

# airto

Association of Independent  
Research & Technology Organisations

## **Summary of AIRTO Recommendations for a Science and Innovation Policy**

AIRTO Paper 2000/1

June 2000

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recommendations for a  
Science and Innovation Policy

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## EXECUTIVE SUMMARY

- Shift policy from incentives for knowledge creation and dissemination to those for demand driven uptake, by increasing the latter; and stimulate value-added knowledge trading in the private sector.
- Complement support to the academic science base as a provider of knowledge for innovation with a focus on motivating the demand side. Broaden policy for public funding support to include all organisations which contribute to knowledge creation and knowledge transfer, recognising that universities must fulfil their other innovation role – which is to provide a stream of well-educated people motivated by a desire for wealth creation from technology.
- Introduce fiscal policies whereby benefit is derived by those investing in innovation. Ensure a “level playing field” for all concerned, including equal tax treatment and equal access to resources, funding and support schemes.
- Make a central pillar of innovation policy the creation of a vigorous private sector encouraging innovators to form new high growth technology companies
- Provide financial initiatives which contribute to risk reduction in innovation and stimulate higher innovation intensity.
- Support several competitive early stage investment funds aimed at filling the current venture capital market gap and provide fiscal incentives to this element of the knowledge transfer sector.
- Ensure Foresight is used to identify key issues which set the agenda for academic research; ensure connectivity between government departments, EC policy and the private sector to produce critical mass initiatives which generate real change in innovation intensity by better co-ordination and focus.
- Enhance support to industry partners in Faraday Partnerships as a means of stimulating growth of new supply chains and the flow of more appropriately trained graduates; adopt as a target the matching of public funding to industry partners with that provided to the Fraunhofer Gesellschaft.
- Change the Research Assessment Exercise (RAE) to emphasise accountability in HEIs for transfer of academic research output to teaching, thus raising the quality of people-output from universities; shift emphasis in research and teaching to inculcating attitudes in graduates that support industry needs and wealth creation with social benefits.
- Pursue a mid-term policy (five years) of support for a networked infrastructure of ICT based knowledge management and knowledge dissemination (the national knowledge pool), aimed at a long-term self-sustaining and profitable knowledge-trading activity in the private sector.

- Provide incentives for academics in universities to be seconded to industry (for periods of two years) as a means of knowledge transfer and culture changing; reward such academics on return to the university by promotion and salary enhancement.

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## **Summary of AIRTO Recommendations for a Science and Innovation Policy**

### **1) Background**

AIRTO has contributed to the DTI review of Science and Innovation Policy. The policy is moving in a direction to which AIRTO is sympathetic.

AIRTO agrees strongly with the key concern over the low priority given by UK industry to innovation and the evident low innovation intensity across the majority of industry sectors.

The DTI has identified five challenges for government in its quest to increase innovation activity. AIRTO acknowledges and supports the importance of these five areas in the government's thinking but suggests a wider ranging approach to stimulating innovation in industry, commerce and the public sector.

The analysis and recommendations presented by the DTI place too much emphasis on university research, instead of focusing on the measures required to solve the demand problem in industry. The focus should be on the causes of market failure and the role of government in contributing to a solution. It should concentrate on value-adding partnership between the public science base and private sector knowledge-transfer drivers. It is unsound thinking to suppose that stimulating the science-base in universities to act as knowledge traders, will address the deficit in innovation in UK industry; nor will it provide new enterprises which are often the regenerative business feedstock required by large companies through acquisitions.

AIRTO agrees with the DTI analysis that there is a need for more innovation intensity in UK industry and better exploitation of science, engineering and technology to form innovative companies. However there is an increasing need to create infrastructure able to draw on the global academic science base, particularly in building supply chain leaders. Knowledge management for enterprise must be global.

We concur with the DTI analysis that there is a gap in venture capital provision for early stage technology start-up businesses. This is the reason for AIRTO members creating E-SYNERGY LIMITED.

It is to be expected in the future that the most able technically qualified people will be less motivated by working as employees of large organisations and will be more motivated by working in small growing organisations in which they can have an ownership stake. The flow of talented people away from large and/or public sector organisations is likely to increase. Thus the gap in the venture capital market will become more important as a limiting factor for

national growth than in the past. This is where an increase in innovation intensity could have large-scale impact in the long term.

