

Institution: Teesside University

Unit of Assessment: 11, Computer Science and Informatics

a. Context

Over the reporting period, our research has been characterised by a combination of basic software technologies and practical applications, mainly in intelligent multimedia systems, which are underpinned by various Artificial Intelligence techniques (such as Planning). This provides us with a pathway to impact, because the applications we are implementing inform the development new products, whilst the basic technology part guarantees innovation and added value from the users' perspective.

Our target application areas have been digital entertainment and healthcare. Our non-academic user groups are constituted by professional users in these two different sectors of activity: computer game companies, and Healthcare organisations.

The primary type of impact is change in process and technology, through the adoption of research results in the form of direct software provision or licensing, or through take-up of our published research results to generate new technology.

b. Approach to impact

We engage with key users in a focussed way adapted to our main research topics and potential application areas. We have followed a two-stage empirical approach in which we establish informal contacts through standard scientific dissemination activities, moving to establish collaborations and eventually formalising such collaborations through joint projects. This approach has been followed consistently through our various target application areas.

The first stage is to take advantage of the industrial representation that characterises academic conferences in specific subjects like Entertainment Computing and Artificial Intelligence in computer games. From the AAAI Spring Symposia on Artificial Intelligence in Computer Games, Interactive Entertainment (various editions between 1999 and 2002) to the establishment of the annual Artificial Intelligence in Interactive Digital Entertainment (AIIDE) conference, there has been a small-scale, but very regular, attendance from the game industry, mostly as delegates, with whom we have been able to engage. As an illustration, we successfully published joint work with the computer game industry in one of these venues as early as 2001. From these early collaborations we were then able to explore informal projects, until we were finally able to apply jointly to the Technology Strategy Board in 2004. It is generally recognised as very difficult to engage with the game industry at large due to its fragmented structure, limited R&D budgets and product lifecycle, etc. However, we have been involved/participated in initiatives to improve this situation, such as the academic/industrial EPSRC Network on AI and Games (over 15 UK game companies).

In a more proactive fashion, we have actively participated in relevant professional conferences. In the field of computer entertainment, Cavazza was panellist at Imagina 2003, Imagina 2005, the International Broadcasters Convention 2005, and an invited speaker at CEDEC 2010, the conference of the Japanese digital entertainment industry, with a further participation in CEDEC 2011 as delegate.

In the field of Health Informatics, we have regularly participated in the Artificial Intelligence in Medicine conference (presenting work in 2003, 2007, 2009, 2013). This is a conference that always includes a significant element of end-user participation. We have also attended the Guidelines International Network (GIN) annual conference (2011, 2013), which is the most relevant event to our work in Medical Document Engineering. Through this regular attendance, we have established links with various professional users, including the French Health Authority (Haute Autorité de Santé), with whom we have collaborated since 2007.

European funding initiatives, and in particular the successive Framework Programmes (FP),

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constitute an environment in which cooperation with industry and user bodies is encouraged and facilitated. The ICT conferences and exhibitions organised [periodicity], attended by over 4000 professional visitors on average, offer the opportunity to meet and engage with users. We have actively participated in three editions:

- IST 2000 (Nice, France): panel on “games and on-line communities” chaired by Cavazza, with representatives from the game industry (Lionhead Studios, Maxis) and specialist press (Edge)
- ICT 2008 (Lyon, France): participation in the ICT exhibition, with our multimodal interface demonstration featured in the Euronews coverage of the event
- ICT 2010 (Brussels, Belgium): participation in the ICT exhibition, with our virtual character demonstration featured again in the Euronews coverage of the event

The unit provides impact specific support to staff in terms of resources and information. A business development manager in the School of Computing, liaises with appropriate structures in the University. Enterprise allowances are granted to staff, supporting exploratory contacts with industry, travel and attendance to outreach events, and information days about joint funding schemes with industry or users (Technology Strategy Board, European Commission).

The University has invested significantly in a digital enterprise agenda, which explains that most of the support structures are actually centrally managed. The University is host to different central structures, which play relevant roles to develop research impact, principally around Enterprise. The Department of Academic Enterprise (DAE) is 40-staff strong and provides support at all levels of knowledge transfer (including IPR protection, licensing, knowledge transfer and business development). Over 30 academic staff in the Unit have received one-to-one training in enterprise development and exploitation of research results; all research students and Research Assistants receive an introduction to IPR as part of their induction process. DAE also runs “Searchcamp”, a 13-week intensive accelerator programme delivered on campus to 8 teams of people (30 individuals) seeking to establish digital businesses.

