

The Decline in Computing Graduates: A Threat to the Knowledge Economy and Global Competitiveness

[This paper has been produced by the Council of Professors and Heads of Computing [CPHC] (representing the UK HE Computing sector), with support from e-skills UK (the Sector Skills Council for IT & Telecoms), the British Computer Society [BCS] (the professional body for IT Professionals) and Intellect (the industry body representing the UK technology industry).]

Overview

The UK is currently sitting on a ticking time-bomb – all of the evidence shows a significant and increasing gap between supply and demand for IT professionals in the critical IT sector of the UK economy which, if left unchecked, will severely damage the competitiveness of UK industry in the global marketplace, and will hit smaller employers and the public sector particularly hard. Input direct from industry bodies suggests that companies will increasingly move their computing work offshore, global corporations will choose not to place their operations in the UK, and the pipeline of skills into advanced level computing roles will be severely disrupted, compromising innovation and productivity in all knowledge economy sectors. The UK IT sector has historically focused on short-term solutions, i.e. taking more non-Computing graduates and migrant graduates, and off-shoring jobs, rather than with long-term solutions supporting Higher Education (HE) and increasing the available pool of UK Computing graduates. We need to find long-term solutions, so increased national investment, recent developments such as the Revitalise IT programme, and increasing employer engagement through e-skills UK needs to be supported and proliferated.

UK government policies reflect a view that market forces will adjust naturally to meet industrial need, but this is likely to lead to a stabilisation on those roles that cannot be off-shored, i.e. client and business facing, with a significant decline in UK-based capability in advanced technical roles, both in industry and research. This would damage the UK economy in a way that might be irreparable, but if not would certainly take decades in recovery. Rather than adopting a ‘wait and see’ attitude, action and leadership is urgently needed from all those involved in this situation, the UK HE Computing sector, the UK IT industry sector, the sector skills council, the professional bodies and the UK Government, to work together in partnership to support the HE computing sector, review funding arrangements, and join efforts to drive student recruitment.

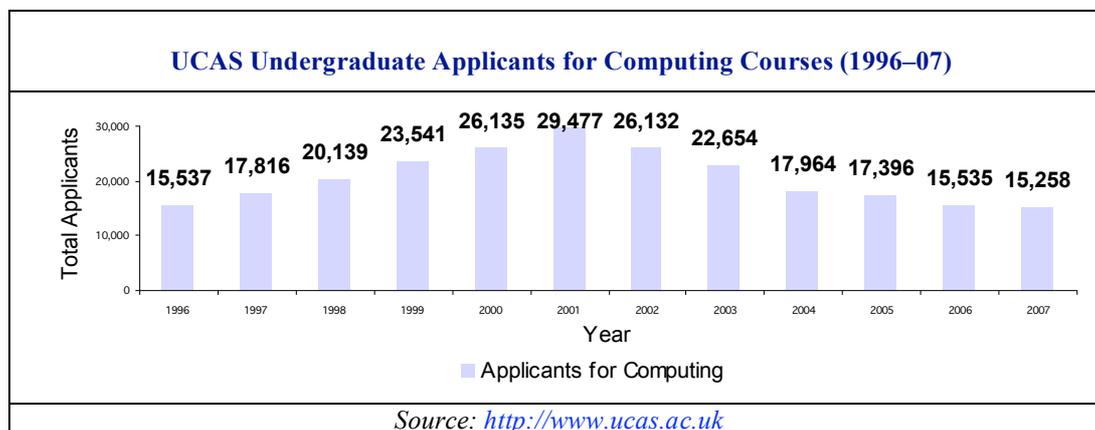
The capability of UK HE Computing to respond to UK economic needs has been damaged by a number of funding decisions in recent years. Over £100 million has been removed from UK HE Computing grant income annually, through the decision to change Computing from Band B to Band C funding and the reduction in ELQ funding. Additional funding made available to STEM subjects has not been made available to Computing because, although it is frequently represented as a STEM subject, it is not treated as such for funding purposes. Although Computing is regarded as a strategically important subject, it has not been regarded as a vulnerable subject, so the additional funding available for SIVS subjects has not been available. Allied to the fall in student numbers, this has significantly changed the financial landscape for Computing departments, and a recent CPHC straw-poll shows a picture of diminishing resources, mergers and restructuring, staff redundancies and, inevitably, departmental closures. However, Computing is absolutely central to the UK economy (as is recognised for other STEM subjects), it underpins almost all disciplines in addition to the dedicated IT sector, so it is essential to the economy that it is re-invigorated and we would argue the partnership identified above is the right way to achieve that. New investment is needed to support this, particularly in terms of employer engagement, because of the incredible pace of technological development and because of the far-reaching impact of globalisation on the UK IT sector and on UK research capability, specifically in terms of needs for high-level skills and deep knowledge. As is already acknowledged with Foundation degrees, increased employer engagement carries increased costs on both sides, and mechanisms to provide the investment to meet those costs and also to help develop new and sustainable business models for future development are urgently required. We need to ensure future global competitiveness by working together in partnership and securing the necessary level of investment now.

