Impact template (REF3a) UOA 11: Computer Science

1. Context The University has a long traditional of applied research in computing, and has developed work which is having impact at national and international levels. Our research has always been undertaken in collaboration with partners from business and industry, so planning for impact has been natural to us. The unit recognises the link between research excellence and impact, and encourages staff to work collaboratively to produce economic and social benefits from research projects by developing links to improve the economic competitiveness of our partners.

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

Our research has always been applied, so developing impact with stakeholders comes naturally to us. We employ a multi-faceted model of knowledge exchange, which is centred around our research, and has the following critical elements:

1. *University research and education as core:* we recognise and promote that the University has a key role in the development of the people within the city and the region, and the delivery of useful results to our many partners;
2. *Built on strength:* our projects build on our significant strength in Computer Science and Informatics research;
3. *Collaboration:* our approach is founded upon a wealth of strong and long-standing collaborations, which transcend the life-time of particular funded projects;
4. *Clear business need:* there is a clear business case for all of our collaborations, and the impact for our partners is clear and planned from the outset;
5. *Multi-action approach:* we use a plethora of regional and national funding opportunities (e.g. Knowledge Transfer Partnerships, Collaborative Innovation Partnerships and EU funding) to support the implementation and impact of our work.

This model has been applied in many contexts, and has been reported in the following journal paper: Hall, L., Irons, A., MacIntyre, J., Sellers, C., & Smith, P. (2010). *Sunderland Software City: An Innovative Approach to Knowledge Exchange in the North East of England*, Journal of Research in Post-Compulsory Education 15(3), pp 317-327.

Examples of how this model has been applied from 2008 include:

- The regionally funded Sunderland Software City (SSC) project that has created numerous strong and deep linkages with regional companies and organisations. The nature of the funding has been such that we have been required to demonstrate and evaluate our interactions with software companies in the region, and the resultant impact.
- The successful operation of a large cluster computer, funded by SRIF. To maximise its usage from the outset it was determined that the cluster should be a general purpose machine and not designed solely for a specific area of application. The cluster has been used to develop software to support R&D for a range of applications including drug discovery (working with our colleagues in pharmacy and their partners) and our collaboration with BT (as presented in one of our case studies).
- The unit's purpose-built usability laboratory. This is equipped with dedicated usability analysis software and eye tracking technology. It has been used to apply research-based usability techniques (developed by McDonald) within a range of consultancies for clients including, for example, Nexus.
- Five highly successful, completed, software-based KTPs with Tait Walker, Tombola, Orchidsoft, Xact PCB and Imprint Creative Print Solutions. These KTPs have drawn upon our computing research to increase productivity and create new jobs, as evidenced in our Sunderland Software City case study. Other KTPs are currently on-going,

3. Strategy and Plans for supporting impact

The University recognises the importance of applied research, industrial collaboration and knowledge transfer. We have always set out to engage academic staff in meaningful collaborations with industrial partners, although historically there has not been a formal impact

strategy, The aim has been to embed this engagement within the culture of the unit, 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
- Collaborative activity embedded within our activities, as part of the Corporate and Academic Strategies.

There are several key components to this integrated approach:

- *The Corporate Strategy.* This articulates our vision as a civic University, and aims to make an outstanding contribution to our city and region.
- *The Academic Strategy.* This takes the vision and clearly identifies (i) research and (ii) teaching and learning, as equal partners: as part of an integrated and blended continuum of activity for all academic staff.
- *The Research Plan.* This sets out a vision for applied research leading to a research-informed university with clear objectives and targets.
- *The Framework for Personal Development and Career Progression for Academic Staff.* This provides a clear career progression pathway for academic staff engaged in applied research activity.
- *The University and Faculty Research and Innovation Committees.* These (i) determine strategy and tactics, (ii) set and monitor targets, (iii) identify and take advantage of opportunities, (iv) implement appropriate academic governance.
- *Faculty-level responsibility*. Each Associate Dean (Research) has executive responsibility for impact at unit level.
- *The central Research, Innovation, and Employer Engagement service (RIEE).* Our knowledge-transfer professionals work to implement the strategies outlined above.
- *Comprehensive Workload Models.* These map the workloads of individual academics, enabling them to be balanced to provide the opportunity for the development of research impact.

