Impact template (REF3a)

Institution: University of East Anglia

Unit of Assessment: 11 – Computing Science and Informatics

a. Context

The School of Computing Sciences at UEA has a history of collaboration, in both research and development, with industry and government. In RAE 2008, the School was commended for its collaboration with industry, and we have continued to build upon this through the REF reporting period. Beneficiaries of these activities include:
- International companies and industry
- National companies and industry
- Government bodies
- Local schools and teachers
- The general public

Impact from our research occurs mainly in the following ways:
- **Consultancy** carried out through the School's own consultancy company "SYS Consulting Ltd" (*SYSCo*), a wholly-owned company of UEA established by the School in 2000. *SYSCo* gives industry, business and government direct access to expertise in the School, and its website (http://www.sys-consulting.co.uk) advertises consultancy expertise within all three of the School's research labs. *SYSCo* was the first consultancy company to be formed at UEA and has been used as model for the University's overarching company *UEA Consulting Ltd*. Within *SYSCo there are "brands" such as* the *Urban Modelling Group* (http://www.uea.ac.uk/computing/urban-modelling-group) and *Virtual Past* (http://www.uea.ac.uk/computing/virtual-past), the latter being a collaboration with the School of History at UEA.
- **Spin-out companies** based on technology developed by the School, and sometimes incubated through *SYSCo*.
- **Software** based directly on research undertaken in the School that is freely available for professional and public users. For instance, we provide a library of downloadable bioinformatics software (http://www.uea.ac.uk/computing/software), which is used by biologists, clinicians, and other professional users.
- **Short courses** for business and industry, which are based on our research (http://www.uea.ac.uk/computing/continuing-professional-development).
- **Engagement** with local schools and teachers by providing academic "taster" sessions for students and exposing students and teachers to some of our research interests e.g. digital animation, speech processing. We host the Norfolk Hub of Computing at School, an initiative to promote the uptake of computer science at GCSE and A-level, as opposed to ICT, in line with recent Government policy.
- **Presentations** on research to technical meetings of organisations such as the Institution of Engineering and Technology (IET) and the British Computer Society (BCS).
- **Publicity** about research in national and international press, TV and radio.

b. Approach to impact

Much of the School's enterprise activity is focused through *SYSCo*, which has an average turnover of £200K per annum in a range of technical areas, including graphical modelling, animation, audio processing, computer vision and statistics. *SYSCo* projects vary from development activities for companies to industrial research projects. The latter sometimes lead to larger awards from companies or from the government, or to spin-outs, as in the case of *Syrinix* and *DigiSize* (as detailed below). Work commissioned by *SYSCo* is undertaken by both faculty and research assistants. In addition, spin-out companies and several brands operate through *SYSCo*, focusing the impact of the School's research and helping launch students into commercial ventures. Recent highlights include:
- Online shoe-fitting applications for *Start-rite* (a locally-based company) based on image processing research by Bangham and Tattersall (ex-CMP lecturer) which led to *Start-rite*'s

click'n'fit technology (http://www.startriteshoes.com/fitting/measure-at-home/), a system that enables customers to upload photographs of their children's feet, which are then automatically measured online and shoe fittings offered directly to them.

- Signal processing for leak detection, originally developed under the EPSRC Water Industry and Treatment Engineering (WITE) programme. Subsequent contracts with *Thames Water*, led to the spin-out company *Syrinix* (http://www.syrinix.com) with Linford (ex-CMP PhD student/RA/Lecturer) as Technical Director. *Syrinix* won the National Clean Tech Award for innovative water leakage solution in 2011.
- Speech processing consultancy by Cox for *ei technologies Ltd.* led to a Technology Strategy Board award for £150K to develop a smartphone app to classify emotion from speech.
- *SpectralEdge Ltd* is a spin-out from Finlayson's work in the area of image fusion. It is based on research from two EPSRC grants. It has already won proof of concept funding and ICENI Seedcorn Fund Pilot Project funding, plus UEA strategic investment and angel investments. It has one full time employee (PhD graduate from UEA) and is currently protected by two patents.

The *Urban Modelling Group* (UMG) within the School of Computing Sciences demonstrates exploitation of the School's research in collaborations with industry and local public bodies utilising automatic modelling software developed by the graphics research group. UMG has employed five RAs who had previously been undergraduates in the School. *SYSCo* provides essential support for business promotion, finance and contract provision. During the reporting period, UMG gained contracts worth in excess of £160K from local government, building developers (e.g. *Clayland*), architects (e.g. *Fielden and Mausen*), international tourist companies (e.g. *Great City Attractions*) and heritage organisations (e.g. *Norwich Heritage Economic & Regeneration Trust*, HEART (see http://www.heritagecity.org). In 2009, Day founded *Virtual Past* (VP), a collaboration between the Schools of Computing and History at UEA, primarily for the 3D modelling and reconstruction of historic events and places. This has secured funding from AHRC and HEART for several projects including 'The Norwich Castle Museum' and 'Walberswick in WW2'. *Virtual Past*'s activities have recently extended to historic database expertise, supported by an AHRC grant of £900K on the digitisation of the MagnaCarta and 'Historacle' (http://www.heritagecity.org/projects/historacle.htm) a KTP with HEART.