Large industrial organisations have resources but also a tendency towards enterprise inertia. They need to be fed by small innovative companies both as suppliers and as a source for acquisition. A focus on small high technology companies able to grow quickly is likely to be most effective, if the right approach can be found. SMEs are an essential part of every dynamic supply chain as are large supply chain leaders. A major failure in the UK economy is the lack of transition from SME to supply chain leader.

The market failure of venture capital in the investment range £50k - £1.5M is seen as partly due to the approach and resources available to it and partly due to the investors desires to maximise return and reduce risk. At the early stage, before there is an established revenue earning business, conventional diligence is expensive and market and technology knowledge is crucial to success of the enterprise. Risk can be reduced with improved knowledge. Rate of return can be increased with appropriate financial management and business support. This is where new thinking is needed.

This new thinking will not be addressed by universities. There is an intrinsic conflict of interest between the university mission to produce well-qualified people and published academic research using public money and the high growth company mission which exploits unpublished or confidential technological developments for commercial gain. Both competences are legitimate but different.

Without a broader perspective that is less concentrated on the university role, and more cognisant of the barriers to innovation in industry, the DTI policy review will have little impact on change or enhanced economic performance. In this document AIRTO therefore advocates a broadening of the policy review.

## **2) Observations on the DTI “Government challenges” for Science and Innovation Policy**

The key issue is the low priority given by UK industry to innovation and the evident low innovation intensity in the UK. The short-term high return on capital sought by shareholders and investors is a factor in this problem. However the greatest impediment to raising innovation intensity is early-stage funding coupled with support to developing the business proposal and the attendant resource support. That is not normally the business domain of venture capital.

Many companies focus on acquisition and disposal to energise themselves, rather than by concentrating on an organic innovation strategy. This may be aggravated by related cultural and fiscal problems. It is only by examining the impact of these two factors – industry culture and the fiscal environment – that progress towards solutions are likely to be identified.

### **3) Dealing with risk in industry**

Large organisations, including government, seek increasingly to divest themselves of risk, preferring to pass risk to their suppliers. Smaller supplier companies find it progressively more difficult to absorb higher levels of risk. This in itself reduces profit margins and deters innovation in SMEs particularly those in high technology supply chains trading in the global market. A culture of partnership must be developed. It requires the services of third parties – such as knowledge transfer companies.

With few exceptions, SMEs engaged in supply chains have always found difficulty in funding R&D. This includes finding the means to upgrade their innovative competences. The DTI policy change, which ended incentives to multi-client research and knowledge transfer, has weakened innovation intensity in UK SMEs.

AIRTO members have a track record as agents for knowledge transfer into industry. The evidence is clear. The combined turnover of AIRTO members, with minimal public funding, is in the region of £1 billion per annum. The Director of Research Councils in a recent lecture to the R&D Society lamented the fact that by contrast the income from IPR knowledge transfer from UK universities was in the region of £150 million per annum.

Evidence of the contribution which AIRTO members can make to technology translation is given in the DTI Assessment Paper Number 32 “DTI Funded Research Projects at Research and Technology Organisations, Evaluation Report” from the Assessment Unit TS Directorate May 1997. That report states the following.

“Co-operative projects were often speculative and benefited the whole membership of the RTO, collaborative research enabled companies to participate in R&D where they would not have been able to do otherwise. It is unfortunate that this type of funding has ceased. RTOs are geared to running collaborative projects, they have built up a knowledge of collaborators who are well aware of the work done and its commercial potential. This knowledge will probably not now be exploited to its full potential. Co-operative research to take products to market usually originated from the RTO membership. This could be seriously hindered without government acknowledged support for programmes of research.”



There is a need therefore to re-examine policy with a view to providing greater demand side incentives for SMEs, particularly in supply chains which need to engage in collective R&D and knowledge transfer.

There are other factors to be taken into account. A result of the policy of passing on risk means large organisations are reducing their commitment to research. This is particularly true of indigenous UK organisations, which means they are progressively losing their position as supply chain leaders. Present government policies which place pressure on universities to generate trading income encourages large companies to outsource their research to universities. In part, this becomes a cost reduction exercise. This reduces the level of active industry involvement in research and downgrades high quality curiosity driven research in the universities. Present policies are actually weakening both the incentive for companies to retain their own capacity for research and for universities to pursue curiosity driven, but relevant, fundamental research.

