dialogic consulting

DIALOGIC CONSULTING RESEARCH

Computing
The Higher Education Issue

Influencing Policy, Professionalism & Growth in the UK Knowledge Economy

Presented at

CITY UNIVERSITY LONDON

POLICY

www.dialogic.co.uk - 07808 888 411

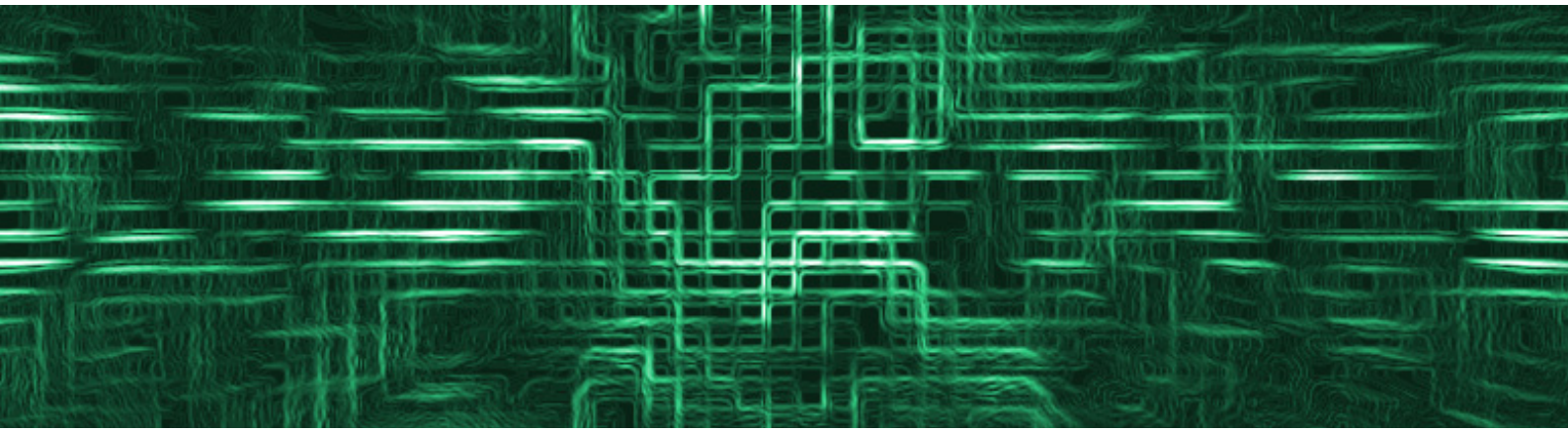
Abstract

This paper is an interim research summary into the issues related to the current crisis in computing within UK Higher Education (HE).

The work was presented at City University, London, May 2008 (*Research Posters influencing policy & professionalism*) on the policies that formulate Government interventions and agendas for the UK Knowledge Economy. The wider research begins to examine some of the major concerns expressed by the IT profession over how it can build a competitive UK IT industry for the 21st century.

The results introduce a new concept - the *Core Spectral Signature* (CSS) and the conjecture is that the UK HE Informatics landscape is currently not fit for purpose.

The paper also highlights that this research work is being used to influence and inform Government policy, the UK skills agenda and professionalism in Informatics.



Introduction

The IT industry is vital to the UK's competitiveness. Over 40% of the UK's GVA (Gross Value Added) is produced from IT-intensive industries that are classified within the 'Knowledge Economy' (KE.) These include the key sectors of financial services, technology and communications as well as the creative industries. The latter group is growing faster than any other sub-sector of the economy.

Government and industry have variously highlighted that an alternative range of high-level IT skills will be required by graduates entering the workforce to meet the demands of the developing KE. These messages are often in conflict with a requirement to produce both technically competent graduates as well as those with the requisite business skills to be effective.

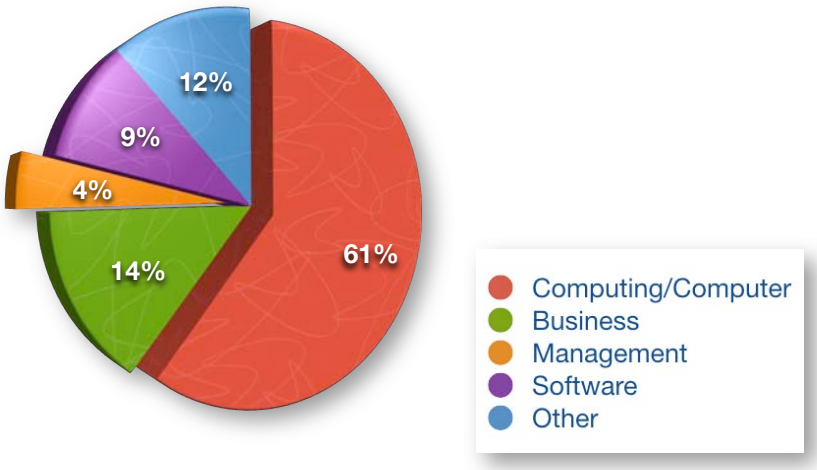


fig 1. Computing Degree Awards Title Groupings as a % of all Informatics Qualifications

