

Why British University Computing Research Deserves Better Funding and Recognition

It might seem unlikely that best-selling software would be the ultimate result of a university research project on “the role of cortical synaptic depression in temporal response properties observed in the primary auditory cortex”. But such pure research work at Plymouth University has led – through some creative computer science - to voice-operated dialling and control of mobile phones from the likes of Nokia and Siemens.

This is just one example from a study by the UK Computing Research Committee (UKCRC) of how publicly funded university research can bring a significant return in terms of new products, new companies and new jobs – even when that is not the primary aim. Such commercial successes of outstanding computing research means the return of money to the public purse through the resulting tax revenues, the UKCRC says: “a valuable return on investment of taxpayers’ money”.

The UKCRC, with a membership of leading academic and industrial researchers, is an expert panel of both the British Computer Society (BCS) and the Institution of Electrical Engineers (IEE), the main professional and learned bodies in computing. It is also supported by the Council of Professors and Heads of Computing (CPHC) which advances public education in the core subject of computer science and in the wider context of computing and its applications.

Computing has brought the UK some impressive returns on public investment in research, the UKCRC study shows.

This is due not least to the quality of UK work over many years: the study notes the recent report by the International Review of Computer Science in the UK by the Engineering and Physical Sciences Research Council (EPSRC), the Royal Society, the BCS and the IEE, which concludes that “computer science in the UK has traditionally been of the highest quality”, and that “the UK has a proud history of accomplishments in computing and information technology”.

However, there is also real concern that levels of public funding in this area have decayed seriously over recent years.

The pervasive nature of IT makes it a likely candidate for wealth and job creation through commercial success, the UKCRC says: “IT is an enabling technology of almost universal application, and this results in very large numbers of potential partnerships between university and industry, for the benefit of both.”

At the same time companies and policy makers are constantly learning in this area and refine their arrangements accordingly, the UKCRC says. All this has meant a slow but steady acceleration in the speed of take-up of new ideas and technologies, and a corresponding relentless reduction in the time to put those technologies to commercial use.

Core support for computing research remains with the Engineering and Physical Sciences Research Council (EPSRC), but several paths from the computing research laboratory to the market are identified by the UKCRC study.

These include:

- The creation of spin-off companies from university research departments, with or without financial support from the university
- The creation of spin-off companies by research students - often unbeknown to their departments
- Specific research commissioned and funded by companies
- Projects with joint public and industry funding under government or European Union programmes
- Links between university researchers and people in companies, who may have met through the university or at conferences
- The movement of students with specific knowledge, arising in particular from their research projects, into industry, where their ideas are developed into products.

Some recent UKCRC case studies provide striking examples of successes in some of these paths to

market: in order to track the real market impact, it was necessary to look back at projects started, in some cases, quite a number of years ago.

Susan Denham at Plymouth University has spent over 10 years investigating the human hearing system with a view to using neural networks in speech recognition. She has had funding from the Engineering and Physical Sciences Research Council and the Medical Research Council.

Dr Denham's progress – through active collaboration with computing researchers in the Centre for Neural Adaptive Systems at the School of Computing at Plymouth University - resulted in the formation in 2000 of a company, NeuVoice (www.neuvoice.com), based in Plymouth and Teddington, west London with £1.5m of venture capital.

NeuVoice now provides speech technology ranging from speaker identification systems to voice recognition for dialling and other commands; and acoustic monitoring technology for any device that makes a characteristic sound in normal operation or before or during failure.

The technology is used in mobile phones from Nokia and Siemens and in Hewlett- Packard iPaq personal digital assistants, among other products.

The UKCRC study says, "Despite particularly adverse market conditions in the initial years of the company, NeuVoice created 25 jobs in the first two years - and made important contributions to the public purse through income tax and national insurance."

At the other end of the computing scale, and earlier in the development of this field, the benefits of close collaboration between industry and a university were shown clearly by work by Manchester University's Department of Computer Science and ICL as the then UK computer manufacturer developed its 2900 range of mainframe computers.

Manchester had been a leading centre for computing development since the very early days. In 1967 it applied to the then Science Research Council for a grant to support development of a new machine, the MU5. In support of the application, ICL agreed to build a modified version of a machine from its 1900 series, its mainframe range at the time. ICL would also provide construction facilities for the new machine at cost, and would make available its latest technology and design automation tools. In addition ICL staff were seconded to the university project: five in a team of 20 in 1968.

At the end of the 1960s ICL started developing its 2900 range – and the single most important influence on the design came from significant advances made in the MU5 project.

Other influences included the university's development of an earlier machine, the Atlas, which provided lessons on producing big, efficient operating systems.

The MU5 work influenced the 2900 range hardware architecture, processing and storage management.

The UKCRC underlines the long-term significance of the collaboration: "The 2900 series was a major success. It was ICL's main product range for some 15 years and produced work for tens of thousands of people - with the corresponding significant contribution to tax revenues."