These aspects of industrial strategy are not dealt with in present consultation on Science and Innovation Policy. It is this aspect of strategy that creates barriers to innovation. It will be essential to examine fully the drivers conditioning the behaviour of firms in the global marketplace. From such examination may be deduced incentives to counteract the failure of the market to stimulate sufficient product and process innovation in industry. AIRTO is engaged already in such investigative work in collaboration with ESRC. Partnership with DTI to advance this work more quickly would be welcome and could benefit all concerned.

The innovation problem hinges around the risk/reward ratio associated with innovation. At present there is failure in the total system which inhibits R&D investment both in large enterprises and in SMEs.

To increase innovation intensity it will be necessary to take steps to reduce risk and reach a situation where longer-term returns justify investment. A number of factors serve to reduce risk. These include the availability of large buyers for innovation-based products and services. For example, the government customer presence associated with defence and health. This relationship correlates well with the innovation intensive aerospace, defence and pharmaceuticals industries. In these industries the UK has both strong government presence and supply chain leaders which influence innovation intensity significantly. The result is UK dominance and successful economic performance in these areas.

Sir Alec Broers has drawn attention to another aspect of this issue. He has highlighted the fact that innovation in other sectors fails to lead to the development of UK supply chain leaders. It is clear that working with a supplier which is world leading company helps to nurture innovation. The problem is that there are few large indigenous UK supply chain

leaders in many important sectors. Measures to encourage the presence and development of such companies in the UK should have high priority, albeit the process will require long-term measures and continuity of policy. An immediate start could be made if the Prime Minister authorised the DTI to audit and hold accountable all Departments of government to use procurement as a demonstrable means to support innovation and supply chain leaders. This would be simply following a policy pursued by competitive governments.

Innovation policy needs to take account of what more can be done to reduce risk and make investment more attractive. Technology risk can be reduced by partnership with people having a track record of understanding of science, engineering and technology. Measures to facilitate access to, and interaction with, experienced knowledge application practitioners will provide a significant impetus to innovation intensity. Nurturing such partnership and support infrastructure must be central to a revision of Science and Innovation Policy.

Public support targeted at the demand side, towards SMEs in particular, to provide incentives for collective R&D and techno-business consultancy at affordable rates would contribute to solving the challenge of increasing innovation intensity by

- reducing development risk
- contributing to the establishment of a market for knowledge transfer
- establishing a range of competitive SME suppliers with enthusiasm for innovation in supply chains engaged in global trading.

#### **4) The Universities**

The negative UK cultural attitude to innovation referred to earlier, will need a long-term solution. It is where the science base should make its greatest contribution to enhancing innovation intensity. Universities represent a massive investment of tax payers funds. They must focus on producing people with new attitudes and new skills. Value for money from universities will not be achieved by giving them incentives to become trading enterprises (Out-Reach, University Challenge etc.). The value of direct exploitation and knowledge trading by universities is minuscule compared to their cost and to their potential contribution in terms of producing high quality and appropriately motivated graduates.

Science base policy should be reviewed radically. Science base policy should be focused on the quality of university primary output – the graduates. That quality should be subjected to new measures. The measures should relate to graduate competences, their relevance to the needs of industry, and developing positive attitudes towards the challenges of enterprise and innovation in industry and commerce. When they reach industry, graduates must apply their intellectual skills to the problems of industry. It is not the function of universities to develop

trading activities that seek directly to solve the problems of industry. They are not equipped for this. Student exposure to radical thought processes in fundamental research, albeit in relevant areas, should be at the forefront of universities purpose.

Public expenditure on research in universities should be re-appraised. It should be made more accountable against specific criteria, including Foresight priorities, but more particularly based on graduate quality. Upgrading the role of teaching to produce better graduate output is essential. Low quality academic research is not relevant to the needs of industry and does not contribute fundamental new knowledge. It contributes little to the enhancement of teaching quality and the quality of graduate output. Public funding is not justified in support of such activity when one considers the many other demands on taxpayers investment funds.

An important aspect of innovation is the flow of talented people into industry and commerce. AIRTO supports the views on this subject of Sir Alan Rudge CBE FRS and Dr Bruce Smith CBE. Both have advocated support for directed fundamental research in universities. They have advocated policy initiatives in the transfer of people as a contribution to solving innovation problems. Mobility of people between organisations, as an aid to knowledge transfer, is essential. The Teaching Company Scheme (TCS) makes a contribution but it addresses only one facet of the problem. Present schemes which seek to involve industry incur considerable cost and risk for the donor organisation. This acts as a deterrent. This is a policy area in which review is required.