The combination of these key components provides a thread through from the highest level in the University, to the practical development of academic staff and to support impact within the unit.

At the unit level our previously implicit approach is being made explicit. We are basing it upon the Research Council UK (RCUK)'s "Pathways to Impact" approach. Thus, Principal Investigators are required to produce impact plans at project level. Impact opportunities may arise at any stage (during or after a research project) therefore, it is important to have plans in place to create and optimise such opportunities rather than relying on serendipity.

In collecting the evidence for the two case studies the following factors became obvious: the need to (i) collect data and evidence *when they arise*, (ii) maintain collaborative links after the formal end of a project, and (iii) disseminate project results in a range of media. Therefore, our 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.

In addition the unit has established, and is expanding, a range of mechanisms to facilitate, support and maximise impact, including:

- An Industrial Advisory Board (IAB) which meets quarterly, and consists of senior computing specialists from, for example, Sunderland City Council, BT, Sunderland Software City and British Airways, and helps shape our research programmes.
- A LinkedIn group for our staff and (potential, current and past) collaborators to facilitate discussion of current and future projects.
- Formal collaborative clusters, built on a similar model to the department's highly successful AMAP (Automotive and Manufacturing Advanced Practice) centre which is a research and

consultancy centre (http://centres.sunderland.ac.uk/amap/) bringing together expertise in industrial applications and digital technologies to provide a range of services to manufacturers in the region.

- An Industrial Seminar Series.
- Secondment of academic staff to our key partners.

4. The relationship between the unit's approach to impact and the submitted case studies. The two case studies are good examples of how our approach has led to significant impact for our partners.

Developing the Software Sector in the North East (Sunderland Software City: SSC): This case study is an example of how research strength, local need and regional strategy have come together to generate significant impact. The city of Sunderland has a long and established history as a focus for Information and Communication Technology, and an increasing number of new software businesses have grown within the city. An opportunity to develop this sector was recognised, and this was aligned with significant research strength in computing and our existing linkages with software companies. There is a strong ethos of partnership within the city and the region, and all of the major players recognised the strength and power which could be gained from working together. It was from all of the above that the SSC project was formed.

This can be expressed in terms of our model of working:

1. *University research and education as core:* the University and our research lie at the centre of the SSC project; indeed without our research activity the project would not exist.
2. *Built on strength:* the project builds on significant strength in computing research, and on our experiences of providing software-based research solutions to commercial and industrial problems.
3. *Collaboration:* SSC is founded upon a wealth of strong and long-standing collaborations with software companies across the city and the region.
4. *Clear business need:* there was a clear business case for the development of the software sector in the region.
5. *Multi-action approach:* SSC is supported by a number of funders, including European Regional Development Fund (ERDF) and Knowledge Transfer Partnerships (KTPs).

Development of Smart Planning Tools for BT and Network Optimisation: This case study demonstrates how long-standing collaborations, built on research excellence and a clear business need, can lead to very significant and wide-ranging impact. A series of research projects have been completed in close collaboration with BT Research Laboratories Ipswich. The research has built on the work of Professor John Tindle and colleagues who have worked with a number of staff in BT. The relationship between the University and BT is long-standing and has developed over a period of 20 years: it has involved the exchange of staff and students (both at MSc and PhD level). This research led to the development of a suite of tools used for network planning.

This can be expressed in terms of our model of working:

1. *University research and education as core:* the University and its network planning group have remained at the centre of this collaboration.
2. *Built on strength:* the project builds on significant strength in network systems, which has developed over a 20 year period.
3. *Collaboration:* The collaboration with BT is long-standing and very deep. It transcends individual projects, and is at several levels: from the strategic and executive level to the level of individual academics working directly with BT staff. Several PhD graduates have been employed to work at BT, and now continue the collaboration.
4. *Clear business need:* BT recognised a clear business case for the exploration and development of novel optimisation algorithms for network planning.
5. *Multi-action approach:* The collaboration has used BT funding, EPSRC CASE awards, as well as Masters projects to support different parts of the work over the years.