Title of case study: Sunderland Software City: Developing the Software Sector in the North East – UoA 11

1. Summary of the impact

Building on excellent computer science research, carried out in a number of applied research centres, the University has taken a leading role in the establishment and development of the software sector in the North East. This has resulted in a regional strategic approach, which has delivered significant social and economic benefits, with impacts including the creation of jobs, SME growth, cluster establishment and inward investment. Sunderland's applied computing research has also resulted in an increase in innovation and research in software SMEs and has impacted on the perception of Sunderland as the heart of a regional software cluster.

2. Underpinning research

The research which underpins the Sunderland Software City (SSC) initiative has produced novel results in several aspects of software development and was situated within a number of research projects (Hall et al, 2010):

- The Centre for Adaptive Systems (CAS), led by Professors MacIntyre and Smith during the period 1995 – 2004, developed and applied novel adaptive computing and intelligent systems techniques (including neural networks, genetic algorithms, and expert systems) to industrial and business problems. Over £1 million of ERDF funding supported work with over 150 regional SMEs, as well as collaboration with larger companies including: British Nuclear Fuels, Nissan Motor Manufacturing UK, Corus Steel, BAE Systems, Reuters, OCF, BT, ActiveMedia Tekniker in Spain, Dassault Systems in France, TK Krates in Estonia, and Harlow Butler in New Zealand. SMART Software for Decision Makers (SSDM) also led by Professor MacIntyre, with Dr Oatley, was a Department of Trade and Industry (DTI) initiative running during the period 1998 to 2000 (Oatley et al, 2002). It was one of only two UK demonstrator clubs established to facilitate technology transfer between academia and industry, in the areas of intelligent systems. This work led to the award of a HEFCE Business Fellowship to Professor MacIntyre. These projects resulted in a suite of novel artificial intelligence algorithms, applied to the solution of industrial and business problems. In addition, lessons were learnt about how to develop demonstrator systems for industrial clients. These lessons were presented in Oatley et al (2002).
- The EPSRC-funded RAMESES (Risk Assessment Method: Evaluation Strategy for Existing Systems) project, led by Professor Edwards with support from Research Fellow Dr Mallalieu (Edwards & Mallalieu, 1999) developed a risk assessment method for SMEs to use when considering information systems change. The work focused on applied socio-technical approach to systems, studying both technical and contextual elements of software engineering. EPSRC also funded the development of a masters module for industry (SMEs) "Risk Assessment of Business Process and IT Systems Change" (part of the Integrated Graduate Development Scheme) which was based on this research project A parallel research track, led by Dr Nelson produced novel information systems formalisms (Rossiter, Nelson & Heather, 2003). This project provided insights into approaches for introducing systems into organisations.
- Dr McDonald, Professor Cockton, and Dr Hall, with support from Research Assistant Dr Monahan led HCI research on methodology and design innovation (Cockton, 2006) and developed novel effective approaches to evaluating systems (McDonald et al, 2006). Their work was embodied within the Digital Media Network (DMN, 2002-4) and NITRO (2004-5) projects, which focused on industry network and cluster establishment. The Digital Media Network had a membership of over 110 regional digital media companies, and grew out of an earlier network, the Multimedia Club, launched by the University. This led to the award in 2003 of £1.4M ERDF funding for the North East IT Reach Out (NITRO), project which was a £3.6M collaboration between Newcastle, Northumbria, Sunderland and Teesside Universities (with additional £280K private sector contributions). This in turn led to the establishment of regional cluster support agent Codeworks, which was officially launched at the IT Works 2004 fair in Newcastle in 2011, providing services across a wide range of digital media and technology-related disciplines. This research provided insights into working with clusters of companies.

These three broad research initiatives thus produced the following insights which underpin the impacts presented here: (i) experience of developing novel algorithms for business and industrial

partners, and working with local software companies to convert these into software demonstrators, (ii) establishment of a set of principles which underpin the introduction of systems into organisations, and (iii) a clear need for clustering; with networking between SMEs, support agencies and Universities seen to be critical factors (Hall et al, 2010).

Staff involved in the research collectively developed a wealth of research experience in software algorithm development, introduction of software into organisations, and working with and supporting clusters of companies. The staff involved are: Prof John MacIntyre (Professor and Dean, 1992 - present), Prof Peter Smith (Professor, now Emeritus, 1981 - present), Prof Helen Edwards (Professor, 1993 - present), Dr Lynne Hall (Reader, 2002 - present), Prof Gilbert Cockton (Professor, 1997 - 2009), Dr Sharon McDonald (Reader, 1998 - present), Dr David Nelson (Senior Lecturer, 1999 - present), Dr Giles Oatley (Senior Lecturer, 1997 - 2007), Dr Gill Mallalieu (Research Fellow, 1997 - 2000), and Dr Kelly Monahan (Research Assistant 2004 - 2008).