The University has launched the Digital City initiative, which includes several structures such as Digital City Innovation (DCI) and Digital City Business. DCI runs a fellowship programme to promote business creation, and organises workshops on business plans, fundraising, as well as various master classes and mentoring activities. The University has been awarded the 2013 Queen’s anniversary prize for its support to the creation of new businesses, in particular graduate companies.

The Institute for Digital Innovation (IDI) represents the physical arm of Digital City, by providing joint office space in the Phoenix building (on the main University campus), for research units as well as start-up companies at an early stage. An entire floor of the building is dedicated to hosting such companies (including amBX, 13strides.com, Datum360). This creates an environment for the exchange of ideas and the identification of user-led problems as well as the take-up of research results.

c. Strategy and plans

One specific pathway to impact we have developed emphasises software development and the release of complete prototypes, in which the innovative technology is embedded in a realistic application context. The development of demonstrators and their public presentation (whether at academic or professional conferences and exhibitions) imposes additional efforts in terms of scalability of results and sometimes additional work, for instance in media content creation. Even very technical areas of research can demonstrate their potential through applications. A recent example has been the notion of landmark in Planning: the importance of this fundamental planning technology was recognised with the award of the influential paper prize at ICAPS 2013 (the original paper being ECP 2001), which has been adopted as the core technology for several intelligent media applications, obtaining the best application prize at ICAPS 2013, the same year that the underpinning technology was distinguished. Since 2001, we have assembled over 10 demonstrators, mostly in the field of interactive technologies. These have received two Best demonstration awards (Autonomous Agents and Multi-Agents Systems 2010, International Conference on Automatic Planning and Scheduling 2013) and have featured twice in international news (Euronews): in 2008 for a prototype of affective multimodal interface, and 2010 for a virtual

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conversational character.

This commitment to software development represents a significant overhead on the research activity, but is eventually justified from an impact perspective.

They have supported for instance:

- filing a US patent on video-based narratives (joint work with University of Brescia), which is also an output of our FP7 Network of Excellence IRIS (US patent application 13/677,797)
- transferring source code for various AI techniques to Eidos Interactive plc as a result from the DTI-funded BARDS project
- releasing an early version of CaveUDK™ as open source software to several academic institutions internationally

We have during the reporting period explored different cooperation modalities with the computer gaming industry:

- accessing user-related problems, data, or background software, through Non-Disclosure Agreements. This has given us access to game specifications (Sony Computer Entertainment Europe, for the game Dropship), to design documents (IO Software, for the game title Hitman™¹), or to source code (Epic Games Inc). This supports impact by increasing the user-relevance of research without compromising research quality when the problems are deemed significant (joint work ensures that application development does not subsume research)
- jointly funded DTI Projects (for instance, with Eidos Interactive Ltd.) supporting research into user-defined problems

Our involvement in FP6 and FP7 projects have led us to collaborate with the following industrial partners: Electrolux, Telefonica I+D, BBC, Loquendo (now Nuance Communications) ...

IPR strategy is a significant component of impact in that it should i) ensure appropriate exploitation of results and ii) support, rather than hinder, collaboration with other institutions, and in particular commercial partners and users:

- we have filed two patents for the reporting period
- we have developed the CaveUDK™ middleware, to be distributed as open source as open-source (this was imposed by our agreement with Epic Games Inc. to avoid third party distribution issues)
- we have privileged type 4 Lambert collaboration Agreements

Our future plans will largely preserve the above balance. We will however consider a more thorough patenting strategy based on the finding (in Impact Case I) that our work has been cited as part of the background of several patents including by significant actors (IBM, Microsoft; see impact case I "Interactive Storytelling Technologies").

d. Relationship to case studies

Our two case studies illustrate the above approach and strategy, in that they each represent one different aspect, from user-led problem to technology transfer, as well as being representative of our main application areas.

Our first Impact Case Study, on Interactive Storytelling Technologies, is the result of our engagement with the game industry since the early 2000s and our involvement with user-led research in Games Artificial Intelligence. It is based on some of our best research (in terms of publication venues and citations), which has been informed by interactions with industry, through informal and formalised joint projects. Our end users have been UK-based game companies, although with an international component as well.

Our second Impact Case Study, on Medical Document Engineering, illustrates joint research developed from user-identified problems. It has also led to joint funding acquisition (FP7) to sustain a long-term collaboration, although in this case funding has been acquired at a later stage than in the first impact case.

¹ See reference [Pizzi et al., 2010] in Impact Case Study n.1.