Another more recent collaboration, this time between Cambridge University and Acorn Computers, has produced a UK world leader in reduced instruction set microprocessors. In 13 years the company, ARM (www.arm.com/), has grown to more than 700 people in nine countries, and its low cost, high performance processors, consuming relatively little power, are becoming the standard in portable communications and computing devices.

ARM's success arose from early collaboration on chip design. In particular Cambridge University's Computer Laboratory had Very Large Scale Integration design and development knowledge and tools, supported by the then Science and Engineering Research Council.

Most of the paths from research to market identified by the UKCRC have been followed by the University of Abertay Dundee in response to the potential of the computer games market – estimated to be worth \$18.5bn in 2003.

In 1999 the university launched its International Centre for Computer Games and Virtual Entertainment (IC CAVE: www.iccave.com), offering technical support in many areas of games development, including software tools which are now being researched.

IC CAVE builds on years of research in the university's Centre for Scottish Informatics, Mathematics, Biology and Statistics and the Electronics, Photonics and Information Control Centre in the School of Computing and Advanced Technologies.

Initial funding came from the Scottish Higher Education Funding Council, Scottish Enterprise, local authority and charity sources and the European Regional Development Fund. Subsequent support for particular projects has come from sources including the Scottish Executive's Proof of Concept Fund.

Abertay is also playing a leading role in an international industry and university project funded by the European Union, the Ultimate Entertainment Mobile Open Service Platform, led by Siemens.

In addition it has set up a business incubator centre to support new companies in this field.

The UKCRC says, "Expertise in the relevant technologies on Tayside, and local entrepreneurial strengths, have already led to the emergence of a significant sector - some 200 companies, employing more than 1,500 people - to which Abertay has responded with impressive focus, intelligence and commitment. IC CAVE promises great things for the future."

Many other developments which have found their way into commercial or industrial use are listed by the UKCRC study. The following are just a small sample:

- One of the first hypertext software products, from work at Kent University
- High performance data compression and decompression, enabling high motion video to be shown on mobile phones, at the University of Manchester Institute of Science and Technology
- Automated design of integrated circuits, by computing researchers at Edinburgh University
- A simulator to enable communications network operators to maximise the available bandwidth and guarantee service levels, at Leeds University
- The automation of natural language processing from work carried out at Cambridge University
- Real-time signal analysis for sensing for example underwater wreckage, heat sources in nuclear power stations, and pipe leaks, by researchers at Anglia Polytechnic University.

The UKCRC points out that these and many other computing research projects have come from the laboratory by the various paths to make valuable contributions to existing development work in industry and commerce and often to create new companies and jobs. It believes these projects – which remain largely unsung – show that public funding of research can truly be seen as investment.

None of these projects would have emerged to build wealth and jobs without the initial public funding from the Research Councils. Unfortunately, funding levels for computing research have fallen steadily over recent years, and UKCRC is working hard with the BCS and the IEE and others to build on the government's recent general commitment to tackle that legacy. While Computing Research receives stronger financial inputs from industry than many other academic research fields, with creative concepts now emerging thick and fast in so many areas of Information and Communication Technologies, UK industry money is often not available in time to ensure pick-up of potentially valuable ideas, at the early stages, and public funding can in many cases prevent important strategic opportunities being missed for products that could be developed to establish a crucial UK market presence.

The British Computer Society will continue to work with UKCRC and leading researchers to promote examples where Computing Research in the United Kingdom, based on funding from the EPSRC and other public sources, has led to wealth and job creation, real returns to the public purse, and new opportunities for UK companies to make an impact in global markets.

The UK Computing Research Committee is at www.ukcrc.org.uk.

Note to editors:

The UKCRC was formed in November 2000. Its members are leading computing researchers from academia and industry. UKCRC aims to be a single voice for UK Computing Research, with membership from academic and industrial research and its own research agenda.

It is an Expert Panel for computing research in the UK of the British Computer Society, the Institution of Electrical Engineers and the Council of Professors and Heads of Computing.

UKCRC submitted background material for the international review of Computer Science research; it also presented input to the Quinquennial Review of the Research Councils and the Roberts Review of the Supply of Scientists and Engineers. UKCRC will respond to all relevant consultations in the future. The members are active, world class, researchers and most of them are members of BCS, IEE or

CPHC.

The British Computer Society is the leading professional body for the IT industry. With members in over 100 countries around the world, the BCS is the professional and learned Society in the field of computers and information systems.

The BCS is responsible for setting standards for the IT profession. It is also leading the change in public perception and appreciation of the economic and social importance of professionally managed IT projects and programmes. In this capacity, the Society advises, informs and persuades industry and government on successful IT implementation.

The IEE is the leading professional organisation for electronics, electrical, manufacturing and IT professionals, with specifically tailored products, services and qualifications to meet the needs of today's technology industry.

The IEE supports knowledge and education that will underpin engineering in the 21st century.

The Council of Heads and Professors of Computing (CPHC) was formed to advance public education in the core subject of computer science and in the wider context of computing and its applications.

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