The Evidence

All of the evidence presented in this briefing is based on best-case assumptions for supply of graduates, so does not take into account projected increases in demand for graduates in a changing marketplace, or the upcoming demographic dip in the supply of home students. Where there is no documented evidence of shortfall against demand we have erred on the side of caution and kept our demand estimates at the minimum level, based on known graduate numbers. However, there is anecdotal and industry evidence, some of which is referenced, that the estimates we present here severely understate the problem, that the demand for Computing and IT graduates is much higher than we suggest and not being met, and that the developing knowledge economy has an even greater need for Computing and IT graduates, which we will not be able to meet.

1. Student Decline

The number of students in UK HE Computing rose in line with growth of demand for graduates in the UK IT Sector between 1996 and 2001, supported by additional investment from the Funding Councils, with student numbers doubling in that period. Since 2001 student applications have declined, despite continuing demand from the sector, to the extent that the numbers are now less than they were in 1996. Given the time lag between application and graduation, the decline has been reflected in graduate numbers over the past two years and, without significant intervention, we know that these numbers will continue to decline, at around 8% per year, for at least the next three years, giving an overall decline in the order of 50% by 2010 and taking graduate numbers back below the level of 1996.



The decline in student applications also reflects a similar decline in secondary pupils undertaking A-level and Scottish Higher studies in Computing. Studies have identified considerable concerns over the secondary Computing curriculum, lack of distinction between ICT and Computing, and the qualification level and subject currency of secondary school Computing teachers. There are a number of initiatives under way to attempt to address these issues, such as the Teaching and Learning Programme, but many more are needed and there is also a need to provide financial incentives to encourage high quality, inspirational Computing graduates to become secondary Computing teachers.

2. Industry Demand and the Supply Gap

The UK IT job market has been steadily growing since 1994, with IT & Telecoms professional employment rising from 500,000 to over 1 million. e-Skills UK research predicts that there will be a growth of 15.25% from 2006 through to 2016, rising from 1,069,000 to 1,232,000.

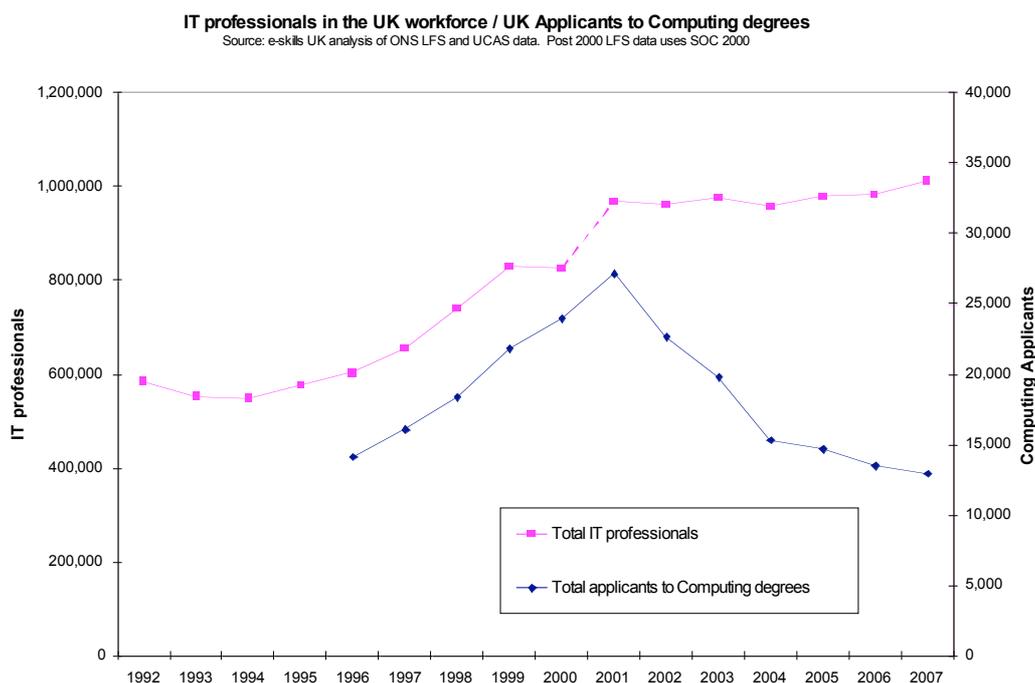
In order to calculate the number of HE computing graduates required by the UK IT industry, we have to establish a benchmark number from existing recruitment. In 2005, there were 37,445 HE computing awards, as reported by HESA. Of these, 7,810 were sub-degree level awards leaving a total of 29,635 HE Computing graduates. The HESA statistics indicate that 70.4% of these graduates entered the UK workforce (after 6 months), and 42.2% of those took up IT professional roles. This gives us a benchmark total of 8,804 graduates entering IT professional roles. In the absence of any information on unfilled vacancies at graduate level we must assume that this number represents, as a minimum, the demand for HE computing graduates in 2005. As there has been no decline in the IT job market in the intervening period, it is reasonable to assume that this number can be used as a baseline for the calculation of the industry requirement for HE Computing graduates. Also, since the evidence over the last 5 years is that the HESA destination statistics quoted above are relatively constant, we can use these as a basis for calculating the percentage of graduates entering IT professional roles over the period 2007-2016.