At present success criteria in academic research depend on the RAE. It must be changed. Incentive is needed for academics to be seconded to industry for periods of up to two years. This would transfer knowledge “by people” and change the academic culture. The cost should be carried by the university but rewarded by a new approach to RAE and the winning of additional public funding from Research Councils etc. Academics who undertake industry secondment must be given priority for promotion on return to academia. That would be to reverse the present culture.

## **5) Measures to stimulate innovation**

A tendency which runs through present government policy is the inclination to introduce “promotional schemes” to solve the innovation problem. Awards can motivate companies to change behaviour, but the benefits diminish over time. Evidence based assessment of the marketplace suggests an alternative way to stimulate change. The model is that of the sector leader or sector maverick.

There is no more powerful influence on other players in an industry sector than the successful maverick exemplar. A successful exemplar based on innovation forces all players

to reconsider their position and practices. This implies change for government policy as the agent of public leverage. It suggests abandonment of “promotional” change management and its replacement via competitive bids which support private sector enterprises willing to adopt innovative business activity. Support to such enterprises, linked to Faraday Partnerships and to a knowledge transfer trading sector would produce step-change in the UK marketplace. A more creative policy approach is needed from the executive branch of government. Dealing with trade sectors will not stimulate enterprise. Encouraging an infrastructure for entrepreneurs will change the economy.

Faraday Partnerships remain an excellent concept. They could contribute more to increased innovation intensity by a public policy which rewards “connectivity” as a Faraday mission. The original Faraday concept was one of partnership between the academic community and industry, with industry setting the agenda. Aspirations for these Partnerships will be fulfilled only if incentives are provided for industry to set the pace and direction. The recent change in DTI policy should be encouraged but it should provide increased financial incentives for the industry Partners. Market failure – which is manifest – requires short-term but significant intervention to change attitudes and practice.

The argument that backing “change exemplars” means selecting winners can be overcome by an independent competitive challenge award system. AIRTO would be willing to contribute to the outsourcing of such a change programme.

In summary, innovation is not an abstract concept of linear knowledge transfer focused around the university science base. It is a practical activity which must be embedded in all organisations. It must be underpinned by a positive culture towards change and risk. Innovation policy must take an holistic view of the subject and the company business objectives. Managing innovation is a complex skill and requires an holistic public policy.

## **6) Focusing on early stage investments: public - private partnerships and the need for comprehensive management support**

An essential driver to innovation intensity is to maximise UK creativity and turn it into profitable business enterprise. Ideas come from a wide spectrum of inputs. There are many employees with excellent innovative ideas, but who have no route to implementation. Research and technology organisations produce novel ideas but have not developed resources for investment capital. Individuals in the science base have novel ideas but are often unmotivated to collaborate with their own university or with venture capitalists.

The DTI has recognised this problem through its commissioning of Westport Private Equity to manage the DTI UK High Technology Fund. This approach is to be welcomed but it must not

be the exclusive involvement of the DTI in early stage support. There are two reasons why this commitment must be extended. In the first place Westport Private Equity will benefit by having competition. Second the AIRTO community can provide a comprehensive network of support to early stage development which is wider in coverage and greater in depth than any venture capital managing agent is able to provide. The willingness of the DTI to be an investor in a number of such funds is an excellent initiative. It should be developed. It should be linked to similar EC initiatives.

The growth of small technology companies in the UK can be increased only by active involvement of investors and participation at board level in the formulation of strategy that will manage the development culture. An initiative has been made by an AIRTO member consortium to develop a new style venture capital fund especially for the purpose of enhancing the growth rates of small science, engineering and technology based businesses.

## **7) The new consortium of AIRTO members**

Drawing on the experience and supply chain networks of AIRTO members, E-SYNERGY Limited has been formed. It plans to focus on investing in, and supporting, the growth of small innovative companies where technology is an important part of their business objective. It is planned to put together a fund of around £50 million for investment in small technology based businesses in Britain.

E-SYNERGY Limited will include not just the fashionable Internet activities but any area of industry where growth can be achieved with new technology. It will not be restricted to a single geographic location but will build synergistic relationships on a national basis. It will develop professional processes a) to improve the efficiency of effective investment decisions and b) to enhance the growth rate of small technology based companies and encourage a culture of effective R&D. The aim is to use the network of independent research and technology organisations to complement the provisions of the venture capital industry and of Business Angel networks.

