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The Association of Innovation, Research and Technology Organisations (AIRTO).

Contact:

Professor Richard Brook OBE, FREng

President

AIRTO

Telephone: 020 8943 6600

Email: enquiries@airto.co.uk

Introduction

This response is from AIRTO (the Association of Innovation, Research and Technology Organisations). AIRTO's members comprise representatives from:

- Public Sector Research Establishments (PSREs)
- Non-profit distributing member and non-member based research and technology organisations (RTOs, including Catapults)
- Privately held research and technology companies (including Contract Research Organisations - CROs)
- Universities (Enterprise/Technology Transfer Departments)
- R&D departments of industrial companies
- Business support (including Access to Finance) and early stage technology-based venture capital companies

AIRTO's members are involved in aspects of the translation of ideas, research and technological advances into the commercial arena, for clients in both the private and public sectors. Collectively, these bodies connect fundamental research to commercialisation and are referred to as comprising the Innovation, Research and Technology (IRT) sector.

Executive Summary

'Hands-off' approaches to industrial strategy have already demonstrated that they are insufficient for a country that espouses free trading relationships with highly developed and globally competitive economies, many of which employ politically underpinned industrial agendas. Other countries use the power of government influence to tilt the industrial field playing field in their favour and the UK, if it is to flourish independently outside a larger bloc of nations, must harness the power of government to handle political relationships and work alongside industry to outperform the competition. Furthermore, in the drive to reshape the UK economy, and in the process make best use of its exceptionally strong knowledge base for competitive advantage and growth, the government must help to embed innovation in the fabric of the UK's economy, helping businesses address the challenges and reach beyond established safe comfort zones. The government needs a strategy that, in partnership with industry, enables management of the challenges and risks inherent in such an ambitious enterprise.

To ensure success, the industrial strategy needs to:

- i). Align with and help to deliver the government's other high priority socio-economic and political objectives for the UK including, for example, exiting the EU, stimulating regional economic prosperity, providing a secure future for citizens, driving economic growth and providing high quality public services. The government's policy priorities drive the actions and behaviours of its key departments, and an industrial strategy which helps to support these priorities should minimise conflicts with other policy areas that can otherwise pull industry in opposing directions. It should also help to identify where innovation is most needed in order to successfully deliver government policies.
- ii). Link together the elements of infrastructure that enable industry to work productively and efficiently, especially research, innovation, investment, skills, communication structures, regulations and logistics. A key component of this infrastructure is the IRT sector, which operates in a complementary dynamic with universities and business to deliver innovations into day-to-day life.
- iii). Remain in place for the longer term in order to provide a clear and consistent context for risk taking and investment. The strategy must also be well articulated and the rationale explained to all stakeholders, including the public.

About AIRTO

AIRTO welcomes the Committee's consideration of a proposed industrial strategy for the UK. Organisations in the Innovation, Research and Technology (IRT) sector play a pivotal role in driving economic growth and innovation, frequently acting as the aggregator of scientific and technological demand from businesses and markets. Such organisations are well placed to understand national industrial strategy and its implementation within the context of regional growth strategies, because they work to closely with companies in key sectors to lead innovation, and so are optimally positioned to facilitate interactions involving academic partners, SMEs and large industrial businesses to driving challenge-led programmes.

A key component of an effective national industrial strategy for the UK is the capacity to deliver innovation. Britain has a large and thriving IRT sector, which contributes significantly to our national capabilities¹, with the economic impact for UK plc now estimated to stand at £32-36 Billion pa. The Research and Technology Organisations (RTOs) that AIRTO represents are a significant component of the UK's innovation ecosystem, but differ from universities in their primary objectives, strengths and capabilities, which are centred on commercial translation of applied research. In its 2011 'Innovation and Research Strategy for Growth', the Department of Business, Innovation & Skills recognised the sector as an 'under-utilised asset'². Both universities and RTOs have vital and complementary roles to play in the national industrial strategy. The best outcomes for the UK will be achieved by an industrial strategy that supports these two crucial sectors, working together, to operate in the specialities where they excel, to partner with industry in driving forward innovation and to enhance the UK skills base.