In 2007 there were 25,710 HE Computing graduates, so, based on the statistics, there were 7,638 new entrants to IT professional roles, a shortfall against the benchmark of 1,166 graduates. Assuming the growth rate of IT graduate roles reflects that of all IT & Telecoms professional employment, predicted by e-skills UK at 15.25% between 2006-2016, the shortfall in graduates will continue until at least 2016. Based on the decline in applications of 8% per year impacting graduate numbers until 2010, and assuming steady state thereafter until 2016 (since we do not have entry statistics to predict numbers past 2010, and we cannot accurately predict the effect of the demographic dip), there will be a total shortfall of 31,893 HE Computing graduates by 2016. The result of this shortfall is that, far from growing at 15.25%, the number of IT professionals with a computing degree will decline by 11% in the same period (over 25,000 staff) from 21% of the IT professional population in 2007 to 16% in 2016 – as a result, in order to meet the existing requirements for IT professionals, without any development or growth of the technical base, this would require employers to be able to bring in an additional 59,610 HE Computing graduates from other sources. Employers of IT professionals are already complaining of increasing difficulties in recruiting sufficient volumes of Computing

graduates, with volumes now falling well below employer need (AGR report 33% of UK IT employers predict a graduate shortfall in 2008 [5]). The shortage of skilled talent to fill these IT professional roles is not unique to the UK, and the challenge for the immediate future will be in the global competition for talent, which we must address to remain competitive.

3. Shrinking Pool

As large corporations within the IT sector have identified concerns about this shortfall they have become more creative in their recruitment methods to optimise their graduate recruitment. This further increases pressure on smaller employers and the public sector as they attempt to recruit from a shrinking pool. Consequently, more graduates from outside the UK, particularly Eastern Europe and Asia, are being employed in the UK as migrant workers, a higher percentage of jobs are being outsourced outside the UK, and the potential for growth in the UK IT sector, particularly in high-skilled jobs, is compromised.



IT professionals in the UK workforce / UK applicants to Computing discipline degrees 1992 – 2007
(e-skills UK)

4. International Competition

The effect of globalisation has led to greater use of offshore resources, but not to a decline in resources onshore. Instead, it has shifted the demand onto higher-level skills, with a consequent decline in entry-level jobs for new graduates, compromising the potential for UK industry to grow their own talent stream. The pace of change has also increased, so IT workers are required to adapt and change their skills more quickly. In an analysis of the skills gaps existing amongst those occupying IT professional roles, e-skills UK identified a significant and growing technical skills gap as the most serious, alongside the need for development of business and interpersonal skills. For IT workers, developing higher-level skills, as well as flexibility and adaptability, will be impeded by a lack of the **deep knowledge** that could be gained from Computing degrees. This lack of **deep knowledge** not only impacts on the ability to undertake advanced level IT activities, but also on the ability of the sector to strategically exploit advanced technologies to support business research and development. For the large segment of existing IT industry professionals with non-IT degrees, and the 50% of the 141,300 new entrants to the sector each year coming from a non-IT background, routes to up-skill at an equivalent level in Computing have also been made more difficult, through the reduction in ELQ funding. In a post-Leitch environment, where 70% of the 2020 workforce have already completed their tertiary education, provision to support retraining and re-skilling of the existing workforce is absolutely vital and the removal of financial support for these activities is significantly damaging.

