

Automotive Innovation and Growth Team

Technology Report

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Introduction

Motor vehicles have become increasingly sophisticated with rapid adoption of 'leading edge' technologies in engine/ transmission, electrical/electronic systems, the body and chassis forced by customer demand and competitive pressure. Prospective car owners face a bewildering choice of vehicles designed for a general or specific customer use which can then be specified with a wide choice of engine and other options.

To provide this choice, car manufacturers are increasingly reliant on suppliers who not only provide vehicle systems in component or built-up form to the manufacturers but are also responsible for developing technology on the manufacturers behalf.

Technology development centres and the motor companies HQ tend to be within the same national boundaries so the loss of either one tends to impact the other – either as a straight loss or through investment prioritisation over time.

Research and Development is encouraged by the UK Government through various means but notably through the Foresight Vehicle Programme – now in its fifth year.

The AIGT Technology Group set out to make recommendations on the following issues:

- To determine whether Foresight Vehicle could be improved as a mechanism for encouraging development of technology in the UK
- To identify the key technologies which will change the automotive environment for manufacturers and consumers in the next 5 – 10 years
- To identify improved routes to commercialise these processes and technologies

The Key Issues

Although the UK automotive industry has essentially re-invented itself in the past 20 years, a number of critical issues remain which, if not addressed, will handicap further development and potentially result in wholesale movement of technology development overseas. Among the key issues are:

- Weak research and development performance – UK spending is about 80% of the international average
- A bias for quick results reducing the appetite for strategic expenditure
- Research 'following' geographic location of the manufacturers HQ

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- Many small and medium size companies lacking geographic coherence and linkages encouraging co-operation, knowledge sharing and skilled labour pool development
- A general lack of confidence in technologies which may have a significant risk and lead time to profit

Foresight Vehicle

Foresight Vehicle is generally accepted as the UK's 'flagship' mechanism for encouraging automotive R&D. As such, it attracts surprisingly polarised comments from industry participants and observers. On the plus side it has created an excellent business network with over 100 projects and over 400 participants. This network has increased supplier capability, promoted UK industry abroad, helped to link industry, government departments and academia. The involvement of EPSRC brings a welcome commitment to the generation of new knowledge and scientific excellence. It is relatively low cost with total funding of £75 million of which well over half comes from industry.

On the downside, Foresight Vehicle is perceived, by many industrialists in as attracting "techies" without adequate objectives, timescales and commercial imperatives. Too many of the projects are considered theoretical and "blue skies" and are not seen as critical by the commercial departments and senior management of participating groups. Further, Foresight's work is considered invisible to decision-makers more generally and lacks focus due to the wide array of technologies under investigation.

The Technology Group believes that a re-focussed and re-vitalised Foresight Vehicle has the potential to deliver technologies capable of commercialisation and enhance competitiveness. However, change is required:

- Within the constraints of State Aid rules, projects should be selected with a clear bias towards commercialisation, in the short, medium or long term
- Each project should have carefully defined objectives and timescales with regular 'gateway' reviews. Failure to demonstrate clear progress towards the agreed objectives will result in cancellation and re-allocation of funds
- Each project should be supported by a 'Chief Executive' level sponsor to drive the project forward, ensure that commercial objectives are recognised, to achieve the necessary 'profile' for the project and to communicate to a wider audience the status of work-in-progress and team successes

Foresight Vehicle should act as the 'ideas hopper' where projects with potential are identified, developed with industry/government support and either made available for further development and commercial exploitation, or discarded, within short time frames.

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Technologies or processes of exceptional potential would feed into ‘key project hatcheries’ – described later – supporting either regional or national interests. Projects of exceptional importance will demonstrate some of the following characteristics:

- Change the nature of the industry – step change rather than evolution
- Require the simultaneous development of technology solutions or process improvements in several areas
- Have the potential to affect or be applied in several different industries
- Will mature in 3 – 5 years and fully evolve in 5 – 10 years
- Improve the quality of life of both future users and the population at large
- Have global applications and relevance
- Currently have enough expertise or impetus in UK companies or institutions for the UK to have the potential to be the first or second most important centre of excellence, globally.

The ‘Project Hatcheries’ - Centres of Automotive Excellence and Development

Centres of Automotive Excellence and Development would be established to further development of outstanding technology or processes identified by Foresight Vehicle and fulfilling several of the characteristics identified above. These centres, co-located at selected Universities or in regions currently demonstrating obvious excellence in the subject areas would create a unique environment for further development and would attract long term government funding.

Similar to the German “Frauenhofer” Institutes the centres would act as magnet for regional development of selected technologies and would cross industrial sectors. All would be ‘high performance’ in nature but could include automotive, electrical/electronics, chemistry, software development, production and business. Financial institutions and venture capitalists would become involved and the centres would act as an incubator for development of technology and business. Development of clusters with the scale and importance of the Aachen technical node in Germany is the overall objective.

Both Foresight Vehicle and these new automotive centres would be co-ordinated by a high level board comprising industry leaders, representatives of the SMMT and the DTI. The governance structure and reporting/supporting bodies are shown opposite.