AIRTO's response to the specific questions posed is as follows:

1. What does the Government mean by industrial strategy, and what does the private sector want from one?

An industrial strategy is essential to stimulate productivity and growth for the UK. Now, more than ever, with uncertainties surrounding the precise future trading relationship with the EU, it is essential for the UK government to set out a bold vision. The government's industrial strategy should combine this vision with a clear, strong and cohesive roadmap for supporting and enhancing our national industrial base. Such a strategy should seek to provide an action plan for investment in the infrastructure and skills needed to enable the UK to keep pace with, and ideally outperform, competitor nations, rendering the UK an attractive place for technology intensive industries in the global economy to be doing business. The primary goal of such a strategy should be to stimulate productivity, wealth and job creation, thus underpinning prosperity and quality of life.

The national industrial strategy for the UK should:

- Support and, where necessary, influence other major top down government policy agendas because these policy agendas drive actions and behaviour of key departments (e.g. BEIS, DEFRA, DfT etc.). It is essential to avoid conflicts that could hamper industry from contributing to economic prosperity and adding value into the economy by imposing policies which would 'pull' in opposing directions.
- Facilitate access to the resources essential for successful innovation and economic growth, such as skills and finance, and in doing so, recognise that innovation:
 - is an integral part of a successful industrial strategy;
 - underpins the national 'bigger picture' for the success of the UK economy;
 - involves three key players - the IRT sector, universities and industry operate as a complementary dynamic. The national innovation strategy should ensure that best use is made of all parts of this tripartite dynamic to implant innovation as successfully, quickly and efficiently as possible;

- lay down consistent, clear long and short term priorities and provide for the supporting measures and interventions needed to help industry take on the challenges and risks of innovation and commercialising new opportunities;
- outline the government view on where challenge-led innovations are needed in the economy.

2. How interventionist in the free market should Government be in implementing an industrial strategy, for example in preventing foreign takeovers of UK companies?

A 'hands-off' approach to industrial strategy is insufficient for a country with such a strong knowledge-based economy that depends heavily on driving innovation to achieve growth. Knowledge – particularly scientific and technological know-how - can be better and more efficiently directed and channelled towards industrial benefit across supply chains in key industrial sectors and regions if there is an appropriate level of focus and intervention by the government. The so-called 'valley of death' for innovation highlights the need to continue investing in the UK's innovation capabilities and de-risking promising new technologies. Such intervention enables British companies to 'home grow' and 'home finance' their innovations rather than looking overseas (a potential risk factor for increasing the likelihood of future foreign ownership).

The UK should match what other governments are doing in competitor nations, tilting the playing fields to match competitors' public sector support for their industries. The government should stimulate new and 'out-of-comfort zone' developments by risk-sharing with industry in priority areas of national and regional strategic importance, especially where opportunities lie to grow future exports. Support and investment should be committed on a case-by-case basis. To ensure healthy competition is maintained, investment of public funding aimed at stimulating industrial development needs to be delivered in a consistent and fair manner with equal access for all players operating in priority areas. It is particularly important to achieve equal access to funding for public sector owned/funded bodies and those organisations which are independently funded and operated. This avoids the criticism that government intervention crowds out private enterprise.

However, it is important when investing in innovation to understand that it cannot be thought of or managed as a simple, linear process; 'innovation champions' and quality leadership are essential in both the public and private sectors. Such leaders require wide-ranging experience of translating opportunities into self-sustaining, competitive and growing businesses. Furthermore, academic research outputs may underpin significant opportunities for future innovation, but in most instances will not be immediately 'innovation ready' unless commissioned as part of an integrated, challenge-led programme of research and exploitation with clear practical application goals.

Foreign ownership of UK companies of strategic importance can only be considered on a case-by-case basis. In general, there is merit in fostering a business environment where companies at the top of key value chains can retain UK ownership. This links in to considerations concerning availability of finance, sources of 'patient' capital and liquidity in relevant financial markets.

3. What lessons can be learnt from:

• Previous governments' industrial strategies?

Previous strategies suffered from a lack of longevity and failed to survive changes of ministers and Government. To ensure success, the industrial strategy must be one that has sufficiently widespread support to survive ministerial changes. Strong integration of key linkages in the strategy is essential to the success of Government measures for:

- i). Stimulating productivity/growth and exports.
- ii). Investment in, and leveraging of, research.

iii). Investment in, and leveraging of, innovation.

iv). Investment in infrastructure and public services.