Failing to ensure an adequate UK-based supply of talented and skilled graduates to take up IT professional roles within the UK IT Sector represents a grave threat. Rather than competition for business, it will be competition for talent at the international level that presents the greatest risk to this sector of the economy, and those that rely upon it.

5. Long Term Effect on HE Capacity

UK HE Computing departments are under significant pressure through the decline in student numbers, and reductions in funding. Although regarded as a STEM subject, Computing receives neither funding nor support in relation to that STEM status, the impact of this lack of support is a contributory factor to a decline of 8% in computing graduates between 2002/3 and 2006/7 as opposed to a growth of 11% in the same period for STEM subjects. Computing is also regarded as a strategically important subject, but not as a vulnerable subject by the Funding Councils, hence does not receive SIVS status or funding. Coupled with the decision by the Funding Council to change the funding level for Computing programmes from Band B to Band C, this has resulted in a funding decline of over £100 million annually for UK HE Computing. There have already been staff redundancies, departmental mergers and restructuring, and departmental closures are currently inevitable, which reduces the capability of UK HE Computing to respond to initiatives to increase numbers of graduates, and progressively will damage research capability and hence international competitiveness. At the moment, the UK is a leader in research and teaching of Computing internationally, but, without significant intervention, that position will be eroded.

6. Industry Collaboration

The Lambert Review in 2003 identified that UK industry spends £23 billion on training, of which less than 1% is spent with HE. In 2007 Lambert, addressing UUK as Chair of the CBI, said that this had not changed significantly and there is a need to develop mechanisms to encourage greater collaboration in this area. The desire for greater engagement (including financial) by employers in HE is also expressed in the Leitch Review. One route to encourage development of such support is through partnerships in research and innovation, curriculum development, and direct industrial engagement in programme delivery, and there are a number of such initiatives under way which need to be supported. Current examples of collaboration between UK HE Computing and the UK IT sector offer a good basis for deepening collaboration in the spirit of the Leitch recommendations. However, taxation of this activity, unlike competitor markets in the USA, Europe and the Far East, acts as a significant block to increases in the level of such activities.

Recommendations

- Funding:
 - Move Computing into SIVS status.
 - Ensure that Computing and IT is fully covered by The STEM Programme.
 - Reinstate Band B HEFCE funding to maintain departments to avoid loss of facilities and staff.
 - Provide scholarship and other funding support for postgraduate students in Computing, both for those with non-Computing backgrounds and those looking to follow advanced study, to provide a more immediate increase in the Computing graduate pool.
 - Offer tax incentives for University-based and University-linked Computing education investment to increase HE-industry engagement, and encourage individual lifelong learning.
- Continue to support and increase efforts on recruitment and publicity campaigns both for the HE sector and the industry, such as the HEFCE-supported Revitalise IT programme being led by e-skills UK – encouraging cross-branding of industry and academic campaigns
- Develop plans to support Masters programmes for those with non-Computing degrees, to encourage movement into the industry and development of deep knowledge. Campaigns are also urgently needed that encourage advanced postgraduate study for those with Computing degrees, in line with recent policy announcements.
- Review and revise the IT curriculum in Schools and Colleges and provide financial support and incentives to attract highly qualified, inspirational Computing graduates to train as teachers.

References

All of the information included in this document is referenced against, and supported by, the following reports:

1. A Study on the IT labour market in the UK 18th April 2008. Research Insights report commissioned by the Council of Professors and Heads of Computing. <http://www.cphc.ac.uk/docs/reports/cphc-itlabourmarket.pdf>
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4. DIUS Higher Education at Work, High Skills: High Value. 14th April 2008. DIUS Consultation document. http://www.dius.gov.uk/consultations/documents/Higher_Education_at_Work.pdf
5. Association of Graduate Recruiters <http://www.agr.org.uk/>