One of the most effective means through which the School's research has direct impact is via the software that it produces in collaboration with end-users, for professional and public users. Highlights in this REF period include:

(i) 3D visualisation software for medical images jointly developed by Lapeer and *RMR Systems Ltd.* through EPSRC-funded research (http://www.rmrsystems.co.uk/volume_rendering.htm). This is used by researchers, clinicians, scientists and students across the world and has been downloaded more than 15,000 times.

(ii) The BBSRC-funded UEA small RNA Workbench software (http://srna-workbench.cmp.uea.ac.uk). Since its release in 2012, this has been downloaded more than 3000 times, and is used in various research and industrial institutions including the Beijing Genomics Institute and *Xcelris Genomics Ltd*.

During the reporting period, the School increased its engagement activities based on the School's research by organising a number of academic "taster" sessions for schoolchildren in areas such as computer programming, writing computer games, speech processing, and digital animation. In 2008/09 we developed specific robot programming courses to be held in schools and colleges across East Anglia. In 2009/10 we coordinated 77 sessions involving over 1300 students; and in 2010/11 60 sessions were run with over 1100 students involved. Our engagement activities are modified to suit all age ranges from Year 8 to Further Education, and also to suit a variety of abilities, targeting both Widening Participation and Gifted & Talented students.

The School has also disseminated facets of its research expertise through a programme of short courses run throughout the reporting period. These are designed to help businesses and other organisations improve their skills, and capacity to analyse and obtain value from their data. Examples include 'Knowledge Discovery and Datamining' (a five day course) and 'Analysis and Dependence Modeling using Multivariate Copulas with Applications' (a two day course).

Support for impact

The University supports enterprise activity by, *inter alia*, providing a Proof of Concept Fund for commercialising research, to which the School made eight successful applications during the period; providing accommodation for start-up companies at advantageous rates; giving access to the ICENI Seedcorn Fund (http://www.icenifund.com) for early venture capital funding; supporting buy-out for researchers working in industry; and supporting patent costs. For example, ICENI funded the early development of Finlayson's spin-out company *Imsense Ltd.* which is the basis of one of our impact case studies.

The School has a Director for Enterprise and Engagement who is also the CEO of *SYSCo* and who sits on the School's Executive Team to ensure that both enterprise and engagement are embedded within the core activities of the School. The School's workload model encourages enterprise activity, and engagement in general, by allocating time for both. In addition, faculty are supported by being further credited for additional engagement and enterprise activity within the workload model. Part of the overhead that *SYSCo* charges for consultancy done using School or University facilities is funnelled back to the School to support further enterprise activities.

c. Strategy and plans

A key component of the School's strategy is to identify and develop strategic industrial partners. Currently, these include *Apple Inc.*, *Aviva plc.* and *The Walt Disney Company Inc.*, with whom it aims to strengthen its ties over the next five years through alumni employment, faculty secondments, internships, consultancy and research interaction. Additionally, *SYSCo* and *UEA Consulting Ltd.* will continue to drive the School's consultancy base through its rich database of contacts.

A new £15M Norwich Research Park (NRP) Enterprise Centre will open in 2014 and provide added focus for developing commercial activity from research undertaken across the NRP. The School aims to use this as an incubator for spin-out companies from faculty and students. Successful spin-outs can then move into the new Centrum building for innovation, which is being constructed on the NRP as part of a £26M investment by the Treasury in March 2011.

All enterprise and engagement activities now feature alongside teaching and research in the probation and promotion criteria for UEA faculty members. In additon to encouraging consultancy activities, the School actively seeks opportunities for impact by engaging with PIs throughout their research grants to identify IP assets and potential for commercial exploitation. There are also programmes to encourage entrepreneurship that are targeted on research assistants and PhD students, who are ideally placed to take forward opportunities to maximise the impact of their work.

The School will continue to grow its offering of short courses to industry, based on in-house research expertise. These also offer a conduit for ideas to feedback in the opposite direction, with ideas from industry leading to previously unforeseen collaborations. The main focus will be on the financial and health sectors, which present an exciting opportunity for growth in courses for analysis of large datasets.

d. Relationship to case studies

Each of the three submitted case studies exemplifies different aspects of the School's approach to, and delivery of, research impact. **Imsense Ltd: The Pursuit of Perfect Photographs** illustrates how the School supports a faculty member to spin-out a research idea to a company. Finlayson was supported by the School to carry out research, part-time at *Imsense Ltd*, and also through targeted PhD studentships, financial support for his Royal Society Wolfson Research Merit Award, Proof of Concept funding, and investment in dedicated laboratory facilities. **Avatars for Visual Communication** illustrates the School's engagement with members of a minority community, exploiting our research to develop technology to enhance their lives. **Improved Insurance Products for the Multinational Insurance Industry** is an example of the School's work with a large international corporation, *Aviva plc.*, and the development of a long-term strategic partnership which has been mutually beneficial.