerships Panel. It should comprise 51% industry CEOs or CTOs (possibly drawn from the FTSE 100) with the remaining representation composed of 25% from intermediate company CEOs and the remaining 24% divided between the DTI and the participating Research Councils.

Faraday Partnerships could be constituted as limited liability companies without share capital or as subsidiaries of the managing agent, where that agent meets the criteria needed to define it as an intermediate company.

Initially the funding of Faraday Partnerships and their research should be provided through the DTI and the Research Councils. The DTI should fund the management costs for up to a period of fifteen years with these costs passing progressively to the industries' sponsors, whereby they would become the funding source of this element of cost. Research projects emanating from Faraday Partnerships, and appropriate to the UK academic community, should be funded by the Research Councils. This funding should include monies for the Faraday Partnership management to analyse the industry need, formulate the research proposal for academia and translate the results back to industry. Where the Faraday Partnership research project proposal is not appropriate for UK academia, it should be 50% funded by the DTI and 50% funded by industry sponsors. Faraday Partnerships should be exempt from taxation. Accountability for their activities should be against criteria agreed with the Secretary of State for Trade and Industry and monitored annually by the organisation's auditors reporting independently to the Secretary of State for Trade and Industry.

## TOWARDS AN ACTION PLAN

The DTI Innovation Review has sought to facilitate new ideas and approaches for government and the provision of infrastructure. There are six areas, which have been examined in detail:

**Technology** – A strategic approach to help develop UK firms, diffuse and exploit new technologies. Examination of the potential to exploit better the knowledge generated by a world-class science base and the relevant scientific knowledge from around the world. Future prosperity will depend on the ability of firms to combine developments in science and technology with changes in business methods to generate new products, processes, services and systems which sell profitably in world markets. This will include promoting higher added-value business activity by working more effectively with Research Councils and businesses to develop and exploit technologies emerging from the interfaces between technologies and between the science and engineering base and business.

**Skills** – Development of demand-focused skills policies, to redress the current mismatch in supply and demand. There is evidence to suggest that the UK does not recognise, to the same extent as our competitors, the need to invest in the requisite skills. A collaborative approach is needed with business, to raise management capability in implementing innovation and invest in the relevant skills.

**International** – There is a relationship between competing internationally and innovation, whereby companies are probably more innovative because they compete within a global market containing more demanding customers. Increased inward investment to bring higher value-added businesses and jobs, and achieving greater benefit to UK businesses from European research programmes are issues to be addressed.

**Regional Innovation** – The need for greater clarity and coherence between national innovation and regional economic strategies. A balance is needed between national and regional activities to promote innovation.

**Regulations** – Outcome-focused regulation can promote innovation. Ways to work more effectively with Regulators, business and others to ensure that regulations, standards, the National Measurement System and the IPR system do more to drive and facilitate innovation.

**Other Government Departments** – Public procurement has the potential to be a significant driver of innovation.

On 17 July 2003 the Secretary of State for Trade and Industry made a statement in the House of Commons on the strategic question of DTI business support. She stated:

‘The DTI invests around £1 billion a year in supporting businesses – of that something between £400-500 million is spent on business support schemes. Our aim is to use this money in a way that ensures the best possible return on that investment for the UK and makes a real difference to business performance.

Excellent progress has been achieved in the radical restructuring of the DTI’s business support to create products that promote enterprise and innovation and meet customer needs for a streamlined range of products that are easy to access.

As a result of the Review, we are reducing the number of schemes from over a hundred to around ten. These new products are broader, more flexible and better targeted at the needs of our business customers than those they replace. We are carefully planning a transition from the old schemes to the new products.’

The DTI-led review of innovation is producing good results. AIRTO members applaud this progress. It remains to be seen, whether the outcome of this review does produce a radically changed policy. AIRTO suggests that policy will need to

- focus on companies
- focus on incentives for collaboration between the players – companies, intermediates and universities
- reduce bureaucracy
- change a DTI policy of urging industry to do better with extensive bureaucratic mechanisms to that of providing simple financial incentives to companies to fulfil the aspirations described by Porter.

## THE ROLE OF UNIVERSITIES AND THE LAMBERT REVIEW

AIRTO members are at the centre of business-university collaboration. Many senior executives in AIRTO are Visiting Professors in universities and some sit on strategic advisory committees and Research Council policy making Panels. They are well-informed about business and university collaboration.

Some AIRTO executives are engaged in the policy to encourage spin-out or licensing from academia which provides them with experience in the contribution of academia to the growth of innovation intensity in UK industry. Thus the AIRTO community is able to speak with authority on these matters and has provided inputs to the Lambert Review. Whether those conducting the Lambert Review take note of these inputs remains an open question.