Achieving 'joined up' buy-in to the industrial strategy across all government departments is essential for successful implementation.

The sectoral approach to industrial strategy adopted by the recent coalition government (setting out priority sectors and the 'Eight Great Technologies' in a somewhat 'standalone' context) did not completely meet the challenge of stimulating economic growth. However, having such a framework was better than none, providing some key areas for focusing investment and policy interventions and encouraging industry and public sector to coalesce around particular strengths of national importance for future economic development. This was largely discarded after the 2015 General Election, much to the detriment of achieving positive co-operation between government and industry. It has also hindered the conveyance of clear messages to regions, industrial sectors and the general public alike about the goals and intentions of government in purposefully working to stimulate long-term, sustainable economic growth. The recently appointed Prime Minister has set out the over-arching goal for the government to deliver "*a country that works for everyone*". This is a laudable goal for the core mission of any democratically elected government, but the apparent simplicity of such a statement disguises the complex and very necessary challenge of aligning industrial strategy successfully with public attitudes and perceptions in the regions. Some regions have host industries (mining and heavy industries, for example) that have historically contributed significantly to success and prosperity both nationally and in local communities (enriching regional identity, skills, livelihoods and social cohesion), but which are now non-existent or struggling to remain profitable as a result of developments in the global economy. Effective consultation, communication and dialogue is needed in such instances to achieve positive, workable strategies for the future.

• **Other countries' attempts to develop industrial strategies?**

Germany has invested consistently in its industrial strategy over many decades, and sustaining a strong IRT sector has been an essential component of this e.g. investing in the Fraunhofer Institutes. The UK has sought to emulate such practices e.g. by establishing the research associations after World Wars I and II and more recently by implementing the Hauser Review with the creation of the Catapult Centres (a concept now being copied by France). However, more could be done to invest in our existing innovation infrastructure to support governmental industrial and innovation strategies. The UK still underinvests in translating the outcomes of its excellent research into commercial enterprise, a challenge which the IRT sector is well able to tackle given better and more appropriate access to financial capital.

4. What tensions exist between the objectives of an industrial strategy and the objectives of other policies, and how should the government address these tensions?

As stated above there is a need for clear integration of an industrial strategy with national plans for productivity improvement, research and innovation, and goals for growth in exports. In addition a strong Brexit deal with the EU and good arrangements with other global trading partners is essential for the successful implementation of an industrial strategy. Particular aspects of the Brexit deal that will require major attention in this regard are:

- Conserving established partnerships – across supply chains and with key innovation partners.
- Continuing access to people and skills – to ensure that the UK workforce is able to attract inward talent simply and cost-effectively.
- Ensuring access to innovation funding – loss of schemes like Horizon 2020 will have a negative impact unless compensated for elsewhere. The opportunity exists to create a replacement fund for innovation that the UK could encourage other non-EU nations to also investment into as a for driving new international challenge-

led strategic alliances with other key partner nations in key sectors where the UK is world-leading e.g. space, aerospace, materials, transport, future cities, life sciences, construction, agri-food etc. Such a programme could support UK innovation centres of excellence in accessing supply chains overseas, an important prerequisite for driving future exports in addition to acting as a catalyst for driving innovation in the shorter term.

- Providing alternatives to European Structural Funds for large strategic infrastructure investments in regional economies - these will disappear, so other means of boosting regional infrastructures will be required in order to continue attracting industrial investment.

There are tensions potentially arising between a national industrial strategy aimed at industrial growth with a whole range of government policies, including immigration, tax, wages, foreign direct investment, the environment, public spending, foreign policy and regional growth. All such policies should ideally be congruent with a national industrial strategy. A hierarchy of policy drivers should be established – this will define how the industrial strategy interacts with other policies, and where other policies can be established in a way that works in tandem with the industrial strategy (rather than in conflict with it).