3. References to the research

1. Cockton, G. (2006). Designing worth is worth designing. In Proceedings of the 4th Nordic conference on Human-computer interaction: changing roles (pp. 165-174). ACM. *This paper proposes novel principles of design in relation to computer systems.*
2. Edwards, H. M., & Mallalieu, G. M. (1999). RAMESES: A method for evaluating change in small organisations. In Software, IEE Proceedings- (Vol. 146, No. 3, pp. 137-144). IET. *This paper presents the results of the EPSRC funded RAMESES project, which is a method to assist small organisations (SMEs) in evaluating the effectiveness of information system changes.*
3. 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. Research in Post-Compulsory Education, 15(3), 317-327. *This paper presents the origins of the Sunderland Software City project, and the novel model of knowledge exchange which underpins it.*
4. McDonald, S., Monahan, K., & Cockton, G. (2006). Modified contextual design as a field evaluation method. In Proceedings of the 4th Nordic conference on Human-computer interaction: changing roles (pp. 437-440). ACM. *This paper presents novel work on usability and HCI evaluation.*
5. Rossiter, B. N., Nelson, D. A., & Heather, M. A. (2003). Formalizing Types with Ultimate Closure for Middleware Tools in Information Systems Engineering. In ICEIS (1) (pp. 366-373), International Conference on Enterprise Information Systems. *This paper presents a formalism, based in category theory, for middleware tools.*
6. Oatley, G., MacIntyre, J., Ewart, B., & Mugambi, E. (2002). SMART software for decision makers KDD experience. Knowledge-Based Systems, 15(5), 323-333. *This paper presents the lessons learnt from the SMART software for decision makers project, including work on KDD (Knowledge Discovery in Databases).*

Papers 2, 4 and 6 are representative of the quality and range of subject matter of the research. The research has been supported by a range of competitively won funding including DTI funding (Smart software for decision makers), EPSRC research grant (RAMESES), and regional ERDF funding (CAS, DMN, NITRO). Total funding support is in excess of £2M.

4. Details of the impact

The research work presented above resulted in a toolkit of software solutions, applied within several different companies, and a set of experiences of, and principles for, working with the software sector in the region. These research experiences, knowledge and expertise led directly to the formation of Sunderland Software City. Sunderland Software City was formed in 2008 as a partnership involving the University of Sunderland, Sunderland City Council and the North East Business Innovation Centre. The rationale was the opportunity to promote economic growth in the North East by building on excellent computer science research in the field of software within the University and the region's existing software sector. The overall vision is: 'Sunderland Software City will establish an internationally recognised software industry centred in Sunderland and impacting the wider North East. The area will be home to innovative businesses, a destination of

choice for global software brands and a hub for a highly skilled software workforce' (Sunderland Software City Project Plan, 2008).

The birth of Sunderland Software City lay within the research outlined above, and was first formally planned in the Regional Economic Strategy launched in 2006 (Evidence 1). It initially set itself the target of creating 150 software businesses and 1500 jobs over the medium term. The Sunderland Software City project secured regional funding in 2009, to deliver a range of services and activities to support the growth of the regional software sector. The University received £566K ERDF and £1.5M Single programme funding for our element of the project. The extent of the impact (between 2009 and 2011) in quantitative terms is: 78 jobs created; 32 businesses created; 70 businesses engaged in new collaborations with the knowledge base; and 92 SMEs assisted. These outputs have all been achieved directly by the University and are evidenced within the project reports returned by the University as a requirement of the regional funding (Evidence 2).

The development of this initiative was reported in the joint UUK/HEFCE report of 2009 (Evidence 3): "*Sunderland Software City was set up to encourage the growth of the software industry in the north-east of England. The aim is to make the region a location of choice for software-focused businesses and thus contribute to economic growth. The University of Sunderland helped found this project through its strength in computing and digital media research. As part of this it used QR funding to set up initiatives in support of software and digital media in the region."*

In working towards its vision, SSC's business strategy and service offer is organised around the four key work streams of: Enterprise; Education; Innovation; and Infrastructure. It also has a focus on improving the awareness and perceptions of Sunderland and the North East as an important software industry centre, supporting its efforts to attract investment and skilled workers to the area. A Software Centre has been created in a new, specialist accommodation centre and growth hub for software businesses located in Sunderland City Centre, which opened in 2013, offering 53,000 sq ft space for more than 60 businesses.