The management company will include established venture capital partners who will then be able to take on later stage investment once the ventures are established. An investment and support methodology is being developed specially for large numbers of early stage technology proposals. Discussions have taken place with representatives from the venture capital industry as well as the banking community, E-SYNERGY Limited has been welcomed with enthusiasm. E-SYNERGY will have characteristics not available from other initiative. Some of these characteristics are as follows.

- A management board composed of CEOs with an established track record of managing technology for profit.
- Unique links with the investment community which bridges the technology - to - investment gap.
- The resources to draft-in additional management skills whenever required from the AIRTO community.
- Unique experience and skills in linking public funds to early stage development in a continuum to other investment funds and subsequent onward financial growth.
- A unique reputation as a trusted partner community willing to provide partnership support and longer term investment.
- Through the AIRTO network, a wide range of marketing contacts and marketing intelligence.
- Through the AIRTO network, a wide range of incubator facilities combined with project and financial management skills.
- Connectivity to additional research and development skills in the AIRTO community or the university network.

E-SYNERGY is a unique initiative by the private sector. It seeks no special privileges or arrangements with the DTI. However, as the DTI has acknowledged the need for high technology funds, the Department is now invited to invest in the E-SYNERGY fund to assist in its initial development, following the precedent reported for Westport. It is also invited to pilot an appropriate grant scheme tied to investment in SME growth that would be open to all. AIRTO and E-SYNERGY would be willing to help develop such a scheme.

## **Description of AIRTO**

AIRTO is a network of the United Kingdom's independent research and technology organisations 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.

With some fifty member companies having between them a total turnover approaching £1 billion, AIRTO embraces a major portion of the growing industrial R&D effort of the UK. Members' activities span a wide range of disciplines from life sciences to engineering. Their work includes consultancy, managed fundamental 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 are listed below.**

- 99/1 Encouraging people to collaborate to compete: Proposal for implementation of a Competitiveness White Paper vision – AIRTO VIRTUAL
- 98/1 The PTP Scheme Achievements, lessons and recommendation for its continuation
- 97/2 The role of the RTOs in cross sectoral technology transfer: building on the success of The Carrier Technology Programme
- 97/1 AIRTO contributions to Foresight, training and education and knowledge-transfer as presented to Mr John Battle, MP, Minister for Industry and Energy on 12 June 1997
- 96/3 Case for the continuation of the first five PTPs
- 96/2 Trading with SMEs: Improving their competitiveness
- 96/1 The role of the European Commission in funding research and technological development
- 95/4 A challenge-led approach to wealth creation and quality of life
- 95/3 The Faraday concept – the way ahead

## List of Members

Advanced Manufacturing Technology Research Institute	AMTRI
Aircraft Research Association Ltd	ARA
The British Glass Manufacturers' Confederation	British Glass
BHR Group Ltd	BHR
BLC Leather Technology Centre	BLC
British Maritime Technology Ltd	BMT
Building Research Establishment	BRE
Brewing Research International	BRI
The Building Services Research & Information Association	BSRIA
British Textile Technology Group	BTTG
Campden & Chorleywood Food Research Association	CCFRA
British Ceramic Research Ltd	CERAM
Construction Industry Research & Information Association	CIRIA
The Central Laboratory of the Research Councils	CLRC
CRL – The Innovation Centre	CRL
Cambridge Refrigeration Technology	CRT
EA Technology Ltd	EA
ERA Technology Ltd	ERA
FIRA International Ltd	FIRA
HR Wallingford Group Ltd	HR
Inspectorate plc	Inspectorate
Leatherhead Food Research Association	LFRA
LGC	LGC
Materials Engineering Research Laboratory Ltd	MERL
The Motor Industry Research Association	MIRA
Mineral Industry Research Organisation	MIRO
The Motor Insurance Repair Research Centre	MIRRC
The National Computing Centre Ltd	NCC
National Physical Laboratory	NPL
Pera Group	PERA
Pira International	PIRA
The Post Office Research Group	The Post Office
The Paint Research Association	PRA
RAPRA Technology Ltd	RAPRA
SATRA Technology Centre	SATRA
The Steel Construction Institute	SCI
Sira Ltd	SIRA
Smith Institute	Smith Institute
The Sports Turf Research Institute	STRI
TNO BIBRA International Ltd	TNO BIBRA
TRADA Technology Ltd	TRADA
Transport Research Laboratory	TRL
TRW Technical Centre	TRW
TWI Limited	TWI



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