REF3a: Impact template- UoA12

1. Context

The mission of the University of Sunderland is to be a civic university, leading in the development of our city and the region, and initiatives within Engineering sit firmly within that context. The University has a long and strong tradition of applied research in Engineering. Our aim is to embed a research culture, and provide useful research results, within key strategic partners in the regional automotive industry, its supply chain and the general manufacturing sector, in line with regional and local economic strategies. Senior company personnel have been seconded to our research programmes and findings have been disseminated to the benefit of companies and the region. Companies and agencies involved include: One North East; NEPA (North East Productivity Alliance); Nissan Motor Manufacturing (UK); Magna Kansei; Tallent Automotive Ltd. Gestamp Automoción; AVID Vehicles; Black & Decker; Assa Training & Learning; RTC North; and the regional Learning & Skills Council.

2. The Unit's approach to impact during the period 2008-2013

Our staff have traditionally worked on applied research with local, national and international collaborators, supported by a range of funding mechanisms. In recent years, we have focused our research into the areas of automotive engineering, low carbon technologies, and maintenance. This builds on our strengths and aligns with regional and national strategy, and the needs of our partners, thus enabling us to maximize impact. We have established national and international collaborations with world-leading laboratories and organizations, to develop impact from our research. For example:

- Strong established links exist with Oak Ridge National Laboratory (ORNL) and the National Transport Research Center (NTRC), Tennessee, USA. We are conducting joint research with ORNL on the development of low-cost carbon fibres for automotive applications.
- The University of Sunderland is the UK Government's nominated representative body for the International Energy Agency (IEA) Implementation Agreement on Advanced Materials for Transportation (AMT). A new research theme on developing the use of carbon fibres in automotive applications has been accepted by the relevant IEA Executive Committee.
- Strong research interactions exist with world-class institutions including: Massachusetts Institute of Technology (MIT), USA; Kyoto University, Japan; Institute for Material Research (IMR), Japan; Space Structure Laboratory, Tohoku University, Japan; Laboratory for Advanced Computational Engineering, University of Maribor, Slovenia; Vibration and Computational Dynamics Laboratory, University of Toronto, Canada; Ryerson University, Canada.
- Strong interactions with national and international industries, including: Engineering Service Inc. (ESI), Canada; Applus IDIADA Automotive Technology, Spain, on occupant safety investigation; Mascotech Co., USA; AVIDS Vehicles, HilTech and Tallent Automotive Ltd. Gestamp Automoción, UK.

These are examples of where automotive and manufacturing engineering research at Sunderland is making a global impact. The local and regional impact is also strong with staff working on a range of projects with Nissan, and its supply chain.

The unit has established AMAP (Automotive and Manufacturing Advanced Practice) which is a research and consultancy centre http://centres.sunderland.ac.uk/amap/ bringing together expertise in industrial applications and digital engineering technologies to provide a range of services to manufacturers in the region. AMAP has delivered applied research, consultancy and training to hundreds of companies regionally and nationally.

We employ a multi-faceted model of knowledge exchange which draws from and builds upon the work outlined above. Our model has the following critical elements:

- *Collaboration*: Our approach is founded upon strong and long-standing collaborations. This has enabled us to align our research with the needs of our partners over the long term.
- *Clear Business Need:* There is a clear business case for all of our collaborations, and the results of our research deliver outputs which can be used by our partners and benefit the wider economy and the environment. Examples include our work on manufacturing systems which sets out to improve the productivity of regional companies, and our work on low carbon approaches which has direct environmental impact.
- *University and education as core:* It is the development of the people within the projects which make our initiatives work.
- *Built on strength:* Our projects build on our research strength in automotive and manufacturing technology, which has been developed over the long term.
- *Multi-action approach:* Our projects have used a plethora of regional and national intervention mechanisms to fund and support development and delivery, including KTPs, EPSRC CASE awards, regional and EU funding.

