Institution: University of Sussex

Unit of Assessment: UoA 15 General Engineering

1. Context

Sussex Engineering's research achieves non-academic impact in the areas of sensor development and applications, computer-based simulation, the experimental verification of control and efficiency enhancements in engines (aerospace and automotive), and signal processing. The impact has been achieved through licensing technologies to allow Plessey Semiconductors to create sensor-based products, helping Rolls-Royce and GE Aviation to improve their jet engines, influencing the design of future internal combustion engines, establishing a spin-out company to exploit novel image-processing algorithms, and undertaking consultancies and interactions with non-academic bodies across the spectrum of the UoA.

The beneficiaries thus range from companies needing enabling technologies such as sensors, to those needing rapid improvements or solutions. The research typically has economic, environmental or health impacts realised in the short or long term.

2. Approach to impact

The UoA's approach has been to develop standard methodologies for 'typical' impact routes that are then customised to suit atypical situations.

The UoA has supported the use of consultancy projects to achieve impact. This support includes using the income generated to support underpinning research, and taking consultancy income into account when considering individual career progression, as is the case for research-grant income. The benefit of this approach is evidenced by the long history of consultancy during the assessment period. Examples include Ali's work with Qinetiq on *ad hoc* networks in 2008, Birch's image-processing consultancy with Spiral Scratch and 2020 Imaging, Chatwin's on-going relationship with 2020 Imaging, and Glovnea's work with Inawa in 2013. Such interactions have generated on-going relationships, company-funded research and industrial advisory positions.

Knowledge Transfer Partnerships (KTPs) are also used to produce impact from the UoA's research. KTP experience has been enhanced by the arrival of Mynors, who has run TCS / KTPs since 2000, and has a previous project selected as a finalist for the 2013 UK Best KTP Partnership award. Birch currently has a KTP with Photek Limited, developing software for a new vacuum detector.

The UoA also undertakes high-value contract research in which the results are typically owned and exploited directly by the funding customer. Such arrangements include the normal provisions for approving publication, and knowledge transfer – including through the movement of staff. Examples include work with the aerospace (Rolls-Royce and GE Aviation), and automotive (Jaguar Land Rover) sectors.

Where results from fundamental research show commercial potential, as identified at the project commencement review and during the project, the UoA, in conjunction with the University, assesses risk, potential applications (hence future market uptake and return on investment) and the most feasible means of commercialisation. If the commercial potential is deemed significant, prior-art searching is undertaken and the IP is protected, the cost being borne by the University with the expectation that, if commercialised, the patent costs will be recovered. Technical development, proof of concept, market exploration and business planning are all part of this process. The support for this is provided by the University's Enterprise Development Fund (EDF), with business support from the Sussex Innovation Centre, the University's wholly-owned business incubator.

Examples of research at various stages and styles of commercialisation include:

- Dunne's Amocatic Generator Concept, which is being developed as a range extender for electric vehicles, patented initially in 2010 (PCT/GB2454360) with four other patents pending. This technology resides at Technology Readiness Level 2, with a full product-development feasibility study and hardware proof-of-concept studies to follow.

- TexRad Ltd is a spin-out company exploiting IP related to image-processing algorithms originally developed to identify tanks in military scenes but since tuned to identify cancer sites invisible to the eye in computerised tomography (CT) scans. The commercialisation benefited from support from the then-Regional Development Agency, SEEDA, via the CommercialiSE-PoC fund as well as from the University's EDF before being incorporated, in 2011, as a joint venture with two UK and one Australian companies.

- Prance's Electric Potential Sensors is a platform technology embodied by seven patent families, and licensed to Plessey Semiconductors. The company have fabricated the sensor as an integrated circuit, and are marketing the product as the EPIC sensor.

Active development of contacts

The UoA is active in linking to external organisations and people in order to enable translation and to produce impact from its research. Examples include participating in industry/academia networks such as:

- The London Technology Network (LTN). A senior member of academic staff was an LTN Business Fellow for five and a half years, 2006–11, and presented the activities of the UoA at more than a dozen networking events. This activity generated leads, including those resulting in two MOD contracts in 2009 (£30k and £60k), which resulted in a CASE studentship with HMGCC in 2010.

- Knowledge Transfer Networks (KTN). The most fruitful of these has been the Sensors and now Electronics, Sensors, Photonics KTN, which has resulted in a TSB-funded project led by Meggitt Sensing Systems to utilise the sensor work of Prance in enhancing gas turbine aero-engine blade performance, and an EPSRC-funded project with Arup and the British Geological Survey, investigating the structural health monitoring of concrete structures.

3. Strategy and plans

The UoA's strategy is to strengthen its research and enterprise culture, and thus maximise its non-academic impact.

The UoA will maintain its focus on nurturing research over long periods, moving research outcomes through IP protection (where appropriate) to developmental prototypes and the formation of commercial entities or relationships. This approach of investing in the potential of an idea will continue, and the mechanisms used to date will also continue.

The intention is to support identification of potential impact at an early stage. This will be promoted by targeted awareness training in areas including disclosure, protection, market understanding, business planning and commercialisation. The heightened awareness of the long-term options for each research team and the associated University Research and Enterprise support team will ensure non-academic impact is maximised through a developmental plan running parallel to and beyond the research project.

The UoA and the University support projects with potential impact, practically and financially, to enable their development. This has typically been through the University's Innovation Centre, in-

line with the University's strategy for 'Business and Community', which aims to 'ensure that our key academic achievements have practical applications, such as products and services, which benefit the wider community'. Additional support is provided through the UoA's Strategic Advisory Board consisting of senior business people.

To bolster the probability of commercial success and bridge the 'valley of death' between research and market, considerable resources have begun to be invested in 'Technical Developers', engaged to facilitate commercial prospects by linking prototype development with potential technology-users and customers.

Technical Developers are provided with funds for development, market research and travel. Their role is to take potential applications with identified market potential and a commercialisation partner and develop pre-production prototypes, test the market and enable the commercialisation partner to move into production, hence ensuring impact and a revenue into the UoA to generate the future intellectual capital.

Further investment in professional support for impact has been made by the appointment of a member of the UoA's administration team, whose role is to develop external relationships through the organisation of showcase events.

4. Relationship to case studies

The two case studies presented illustrate two approaches to the translation of the UoA's research into impact.

- **The use of research on imaging to predict survival rates and optimise treatment planning in cancer patients**

  This case study presents the development and delivery of dual-use research through collaborative inter-disciplinary research and a joint venture, in which 'sweat equity' has provided the capital. Ultimate beneficiaries will be patients and health systems.

- **Improving gas turbine engines**

  This case study describes the impact that has resulted from long-term relationships with aero-engine designers and manufacturers, focused on improving efficiency and hence having both economic and environmental impact. The companies have commissioned contract research, from which they have the rights to exploit all the foreground IP.