Institution: Coventry University

Unit of Assessment: 11

a. Context

Research within the Unit reflects a commitment to the development of software and systems which solve real world problems and create impact. It is organised around three research groups: (A) Distributed Systems and Modelling (DSM); (B) Intelligent Systems (IS); and (C) Serious Games (SG). The **main types of impact** resulting from the Unit's research are economic, public policy, security, health and environment. The main **beneficiaries** of the research include companies, health organisations, the military, and the public.

b. Approach to impact

The Unit has established a structured seven-stage approach to manage and grow engagement with companies and organisations. The process is: (1) identify the research problem; (2) engage with stakeholders; (3) secure research funding; (4) execute research; (5) disseminate research findings; (6) exploit research; and (7) generate impact. Not all projects follow this process in its entirety, so we allow flexibility in its use. For example, stages (1) and (2) may interchange in sequence. Often stakeholders come to us with problems they cannot solve and we develop research programmes to solve them. Occasionally engagement with stakeholders may be delayed until the dissemination stage. The Unit is supported throughout the process by the University, which provides a number of specialist facilities and staff to support the research groups in developing research and delivering impact. This includes the Business Development Support Office (BDSO) who predominantly support stages (1) – (3) of the process. In addition, the Enterprise Unit supports stages (2), (6) and (7) and the Marketing and Communications Department supports stage (5). The University also has an extensive structure in place to support staff development. In terms of facilities, researchers have access to resources, such as the High Performance Computing cluster.

Nature of Interactions and Impact Achieved

The research groups interact with key beneficiaries to develop impact from the Unit's research using a range of different methods, all of which can be linked back to the process of translating research into impact, as detailed above.

- **Work with Practitioners to Develop New Products (Stages 1-7)** – Examples include, an EU funded project in the area of home energy systems carried out by DSM researchers which has led to the development of a commercial product, EnergyHive. This has had significant financial benefit to the producing company, Hildebrand (see case study 11.2). Our contribution was in providing underlying data models and rules for the system. Also, researchers in IS have developed a new design and manufacturing process based on the development of collaborative internet software. Organisations benefitting from this work include Douglas Connect and TANet. An early high-impact result is that this collaborative facility has been applied to drug discovery, yielding a number of viable new anti-malarial drug candidates to be trialled further.
- **Work with Practitioners to Improve Processes (Stages 1-7)** – For example, IS researchers have carried out a radiotherapy scheduling project in collaboration with Arden Cancer Centre, and University Hospitals Coventry and Warwickshire NHS Trust. It has been shown that the scheduling approaches developed by the research group can improve the waiting times in such a way as to meet the targets set by Joint Council for Clinical Oncology (JCCO). The results of this project have been published and well received but exploitation is not yet embedded. This project is an example of stages (1 - 5) of our process and we are working with the organisations to encourage stage (6) which will lead to stage (7).
- **Work with Professional or Practitioners Groups (Stages 1-7)** – Researchers work with various professional groups. For example, the DSM group have been working with teachers and trainers of Mechatronics (stage 1 and 2) in order to create an innovative Cloud System for training. The group had secured funding for the project, which is nearing completion, and dissemination of the results is currently taking place (stage 3-7).
- **Research Consultancy (Stages 1-7)** – An example of the consultancy work undertaken by the Unit is the research which the SG group carried out on behalf of the Department for

Transport on the Code of Everand multiplayer game. The game was an investment of £2.7 million, aimed at increasing children's awareness around road crossing behaviour. It was played by 100,000 children in a trial between 2010 and 2011. The SG group designed and oversaw the trial and reported on the results (stages 2 to 5). The impact of the report is its influence on future government policy on the use of multiplayer games for supporting attitudinal change (stages 6-7).

- **Joint Funding Bids (Stages 1-7)** – The Unit currently holds over 30 research projects including 14 EU funded projects, with more than 200 partners including commercial organisations. Each project follows stages within the seven-stage process.
- **Joint Industry - Academic Events (Stages 1, 2 and 5)** – 'Second Wednesday' events involve academic and industrial speakers and audiences. The events have been running since 2007 with over 40 speakers per year and an online archive. These events provide a useful opportunity for networking and developing joint research initiatives.
- **Organising and Attending Trade Missions (Stages 1, 2 leading to 3, 4 and 5)** - For example, SG researchers undertook a trade mission to Paris in 2011 to visit companies, universities and embassies. This led to a new project, EduGameLab funded by the EC involving Universcience, SeriousGameLab and Microsoft France.
- **Industrial Supervisors for PhD Students (Stages 1-7**) – For example, within the SG group Playgen is co-supervising a PhD in semantic web mash-ups within games environments and Jaguar Land Rover is co-sponsoring a PhD in the area of avatar-car interfaces.
- **Public Seminars and Events (Stage 5)** – The University runs a successful series of public lectures, 'Coventry Conversations'. This provides an avenue for researchers to disseminate their work to the wider public. The University also runs a Professorial lecture series which gives the opportunity for wider dissemination. Furthermore, we have 'Business Intrigue' days designed to link researchers with local industry and business. At these days researchers present their work and communicate with interested businesses.

