Impact template (REF3a)

Institution: Liverpool John Moores University
Unit of assessment: 11 - Computer Science and Informatics

a. Context

The staff returned in this UOA are based in the School of Computing and Mathematical Sciences and engage with the following non-academic user groups or beneficiaries for the UOA's research:

- Industry and commerce, specifically companies: Unilever, Thales, SAP, and SELEX ES Ltd.
- Government bodies and local authorities, e.g. Merseyside Fire and Rescue Service, Salford Local Authority, and Cheshire Police via the EU-funded ECENTRE project[1].
- Charities, particularly the BBC.
- Health and hospital services, e.g. Liverpool Heart and Chest Hospital, and East Lancashire Dental NHS Service.
- Ordinary computer users such as e-commerce consumers.

The main types of impact on the above user groups from the UOA's research include:

i. Economic benefits, e.g. our personalised recommendation algorithms applied by Unilever to increase its sales.
ii. Improved public services, particularly our dwelling fire prediction methods employed by the Merseyside Fire and Rescue Service to reduce fire risks so as to save lives and properties.
iii. Enhanced healthcare, including our autonomous software system developed and deployed based on principles of self-organisation to aid the East Lancashire NHS Dental service.
iv. Increased public awareness, specifically our engagement with the IEEE's Public Visibility programme to raise the public awareness of mobile security in 2011, and participation in a discussion on cyber security issues on BBC Radio Merseyside.

The School's submission to this UOA comprises 10 staff in the PROTECT Research Centre and Neural Computing Research Group (NCRG), as presented in REF5. PROTECT covers five key research areas: critical infrastructure systems, networking, cyber security, computer games and software engineering. NCRG conducts research mainly in interpretable machine learning models. Both of them actively engage in research and development as well as enterprise activities, and have produced each of the above impacts i – iv. Over 90% of the research income listed in this UOA's REF4b involves user partners in research, who have directly benefited from these impacts.

b. Approach to impact

The School has a proven record of enterprise activities and engagement endeavours for the realisation of its research impacts. It has used the approaches below to achieve these impacts:

1. Provision of enterprise services to support research exploitation: The School operates an Enterprise Unit with three academic and one administrative staff, supported by the School's Advisory Board including non-academic users (e.g. 13 of them attended the last board meeting in 2012/13). The Unit also works closely with the University's Business Development Centre. One of its main services is to build and support relationships with external partners to deliver research impacts via knowledge transfer projects, consultancy and training. For instance, the Northwest Regional Development Agency ran an innovation voucher scheme with each worth up to £7,000 for SMEs to engage with the regional knowledge base to increase their productivity and competitiveness. Our enterprise services have helped to secure 10 vouchers for this UOA to work with the related businesses.
2. Visits to companies and other organisations for research dissemination and exploitation:

---

[1] ECENTRE - England's Cybercrime Centre of Excellence Network for Training, Research and Education, total funding of €900k with €161k for the School, 01/2013 - 04/2014.

This allows the School's staff to directly engage with users to discuss the School's research and impacts on the users for research exploitation, dissemination or collaboration. For example, two members of staff gave seminars to all the BBC departments in Liverpool, London, Manchester and Surrey for research dissemination and collaboration in computer game technologies. Such visits provide good opportunities for the staff to better understand the applicability of their research to solve real problems and agilely embrace new challenges underpinned by real applications.

One way to facilitate the staff visits is through the student placement scheme managed by the School's Enterprise Unit that placed 130 second year students in the academic year 2012/13. Each placed student is assigned a member of the School's staff as a supervisor with at least two on-site visits to the student's company or organisation. The visits discuss not only the student's performance but also opportunities for research exploitation with the company. This approach helps bring collaborative projects to the School, e.g. our projects with Merseyside Fire and Rescue Service with impacts on saving lives and properties.

3. Targeted research dissemination for impacts: The School encourages and funds research dissemination via targeted conferences, journals, exhibitions, working groups and research networks involving research users. For example, the School supported over 25 conference attendances a year since 2008. These provide opportunities for the staff to interact with people sharing similar subject interests and develop collaborations for research exploitation. For example, our on-going project with Thales Research and Technology (UK) Ltd was forged via an international conference to exploit our security research for practical solutions.

4. Direct exploitation of research findings for impacts: The School supports the identification of research findings that are of commercial value and directly exploitable by the School or University, and facilitates their commercialisation. This approach speeds up the process of the research outcomes reaching their users or beneficiaries. For instance, four patents have been lodged from this UOA's research since 2008, and one spinout company created to commercialise one of the patents (http://www.cms.livjm.ac.uk/nistl/?to=forsigs), which has particularly benefited Merseyside Police for efficient and reliable digital forensic analysis.