A Software Hatchery was established in the University in 2010 (Evidence 4). The Software Hatchery provides office space, facilities and mentoring to enterprising graduates and entrepreneurs with innovative software business ideas. We promote networking with potential funders, developers and partners. To date it has supported over 20 software businesses including: Acrylic Monkey Fish**,** Accessible Business CIC**,** Angler Games**,** Connect Portfolios**,** design-swine**,** Freaky Weasel**,** Grim Legacy Productions**,** Online Video CV Limited**,** SGIT**,** SR7 Ltd**,** Sweet Digital Media**,** SMS Events**,** Think Pixel**,** and Virtuteq. One example of how the hatchery has enabled the exploitation of our research is LamasaTech, a highly successful company which was established by a graduate of the University, ME. LamasaTech specialises in interactive screen technologies, and, drawing on our research in HCI as led by McDonald and Cockton, *"focus on developing robust applications that are practical, user friendly and effective in various industries and sectors. Our vision is to enhance every day interactions with a touch of technology."* The company is based in the North East, with satellite companies in Saudi Arabia and Egypt, currently employing 17 staff (Evidence 5).

The project has also been the catalyst for the formation of a number of regional software companies. One example is OnePoint Systems which was formed by a University graduate, supported by the University and Sunderland Software City. The graduate drew on our expertise in databases to develop a Production Management System for local company Washington Envelopes, which led to the formation of the spin-out company OnePoint Systems. OnePoint collaborated with the University through a KTP to create an advanced data streaming system, based upon university research into databases as led by Nelson. This resulted in the creation of 10 jobs within the company and the launch of a worldwide product in 2009 (Evidence 6).

Another significant impact of Sunderland Software City has been the establishment of 9 software related KTPs, including a very successful programme with Orchid (2010 – 2012, Evidence 7). Working with the University, Orchid created a new product Orchidnet, an intranet solution for companies of all sizes and for a global mass market. Orchid had extensive software knowledge;

however, they had a clear knowledge requirement when it came to modern development methodologies and technologies. The University provided research expertise in database design and emergent software development practices to enable Orchid to produce the next generation of their intranet product.

A KTP with another software company, Imprint, was graded A, which is “outstanding”, and helped the company grow year-on-year by 30% and produce revenue gains of up to £2m through increased efficiency and new client wins. This has, in turn, led to an increase in staff from 40 to 70. This programme drew on research expertise in databases and management information systems (2011 – 2013, Evidence 8).

The overall impact of the Sunderland Software City project is discussed in a recent publication (2013, Evidence 9) and can be corroborated by the Chief Executive of Sunderland Software City (Evidence 10). The project is a regional collaboration, however, it would not have existed without the university’s computing research alluded to above, and all of the impacts presented here are as a direct result of the work of the university.

5. Sources to corroborate the impact (indicative maximum of 10 references)

1. Leading the Way, Regional Economic Strategy Action Plan 2006 - 2011, See page 19 -21, http://www.newcastle.gov.uk/sites/drupalncc.newcastle.gov.uk/files/wwwfileroot/planning-and-buildings/planning/res_action_plan_may_2007.pdf
This document evidences the role of the University’s research in the formation of Sunderland Software City, and how it has been placed at the core of the software sector within the region from 2008 to the present.
2. ERDF and Single Programme project reports, with evidence of quantitative outputs of impact. Copies of reports available from the University (2010).
3. UUK and HEFCE report (2009), Securing world-class research in UK universities: exploring the impact of block grant funding, see section “*University of Sunderland: Building a software city”, p 7 -8, available at*
http://www.universitiesuk.ac.uk/highereducation/Documents/2009/WorldClassResearch.pdf
This document evidences our use of research results to form a software and digital media cluster, on which Sunderland Software City was built.
4. Launch of Software Hatchery, Newcastle Journal, July 2010
http://www.thejournal.co.uk/business/business-news/entrepreneurs-hatch-plans-transform-sunderland-4454054
5. Lamasatech, http://www.lamasatech.com/ Testimony can also be provided by the CEO.
6. Formation of OnePoint Systems, Press release February 2009, appeared in Newcastle Journal and other newspapers.
http://www.thefreelibrary.com/Winning+entrepreneur+hopes+for+tips+from+his+local+hero.-a0194384933
7. Orchid Software (2012). http://www.orchidsoft.com/blog/article.asp?id=456
8. Newcastle Journal: “Imprint Group: Software graduate helps firm generate £2m of new business” (2013)
http://www.thejournal.co.uk/business/imprint-group-software-graduate-helps-5777917
9. Paper discussing impact of project. Dunn D, Irons A, Smith P and MacIntyre J, (2013). Sunderland Software City: The Impact of a Collaborative Project to Develop the Software Industry Within the North East of England, *GSTF International Journal on Computing* (JoC), Vol. 3, No. 2, pp 98 - 102. DOI: 10.5176/2251-3043_3.2.263
10. Chief Executive of Sunderland Software City