Support for Research-active Staff

The University supports staff in activities which have potential to assist in impact development:

- **Research Networking and Impact Planning** – RAE 2008 QR funding has been used to enable researchers to attend conferences, funder meetings and networking events.
- **Industrialist in Residence** – The University's 'Industrialist in Residence Scheme' facilitates engagement with industry to generate impact at an international level. For example, the Unit recently hosted Dr Zeeshan Usmani, Chief of Research at InterActive Group, Islamabad, Pakistan, to collaborate on the development of intelligent systems to counter terrorism.
- **Higher Education Innovation Funding (HEIF)** - The University has used HEIF funding to appoint researchers, such as **Petrides** and **Dunwell**.
- **Public Relations** – Successful research projects are disseminated to industrial, commercial and other organisations through the University research magazine, *Innovate*. Researchers from this Unit have featured in the publication (**Chao, de Freitas, Petrovic**). Researchers are also encouraged to give seminars both inside and outside the University to bring research to the attention of potential stakeholders. Unit staff have benefited from media training; for example **James** and **de Freitas**. The Unit also has the support of an external, retained PR agency to bring research to the attention of the media and politicians.
- **Grand Challenges Funding** - The University's Grand Challenge programme has enabled researchers from this Unit to network with other Units to develop research programmes with impact potential. Considerable success has been achieved in terms of successful grants involving members of this Unit. This funding has supported projects at stages (1), (2) and (3) of our research process. For example, the Unit was awarded funding from the TSB and EPSRC to work with Ricardo and Unipart Ltd on a multi-disciplinary project. The project developed a system for efficient and reliable transportation of consignments, with near-real-time carbon tracking and reliable rerouting of logistics consignments on a multimodal transport network.
- **Mentoring and Joint Activities with Senior Staff** – Early career researchers are mentored by more senior staff, for example **Doctor** is mentored by **Iqbal**. During this mentoring process

the importance of impact is emphasised and the process of achieving impact is explained.

- **Embedding Research Impact** – With JISC funding (£15k) the University has developed a system, Embedding Research Impact at Coventry (ERIC), which is a methodology, and set of tools for defining, collecting, evaluating and recording impact. At the start of a research project the Principal Investigator (PI) is guided by ERIC to identify appropriate impact measures and how the evidence of impact will be collected. Post-project impact collection includes use of external organisations, such as RAND, to collect evidence independently and to evaluate the impact of large funded projects. For smaller projects ERIC provides an impact checklist to the PI and prompts for impact evidence to be collected, recorded and evaluated as part of the post-project process.
- **Start-up and Spin-outs** – The University encourages start-up or spin-out companies arising from research projects and provides support for this through CUE Ltd (Coventry University Enterprise Ltd) Project Division. Coventry University Technology Park provides a location where start-up companies and research groups can work closely together, generating a vibrant community increasing impact. An example of a successful Unit spin-out company is Serious Games International Ltd (http://www.seriousgamesinternational.com). This business was established as a result of the Unit's serious games research activity. Serious Games International Ltd is now exploiting the research outputs of the Unit. For example, as a result of the Unit's research project *Shakespeare Bytesize*, digital content has been developed and made accessible in an innovative way to visitors to Shakespeare's birthplace in Stratford-upon-Avon (**de Freitas, Dunwell**).

c. Strategy and plans

The strategy for the Unit is to continue to develop and refine the seven-stage process, detailed previously, to translate research into impact. It is anticipated that future research from the DSM group will have economic impact and environmental impact through the development of techniques for domestic energy saving and collaboration across small businesses. Research from the IS group will have impact in the development of new techniques which will improve supply chain logistics and also usability of systems in vehicles by predicting driver intent. Research from the SG group will have impact on public policy and economic impact mainly through research in the usability of serious games. The Unit's plans for enabling and supporting future impact include:

- Developing knowledge on how impact can be identified, communicated and produced, through research training and impact awareness workshops. The Business Development Support Office will also work alongside researchers to identify and develop impact from projects. Research projects will be required to have a clearly defined route to impact before support will be given.
- Encouraging staff to apply for institutional funding to support industrial secondments and staff exchanges with personnel from key external organisations, such as Jaguar Land Rover, to ensure that the Unit's research has real-world application.
- Monitoring and capturing impact from research projects, using ERIC (see section b above). The system will provide a feedback mechanism to researchers and encourages impact throughout the lifecycle of the research project. The Faculty will review impact annually and will use external consultants, such as RAND, to measure impact following the completion of the project.
- Disseminating research findings more effectively and to a wider audience. This will be achieved through better use of institutional channels, such as the research magazine, *Innovate*, and by working alongside the University's social media team who will ensure the Unit maximises impact through channels such as blogs, Facebook, Twitter and Brandwatch.

d. Relationship to case studies

Both case studies showcase our seven-step approach to impact. The Serious Games case study (**case study 11.1**) showcases how a real-world problem can be tackled by securing internal and external funding. The resulting research has provided spin-out and commercialisation opportunities. The Digital Environment Energy Management System case study (**case study 11.2**) showcases how the Unit worked with industry to tackle the problem of domestic energy management. As part of an international consortium, the research was commercialised to achieve impact.