As referenced in our answer to question 3 above, achieving public ‘buy-in’ is crucial for the successful implementation of a national strategy and indeed other government policies. This will require the government to obtain a clear understanding of public attitudes on priorities, e.g. for quality of life and security versus economic prosperity. This will involve finding new and better ways to conduct an effective public discourse on the role of industry in our national prosperity and to increase public engagement with explanations setting out how the economy works. Economics as a discipline has a public image problem, as does much of large industry, which must be addressed to achieve constructive dialogue with the wider population.

5. What are the pros and cons of an industrial strategy adopting a sectoral approach?

As described in our answer to question 3 above, adopting a strictly sectoral and stand-alone approach to industrial strategy will not produce a perfect solution, but a sectoral framework is better than no framework. A sectoral approach is relatively logical, fairly well understood and recognised. Key to the success of a sectoral approach in the context of a sectorally and regionally balanced economy, is identifying clearly which sectors are important for the regions, and ensuring good cohesion with regional growth strategies. An important factor will be for the government to obtain a sound appreciation of each sector’s positioning in its life cycle as this determines the most appropriate form of support and intervention at each stage of development.

• Should the Government proactively seek to ‘pick winners’?

It is desirable to pick winning sectors, i.e. to invest strategically in sectors which promise good returns economically and socially. However, it is important to balance efforts appropriately between technology push and market pull. Unless there are overriding strategic implications, picking winners in terms of providing direct investment to individual companies is not appropriate.

• What criteria should be used to identify which sectors are supported?

A balanced portfolio management approach should be adopted using best practice and capitalising on the expertise, experience and know-how of those familiar with key sectors always ensuring that vested interested (potentially both academic and private/commercial) does not dominate decision making.

Also, the prevailing quality of leadership, scale of ambition, evidence of cohesion, the willingness to partner with the government and repositories of relevant skills in the sector should all be important criteria for deciding where to invest and support.

As noted above, in deciding how and where to direct support, it is crucial to understand where promising sectors and technologies sit in their 'life cycles'. It is important to balance the portfolio of support across early stage, high growth potential (but high risk) areas with the strengthening of more mature (but vitally important) areas proven to add value.

Currently, a good example of best practice in channelling support is the approach adopted by Innovate UK which has clear commitments to specific nominated technology areas, but also reserves some capacity to support and explore outstandingly promising opportunities that arise outside of its declared priority topics.

The IRT sector has an important role in supporting different industry sectors, as discussed above. It is also an important sector in its own right by providing services to companies and government agencies throughout the world, and attracting inward investment to the UK. The industrial strategy should take account of both of these aspects of the IRT 'sector' by its explicit inclusion in the strategy, with the identification of its roles and how these will be supported.

• Should the Government prop up traditional industries that it considers to be in the national interest?

In general, where there is a clear business case, with a clear return on investment, such industries should be offered continuing support. However, decisions must be made on a case-by-case basis in instances of strategic national interest, balancing the short-term investment required with the otherwise long-term social and economic costs of losing an industry and the impact on national security interests (e.g. where other countries may otherwise control supply of vital resources). As part of this, the long term opportunity cost to regions of investing in new skills and sectors to replace lost industrial activity, should also be taken into account, and in some cases it may be appropriate to support older industries if the social and economic costs and consequences of its loss in the long term will be so damaging that they will outweigh the costs of support. It is possible that leaving the EU will permit greater flexibility for the government to mitigate damage and deal effectively with such cases.

Productivity relative to competitor nations is an important factor in deciding whether or not to prop up traditional industries as is awareness of the likely future technological landscape in the area.

• If not a sectoral approach, should the industrial strategy have a broader objective, such as improving productivity?

Whether or not a sectoral approach is taken, the goal of enhancing productivity must be central – i.e. support should be concentrated on sectors/areas where there is significant potential to add value, raise productivity and drive exports as a result of the government's intervention. Raising productivity, and the innovation and investment required to bring this about, should both be central to the industrial strategy.

Having a sectoral component of industrial strategy is useful and provides a clear focus for implementation, but equally there is a risk of excessive complexity in trying to orchestrate too many other facets of economic performance as well – industrial strategy should not be excessively restrictive or pigeon-hole regions and/or sectors at the cost of flexibility and pursuit of new opportunities.