UK Higher Education Institutions (HEIs) have developed a significant number of degree awards to attract students and particularly, the HEIs suggest, to meet the various needs of industry (*fig 1 above.*) These have included mainstream degrees that are 'Business Computing Specific'; 'Software Specific' and 'Computer Science Specific' (the three initial categories analysed here.)

Policy & Economics

The UK software sub-sector alone employs more than one million people and produces an annual Gross Value Added (GVA) exceeding £30bn.

The UK KE has 41% of all UK workers by occupational classification and 40% of GVA by industry classification. It is the fastest growing component of the UK economy predicted to have a 40% all-graduate workforce before 2020. This is extraordinary and highly significant for the future prosperity of the UK.

An example of the importance of computing on the future of the UK economy, is provided by the fact that the value of 'own account' software alone (not packaged for retail sale etc.) in six years time is predicted to reach 1.5% of GDP. A linear estimate suggests that GDP will be approximately £1.2 trillion by 2014 and that the own account software contribution will then be £18bn.

These figures underpin the primary policy drivers for the Government that has focused on how to create wealth and prosperity in a Knowledge Economy that is substantially driven by ICT skills and competences.

Professionalism, The Issue

The current demand for ICT workers is estimated at approximately 150,000 workers per annum. This figure has provoked much alarm in some sectors of the economy. It raises the significant question *'is it sensible to base educational strategy on forecast demand* or s*hould we be looking at other ways of providing workers for the developing Knowledge Economy?'*

The data (fig 2 below) shows the falling numbers of HE students reading computing related degrees; the falling output into industry is about to make an impact. Given this decline it seems unlikely that HEI's will be able to supply sufficient graduates to meet demand from employers.

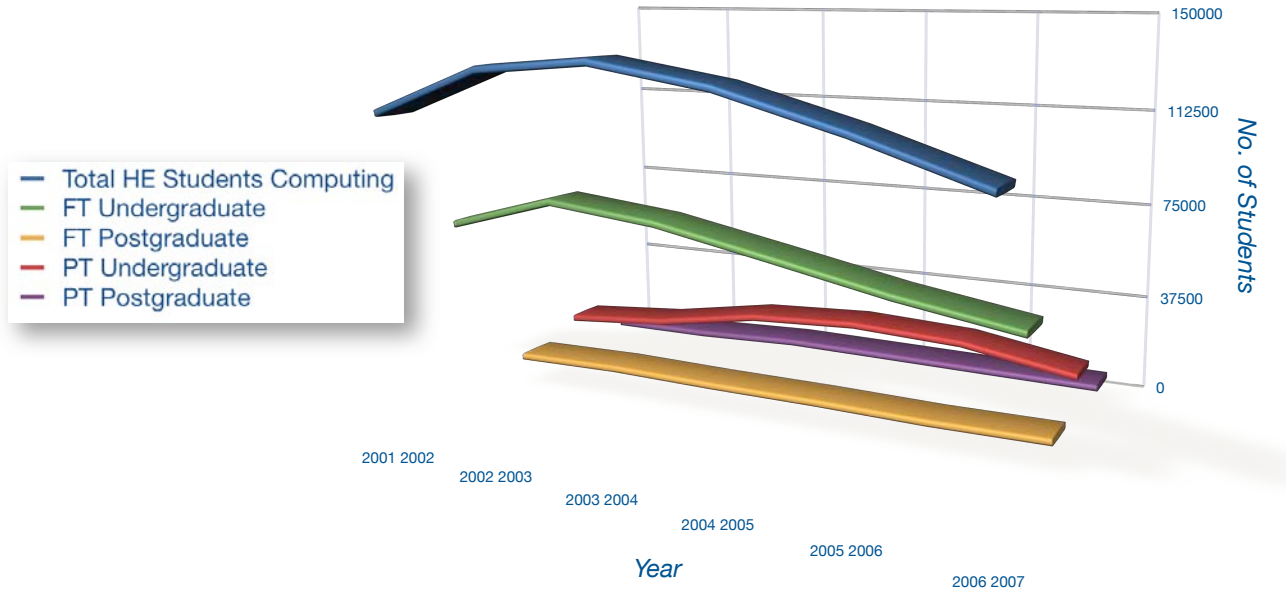


fig 2. Number of HE Students in Computing Showing Study Mode

This situation is exacerbated if we examine the employment preferences of recent computing graduates.