5. Seeking call-for-proposals opportunities to work with users: There are several funding sources such as the EU, EPSRC and TSB, which offer excellent opportunities for exploiting advanced research directly with potential users. This approach enables the research findings to have impacts closer to those users really need. For example, our on-going EU FP7 project ANIKETOS with a total grant of €9.6m involves 10 industrial partners including SAP - the world's largest business software company. It uses real application scenarios (e.g. telecommunication services and air traffic management) from these partners to develop secure and trustworthy composite services, which will have significant positive business impacts directly on these partners and others in the similar sectors. Such impacts are also applicable to two EPSRC CASE studentships awarded to this UOA since 2008.

6. Release of open source or free software for widening user acceptance: The School's research has produced software prototypes for the implementation and evaluation of our research findings. Making them freely accessible helps to accelerate their further development through collaboration with other developers, and to facilitate their wider acceptance by users, so as to generate bigger impacts from the research. For example, the Homura game software development tool produced by our project with funding from the BBC is freely downloadable at http://java.cms.livjm.ac.uk/homura/index.php.

7. Public or community engagement for awareness raising: The School encourages its staff to participate in public or community events via organisations such as the IEEE for raising the awareness of issues related to their research. This approach helps to bring the wider impacts of the research to relevant communities. For example, mobile security is an increasingly important issue for mobile users to be aware of, which is essential for countering cyber crime. The School's involvement with the IEEE Public Visibility programme in 2011 promoted such awareness based on our research expertise in the area[2].

---

[2] A confirmation email from the IEEE programme organiser is available on request.

In addition to the enterprise services mentioned above, the School and University also offer other support as stated in REF5. These include enterprise training courses, grants for conference attendance, work load reduction, promotion and pay enhancement schemes to encourage and reward staff to actively engage in research and impact activities.

c. Strategy and plans

The approaches to impact described in the previous section have been proved to be effective as evidenced in Section a. Our key strategy for achieving future research impact is to consolidate and expand these approaches for improved reach and significance. To achieve this, the School is taking two main steps to develop an impact plan. Firstly, it is reviewing its impact approaches. This includes assessing the performance of these approaches, studying business demands or market trends related to the School's research for the next six years, and seeking relevant advice from our enterprise services and existing user collaborators. This stage is intended to identify the strengths and weaknesses of our impact approaches and future directions for research impact.

Secondly, based on the review information, the School will produce an impact plan in mid 2014 for the period 2014 – 2020. This involves deciding which impact areas to focus on in relation to the School's research plan stated in REF5, how to achieve the selected impacts, and what support to provide for impact realisation. This will be done in accordance with the University's Research and Scholarship Strategy 2012-17 that includes impact as one of its components. The plan needs to ensure sustained demands for the identified impacts, effective approaches to achieving them, sufficient support and resources for the approach implementation, and strong incentives for staff participation.

The main goals of the plan for supporting and enabling future research impact will include:

- Focusing our effort on research with greater impact potential to not only achieve quality research outputs but also create excellent opportunities for their impact realisation.
- Extending our success in direct engagement with users for improving research impact, particularly by expanding our existing collaborations and targeting EU funding for collaborative projects.
- Improving staff assessment and reward measures to encourage and widen their participation in research impact activities.
- Hosting an annual alumni event to promote the School's research/impact activities among, and develop collaborations with, the School's alumni.
- Enhancing cooperation between the School's research teams and enterprise service providers within the School and University for ensuring the quicker adoption of our research by potential users, particularly with PROTECT playing an active role in the coordination.

The plan will be reviewed on an annual basis for necessary enhancement to match technology development and other changes.

d. Relationship to case studies

This UOA submission includes two case studies: Securing Networked Systems, and Fire Prevention and Community Safety. They have utilised combinations of the impact approaches described in Section b, as summarised below:

- Securing Networked Systems: This case study mainly involves the use of approach 1 for the research exploitation with SELEX ES Ltd, 3 for the collaboration with Thales Research and Technology (UK) Ltd, 4 for the creation of spinout company Forsigs, and 5 for the participation in the EU FP7 ANIKETOS project.
- Fire Prevention and Community Safety: The impact generation presented in this case study has employed approaches 1 and 2 for the collaboration with Merseyside Fire and Rescue Service, and 7 for raising the awareness of fire risk profiles in fire safety communities.

The above summary exemplifies the effectiveness of our impact approaches.