Summary Digest of Statistics

Executive Summary

Note: Comparisons by discipline are made between Computer Science (CS), Physics, Applied Mathematics (AM) and Electronic and Electrical Engineering (E&EE).

Funding inputs to University Computing Research (including comparisons)

Research base and assessment

- The 2001 RAE (considering 1996-2000) received submissions from 80 CS departments, with a total of 1560 FTE staff. This is the highest number of departments for comparable disciplines.
- 30% of CS departments, which employ 44.7% of all CS staff, were rated 5/5* in the 2001 RAE. This is the lowest level of 5/5* ratings for both departments and staff among comparable disciplines

Resource inputs

Core government funding – HE Funding Councils and Research Councils

- Total income from the 'research earmarked' portion of university block grants allocated by the HE funding councils provides comparable sums (c. £1m per annum) to the disciplines considered.
- EPSRC funding for CS departments in 2001-2 totalled £26.33m, which represents 9.4% of the total EPSRC Programme budget. £22.27m of this came from the IT&CS/ICT Programme.
- Total expenditure of the EPSRC IT&CS/ICT Programme in 2001-2 was £53.21m, which represents 19.1% of the total EPSRC Programme Budget. £22.27m of this was allocated to CS departments.
- The success rate of grant applications submitted by all departments to the ICT Programme in 2002 was 30%, and the average size of grant proposals funded by the IT&CS/ICT Programme was £139,053. These rates are very slightly lower than averages for all applications and funding.
- Between 1996 and 2000, the contribution to total CS research funding from central government core science base investment (OST and Research Council funding) was £102.82m. This is significantly lower than the sum allocated to Physics or E&EE, and well below the average for all Science and Engineering units of assessment (UoAs) considered by the RAE (£148.87m).

Comment: I find it practically impossible to identify the basis for the assertion in the original that: 'The nominal totals from this source for the four disciplines considered, based on the HEFCE 'QR' rate for each RAE grade, appear broadly comparable in recent years at around £1m.' This simply isn't the case: the nominal earmarked totals vary between £1,225,411 (CS in 2002-3) and £694,521 (E&EE in 2003-4), which isn't anywhere near 'broadly comparable' to the former sum. The figures for each discipline are fairly stable year on year, with no variation greater than £100,000. The figure which is 'broadly comparable' is the *average* level of funding per department, which varies from £20,212 (Physics, 2003-4) to £25,296 (Applied Mathematics, 2003-4). Variations here are due to the balance of departments between rating 4 and rating 5/5*.

Research funding from other sources (figures for 1996-2000)

- CS received a total of £253.5m from all sources. This is significantly less than Physics or E&EE but comparable with the average for all Science and Engineering UoAs.
- EU Government Bodies provided £56.86m to CS. This is significantly higher than any of the other disciplines considered or the average for all Science and Engineering UoAs.
- Funding from other central government sources provided £25.5m to CS. This is less than Physics or E&EE but higher than the average for all Science and Engineering UoAs.
- Funding from private industry provided £37.5m to CS. This is less than E&EE but higher than any of the other disciplines considered or the average for all Science and Engineering UoAs.
- Total funding from all sources per staff FTE as considered by the RAE was £162,265 in 1996-2000. This is less than the average for Science and Engineering UoAs and significantly less than Physics.

Studentship volumes

- 4,017 research studentships in CS were funded from all sources in 1996-2000. This is comparable with physics and almost double the average for all Science and Engineering UoAs.
- 25% of research studentships in CS were funded from the core science base investment. This compares with 63% in Physics, 53% in Applied Mathematics, 28% in E&EE, and an average of 38% in all Science and Engineering UoAs.
- 32% of research studentships in CS were funded by the HEIs in which they were held. This compares is higher than in any of the disciplines compared and than the average for Science and Engineering UoAs.

International comparisons

- A broad picture of national commitment to CS research can be gained by examining the percentage of science base investment allocated to IT. It is unclear whether appropriate comparison is with the 19.1% of the EPSRC budget allocated to the ICT Programme or the 9.4% given to CS departments.
- A figure for Computing/IT research as a fraction of the total Science and Engineering budget is available for: Germany (19%), Denmark (15%), Norway (14%), the USA (13.6%), Italy (9%). A figure for Computing/IT research as a fraction of the total university research budget is available are: Hong Kong (7%), Canada (6%), Australia (6%).

Comparisons between HEI research and private sector R&D activity

- OECD figures (1997) indicate that, alongside comparable economies, the UK had the lowest Value Added by R&D in the ICT sector (3.9%) and the second lowest share of ICT R&D in all business sectors (21.8%). The highest figures are, respectively, 17.2% (Japan) and 43.7% (Canada).
- Total investment in university Computer Science research by UK industry was around £50m per year from 1996 to 2000. This compares with UK industry's total R&D expenditure on 'Computer and Related activities' (as defined by the DTI) of around £700m per year during this period.

Output measures

Contribution to additional knowledge

- ISI statistics (2001) based on citation rates indicate that UK CS research has an average impact rating comparable with that of CS research in other OECD nations.
- The relatively low rating for CS research compared with those of Physics and Applied mathematics is attributable to the breadth of the discipline and the exclusion from these figures of conference proceedings. In 2001, the latter were recognised by the RAE as crucial to exceptionally fast-moving fields field. Similar subject disparities are observed in all countries.

Market impact

- Mechanisms and rates of technology transfer between university research and industry vary greatly between disciplines. The wide relevance of IT results in an unusually large number of applications.
- The ease with which software can be copied makes it difficult to track, protect, and even define intellectual property rights in this field.
- In 2001, UK ITEC companies showed a relatively low R&D spend (possibly because the UK's ITEC sector includes an unusually large service sector). 53% of CS R&D in the UK was in: internet user applications, communications, software, middleware, photonic components, microelectronics.
- ITEC R&D accounts for nearly half of recorded R&D effort in defence, transport, e-commerce, manufacturing, finance, banking and accounting, education and training.
- While respondents considered the *quality* of R&D workers to be a major UK strength, there was concern about the ability of UK HE to provide sufficient *numbers* to meet industrial requirements.
- Concern is growing about software quality issues and a commercial market in software testing is emerging. However, current market incentives are generally inimical to quality improvements.
- A USA study identified potential cost reductions resulting from feasible software testing infrastructure improvements of around $10.6bn for the supply side and $11.7bn for the user sector.

Comment: The *Digest* does not clarify the identity of respondents in this study, although it does indicate that it 'involved a significant survey as well as targeted interviews'.

Supply of experts to the Labour Market

- In 2001, 27.6% of graduates from EPSRC-funded Postgraduate (Masters and Doctoral) Studentships in IT and CS entered private sector employment. This is a lower figure than for any of the other disciplines considered (all of which showed figures between 30% and 35%).
- It is assumed that the majority of CS graduates entering private sector employment become IT strategy and planning professionals, software professionals, and ICT managers.