6. Should the industrial strategy have a geographical emphasis?

Regional specialisation (combining industrial, educational and innovation support to help regions focus on their particular strengths) will be helpful in establishing regional priorities. Regional industrial strategies need to be linked to investment in skills and possibly existing repositories of skills/experience from previous industrial activities in the area. Investing in industries that will regenerate lagging regions should be part of the overall strategy and this should probably pay a part in influencing the choice of sectors selected.

• How should an industrial strategy link with devolution initiatives aimed at devolving taxation and decision making away from Westminster?

Allowing regions to make their own decisions locally is important, but could give rise to wide variations in practice across the regions of the UK, rendering a very complex situation for businesses dealing with multiple locations in the UK (and also for bodies with a national remit). Dealing at the same time with variations in trading agreements and processes across multiple global trading partners in different countries, as well as with different approaches adopted in various locations within the UK, could make operations very difficult for business. Permitting excessive competition between regions could also prove counter-productive. Organisations with a national remit need clarity on where decisions will be made. Connecting with the very many different Local Enterprise Partnerships (LEPs) to understand requirements locally could become extremely time-consuming, confusing and complex.

Harmonising regionally determined strategy elements with an overarching national industrial strategy will be highly desirable in order to simplify operations for business. Divergence of national industrial and regional strategies would be confusing and counterproductive. It must be emphasised that avoiding divergence will be in the best interests of and advantageous to business in each local area/region.

• What examples are there of interventions from central Government that have successfully supported economic growth away from London and the South East of England?

The space industry has successfully established a world-leading cluster in Scotland in the Strathclyde region, with small satellite manufacturer Clydespace exporting to the US and other territories and a centre of excellence in the university. By 2015, the Scottish space industry employed more than 5,000 people and had doubled its turnover in three years. The Scottish Centre for Excellence in Satellite Applications launched in Glasgow, where its theme was driving economic growth. Major national and international space conferences have been held in the city and Scotland is a strong contender to host the proposed UK spaceport.

• How should the industrial strategy work with local authorities and Local Economic Partnerships, reconciling a U.K.-wide strategy and local, regional and devolved nations' priorities?

The national industrial strategy should provide an overarching framework under which local, regional and devolved nations' priorities can be defined. This framework should define how the public authorities at all levels from national to local will interact with industry, giving a consistent overall model. Key industrial sectors for the nation should be identified at the 'headline' level. Within this interaction and national priority framework, more detailed sectorial priorities should be defined taking into account local, regional and devolved nations' specific characteristics. Specifying priorities outside of these 'headline' sectors will require specific and more detailed local, regional or devolved nation justification.

Defining local, regional and devolved nation's priorities will require input from all the relevant local organisations, including industry, the IRT community, local authorities and Local Enterprise Partnerships. In some regions, this consultation is already being partly undertaken by Science and Innovation Audits and their output should be exploited to the benefit of developing an industrial strategy. It is also important that national organisations with a regional view (CBI, EEF, Trade Associations, IRT organisations, etc.) have an input to the definition of local priorities and their justification.

Declaration of interests

This submission is made by the Association of Innovation, Research and Technology Organisations (AIRTO). The organisation represents research and technology organisations operating in the space between the academic research of universities and the commercial needs of industry. AIRTO members undertake research and development, and knowledge and technology transfer. This submission does not necessarily represent the views of individual member organisations. AIRTO currently comprises organisations, employing more than 40,000 scientists and engineers¹, with a combined annual turnover in excess of £5 Billion (AIRTO Ltd. is a company limited by guarantee registered in England No. 1217006 Register office address: National Physical Laboratory, Hampton Road, Teddington, Middlesex, TW11 0LW. AIRTO is a not-for-profit organisation funded by membership subscriptions, and managed under contact by NPL Management Ltd). The members of AIRTO currently are:

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Agrimetrix	Fripp Design and Research	PA Consulting
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DG Cities Limited	National Physical Laboratory	TWI Ltd
Digital Catapult	Northern Automotive Alliance	University of Greenwich
Fera	NNFCC	University of Surrey
	Nuclear AMRC	WMG HVM Catapult

References

¹ The impact of the Innovation, Research and Technology Sector on the UK Economy; Oxford Economics, November 2014.

² Innovation and Research Strategy for Growth; BIS, December 2011.