3. Strategy and Plans for supporting impact

The University has for some time recognised the importance of applied research, industrial collaboration and knowledge transfer. Although there has not been a formal impact strategy, we have always set out to engage academic staff in meaningful collaborations with industrial partners. The aim has been to embed this within the culture of the institution, by putting in place the strategic and operational frameworks and support systems to achieve:

- Increase in engagement in applied research activity by academic staff
- Recognition and reward for applied research activity by academic staff
- Embedding of collaborative activity within the University's activities, as part of the Corporate and Academic Strategies

There are several key components to this integrated approach:

- *The Corporate Strategy*, which articulates our vision as a civic University, making an outstanding contribution to our city and region.
- *The Academic Strategy,* which takes this vision and clearly identifies research activity as an equal partner to teaching and learning, as part of an integrated and blended continuum of academic activity for all academic staff.
- *The Research Plan* which sets out a vision for applied research and a research-informed university with clear objectives and targets.
- *The Framework for Personal Development and Career Progression for Academic Staff*, which provides a clear career progression pathway for academic staff engaged in applied research activity
- *The University and Faculty Research and Innovation Committees,* which determine strategy and tactics, set and monitor targets, and identify and take advantage of opportunities, as well as helping to implement appropriate academic governance
- *Faculty-level responsibility*, the Associate Dean (Research) has executive responsibility for impact at unit level.
- *The central Business Services team*, where our knowledge transfer professionals work to implement the strategies outlined above.
- *Comprehensive Workload Models* which map the workload of individual academics, and balance them to provide the opportunity for the development of research impact

The combination of these key components provides a thread all the way through from the highest level in the University, to the practical development of academic staff to support impact within the unit. Our approach is based upon the RCUK approach: Pathways to Impact.

At an individual project level we will require principal investigators to produce impact plans. We

recognise that opportunities for making an impact may arise at any stage during or after your research project. It is thus important to have plans in place to increase the chances of such opportunities occurring, and to take advantage of them when they do. In collecting the evidence for the two case studies the following factors became obvious: collecting data and evidence when they arise, maintaining collaborative links after the formal end of a project, and disseminating project results in a range of media. Impact plans will contain the following elements:

- Setting objectives for impact;
- Identifying beneficiaries and targeting them;
- Developing a multi-faceted dissemination plan;
- Planning activities; and
- Continuous evaluation and data collection.

Specific initiatives include the appointment of a Nissan chair of Automotive Engineering, to lead on research in that area, and forge even stronger links with Nissan regionally and internationally, and work with the Nissan supply chain. An Industrial Advisory Board (IAB) has been established and meets quarterly. The IAB consists of senior engineering managers from, for example, Nissan and Tallent Automotive Ltd. Gestamp Automoción, and helps shape our research programmes and ensures planning for impact.

4. The relationship between the unit's approach to impact and the submitted case studies.

Research within the unit has, by its nature been applied, and has thus been designed from the outset to generate industrial impact. The submitted case studies detail the range of beneficiaries and emphasise the sustained relationships which have produced the impact. Both case studies exemplify the collaborative and sustained nature of our approach to impact, as discussed below.

New Technologies for Electric Vehicles

The project is based upon a sustained and established relationship between the company, AVID vehicles, and the university; alongside relationships with Nissan and its supply chain, and the regional approach to low carbon technologies. The aim has been to strengthen our relationship and collaboration with AVID Vehicles to create sustainable transport solutions, providing ways to reduce impact on the environment; without sacrificing functionality or performance. It is important to understand the city and regional context as a background to this project, as it is within, and to address, this context that the project was formed. It was recognised an early stage by all players that there was a clear business need for our collaborations with local vehicle manufacturers and their supply chain, and that the University was a vital player in the development of the regional low carbon economy. Our research work has aimed at developing novel powertrain and energy supply systems to be implemented in fully electric vehicles to increase efficiency and improve drivability.

Advanced Maintenance Strategy and Tools

This case study was built upon long standing collaborations with partners across Europe including VVT, Finland, and Glenmorangie, UK. These collaborations have developed over 20 years and across a range of funded projects which have provided advanced maintenance strategy and e-maintenance solutions in a wide variety of industrial applications. There has always been a clear business case behind all of our collaborations in maintenance. Our research excellence in maintenance has been established over many years and aimed to produce novel maintenance solutions at three levels: (a) at the strategic level, creating culture change within organisations; (b) at the process level, developing maintenance strategies and approaches which deliver impact across organisations; and (c) at the technical level developing specific solutions including (for example) on-line monitoring, mobile hand-held devices, and wireless communication. The collaborations have been supported by a range of funding mechanisms including an EPSRC CASE award, DTI funding, and EU funding to support the development and delivery strands of the projects.