Of Computing graduates from 2006 surveyed six months after graduation 66.1% were in full time work and 6% combined work and further study. In addition 10.4% were assumed to be unemployed. However, of those 66.1% in full-time employment only 43.2% were working as IT professionals.

One additional specific concern regarding professionalism, voiced by industry, relates to the emphasis placed on business modules within computing degrees. The concern raises specific questions, such as '*can a fit between business needs and teaching be determined for the business computing courses?'* or *'What characterises a business computing degree?'.*

Research

This research has shown that there is a close correlation between successfully developing the KE and the need for a highly educated workforce.

The Leitch Report on skills also stated that the UK should aim to become a world leader and focus on economically valuable skills. In order to drive productivity and growth in the developing global economy it also recognised that although considerable progress has been made with regard to education and skills in the UK, we are still behind other countries, *'the UK's skills base remains weak by international standards, holding back productivity, growth and social justice.'*

It is generally accepted that, even if current targets to improve skills are met, the UK's skills base will still lag behind that of many comparator countries in 2020; in effect the UK will need to run to stand still.

The question that arises in the detailed work for my research is the extent to which Government policy relates to a received or recursive narrative. Does it intimate the existence of a skills gap as well as a mismatch of agendas between the various interested parties (Government, industry/commerce and academia) without much concrete analysis and deduction?

New Findings

The work presented in this paper forms part of a much larger and complex piece of research on the UK software and ICT economy. In the following section I examine the skills & education/industry mismatch problem in detail and begin to answer the underlying questions that relate to the impact of HE level 4+ skills (Leitch) on the UK Knowledge Economy.

Analysis shows that the output from the UK HEIs does not meet the current demand for a professional workforce on its own. In fact the problem will worsen over the next two years when the declining number of applicants to HEIs in 2005/06 graduate and this will continue to have an increasing negative impact at least until 2010.

If the trend continues without a sharp reversal then the problem will be acute by 2014, which intersects at about the time that the current Government expects that the software sector will be making a substantial impact to GDP.

A full analysis of the complete Informatics landscape across every UK HEI has been completed, the interim results discussed here represent 82% of the complete data set (for operational reasons.) Nevertheless, an initial examination of the remaining 18% indicates that the conclusions will hold true for the complete data set.

The work analysed the core (designated/mandatory) module taxonomy or landscape for every Informatics undergraduate degree programme; the three main Informatics qualification groups are presented here. They are Computer Science (traditional course route into the computing profession; those awards in computing that also name 'Software' in the title (e.g. B.Sc. Software Engineering etc.) and the third group that covers all qualifications in Informatics with 'Business' in the degree title (e.g. B.Sc. Business Information Systems etc.)