Selecting the Technologies

Foresight Vehicle has a process for selecting technologies that are both technologically progressive and relevant to the wider automotive audience. This process assesses each user requirements and the impact of adoption on affected non-users e.g. pedestrians, the environment etc. The AIGT technology group reviewed projects being sponsored by Foresight Vehicle and considered two technology groups to have special merit and be worthy of recommendation to be further developed in Centres for Automotive Excellence and Development:

- Low Carbon and Fuel Cell Technologies
- Transport Telematics and Technologies for Sustainable Mobility

Low Carbon and Fuel Cell Technologies

Fuel cells are a major future technology and are set to become a mass market product in the next decade. Portable power – power back-up and power for remote locations are likely to be the first adopter of fuel cells followed by residential and stationary power sources and finally commercial vehicles and cars. Although adoption by the auto sector will be slower, it will eventually be the largest revenue source. Fuel cells are particularly critical in that they are a major disruptive technology touching three major industries – electricity, oil and autos. Fuel cells also represent the only practicable way to achieve zero emissions and over time the UK's gasoline and diesel engine development and production capability will be substituted by fuel cells. Their importance is already recognised as almost all auto manufacturers, major utilities, equipment suppliers and oil companies are involved in fuel cell research and at least 35 companies (facing page) resident in the UK have interests in fuel cell development. Further, UK academic facilities – including Imperial College London and Loughborough University have leading fuel cell capability.

The low relative advantage for individual consumers in autos means that the fuel cell adoption rate will largely be determined by government legislation some of which is already being used to encourage low emission vehicles and could include some of the measures shown opposite.

A Centre of Automotive Excellence and Development for low carbon and fuel cell technologies would have a key role in developing the broad range of skills necessary for fuel cell development including the chemistry, control electronics, production methods and software development as well as real costing, business development and incubation. The promise of long-term funding from Government will result in a multi-skilled critical mass community of researchers able to take the technology forward, well informed industrialists able to take sound decisions on exploitation, a pool of engineers with the necessary skills to design, manufacture and maintain products based on the technology and education of public opinion to allow the market to make rational decisions on sustainable mobility. Industrial partners in the centres would come from both the traditional and high performance automotive sectors, energy, computing and infrastructure. The centre would be responsible for

development of technology up to proof of concept and commercial potential which could include the build of demonstrator vehicles.

Transport Telemetrics and Technologies for Sustainable Mobility

Based on information from the most recent UK Government sponsored study traffic is expected to grow by a third between 1996 and 2010. Comparable EU studies show that road haulage traffic alone will increase by 50% in the same time frame.

Traffic and Travel information services provide information that help road users make more informed decisions about their travel and the impact can be measured in three areas – safety, environmental impact and time/financial savings. The level of potential savings are huge as indicated by the following data:

- The Automotive Association believes that up to one fifth of driving time is spent lost on unfamiliar roads causing motorists to waste 350,000 tons of fuel each year
- The cost in time lost in traffic jams is estimated to be up to 0.5% of the European GDP – total cost of €€Euro 32 billion per year

Broadcast traffic information began over two decades ago but as traffic congestion has grown the volume of information for a medium sized region could potentially fill one broadcast channel with announcements motorists find intrusive, repetitious and irritating... unless the information pertains to them.

Various solutions are available to provide improved information to help motorists avoid congestion – however each comes with a variety of technical and delivery issues which currently do not meet the needs and expectations of consumers with growing travel and congestion. Further, if congestion charging is pursued it will be incumbent on Government to help provide real time information to maximise traffic flows and give motorists the ability to decide whether to use specific roads at a certain time or not.

A telematics centre would be charged with developing processes, technical solutions and business models on the following:

- Content creation – the government is the sole body who has the incentive to gather traffic information for all users which may require encouraging investments in sensor technology, distribution data, collection architectures and smart devices capable of optimising traffic flows real time
- Data aggregation – data needs to be collected in a prescribed format and the exact mechanism on how the data will be exchanged between public and private bodies needs to be decided.
- Distribution channels – long term planning for broadcasters and receiver development for the 2004 – 2010 timeframe

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- Consumer interface – development of an agreed set of human-machine interfaces that manufacturers can develop products against, development of low cost devices which will enable every transport user to benefit

Each of these areas needs to be developed in a coherent and cohesive fashion for the service to be effective nationally and available real time, cost effectively, for all users.

In addition to the two technology based development centres, the AIGT Technology Group recommends that a third initiative, which has already received some review and support in Government, could be harnessed under the Automotive Centres of Excellence theme:

Motorsport Valley Cluster Development

UK Government and the Motorsport Industry Association (MIA) with the Regional Development Authorities (RDA's) want to ensure that the UK's global leadership in high performance engineering and motorsport is sustained and strengthened.

To do this it is proposed to develop a framework of services and resources to enable and support business development and education and skills development. Further, motorsport's competitive advantages in technology and best practice are potentially transferable across other sectors including aerospace, electronics, material development, ceramics and information technology.

Motorsport currently has a £5 billion turnover of which over 50% is export sales. Further, it employs over 40,000 people of which 25,000 are highly trained engineers in over 3000 individual businesses. However, there are major threats – Toyota will spend over \$1 billion on Formula 1 during the next four years – based in Germany and the UK's share of the Formula 1 engine market has reduced from over 70% to under 30% in the last two decades.

A motorsport centre would build a sustainable base for long term global leadership focussing on:

- business development
- education and skill development in associated technologies
- sporting and driver development
- visitors centres/ tourism

Summary of Recommendations

- Improvements to Foresight Vehicle to improve effectiveness
- Establishment of two Centres of Automotive Excellence and Development for:
 - Low Carbon and Fuel Cell Technologies
 - Transport Telematics and Technologies for Sustainable Development
- Adoption of the DTi/MIA initiative to promote Motorsport and High Performance Engineering under the 'Centre for Automotive Excellence' theme