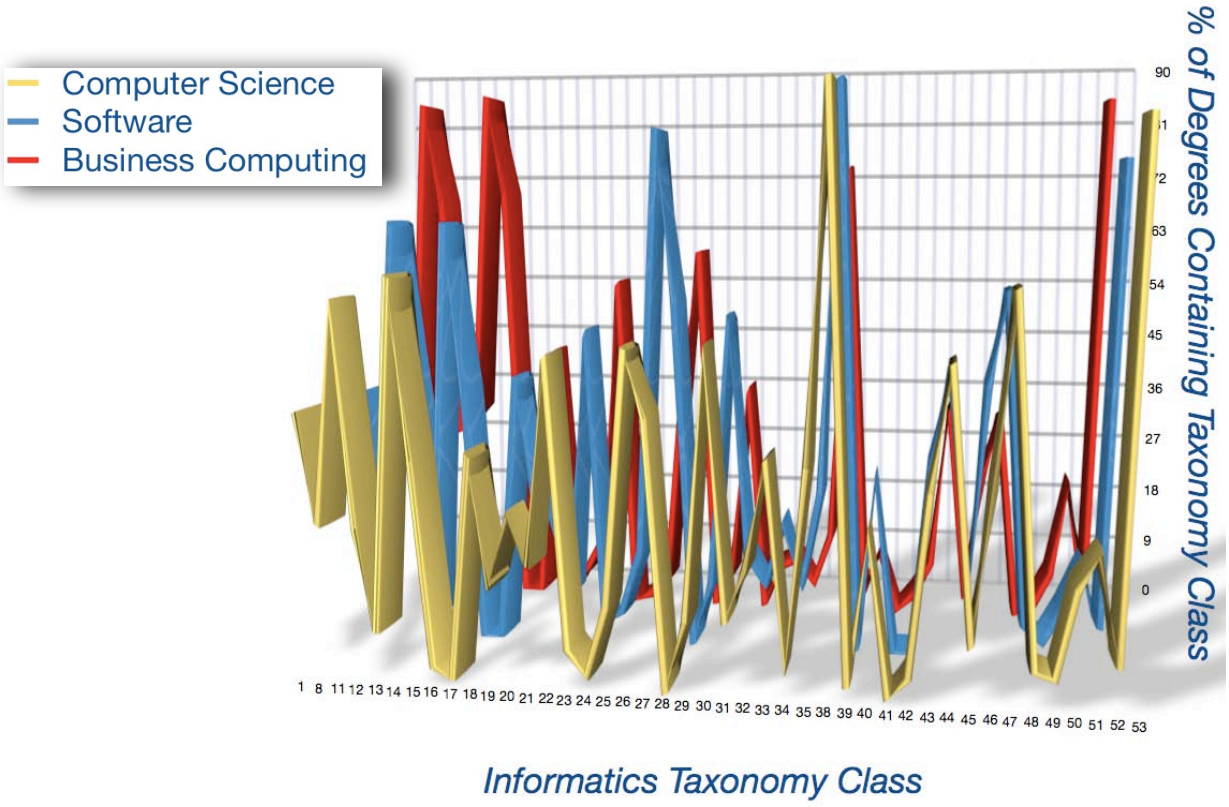


fig 3. 'Core Spectral Signatures (CSS)'
IT Subject Taxonomy Landscape Frequency Polygons for UK Informatics Degrees

The taxonomy devised was developed by augmenting the QAA Subject Benchmark Statement for computing. The initial analysis was conducted on a sample of the UK HEI Computing qualifications using an unmodified benchmark standard. However the analysis proved that more detail was required to understand the nature of the types of qualifications, specifically I required a more detailed picture of the emphasis placed on business computing modules as well as additional breakdown of some technical areas of computing. This lead to the creation of an expanded taxonomy which has enabled a more detailed analysis to be made.

Initial statistical analysis provides a means for comparing the percentage contribution of a particular taxonomy class to each of the qualification groups. These are mapped visually (*fig 3 above*) for each of the three groupings, in the frequency polygons.

These patterns I have termed the *Core Spectral Signature (CSS),* each line (or CSS) on the graph characterises the core modules that comprise or characterise each degree grouping.

There are major peaks in taxonomy classes 20 (Databases); 22 (Web based computing); 38 (Programming) and 53 (Dissertation, Projects) with sub-major taxonomy classes in 8 (Business) 26 (Software Engineering; 30 (Networking/Networks); 44 (Mathematics/Logic) and 47 (Computer Architecture.)

Comparison of the CSS for each degree grouping shows a discernible mirrored pattern in the make-up of each. It appears that there is little by the way of core module differentiation that provides a unique signature pattern to identify each degree grouping.

Under The Microscope

The research, here, was also used to begin to analyse the professionalism issues (mentioned earlier in this poster) to help Government and Industry begin to understand the deeper issues.

An initial analysis of computing degrees with 'Business' in the title was conducted, one part of this work is discussed below.

All UK degrees with 'Business' in the award title were analysed in detail in order to determine a taxonomy subset CSS for the 'Business' components of each degree. This data was then further analysed to provide some aggregate statistics that would show the percentage of business modules covered in these named degrees (f*ig 4 below*.)

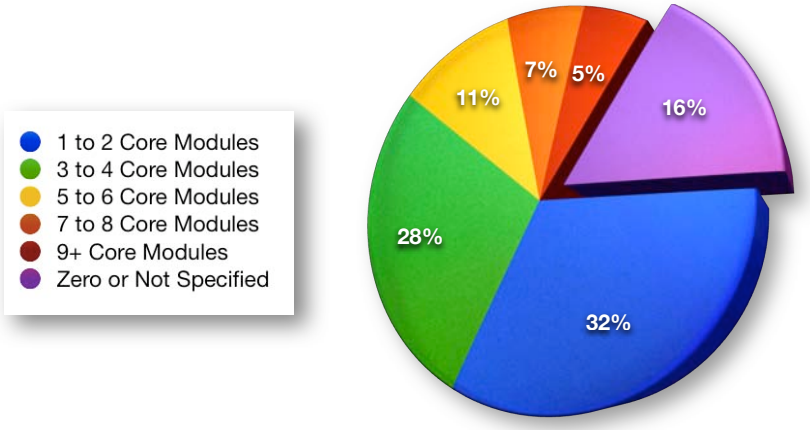


fig 4. Percentage Core Business Modules offered within Named Degree awards containing Business in title

The analysis shows that just under a third of Business Computing courses offer only between one and two core business modules whilst 16% have zero core modules or do not specify the core business modules at all.

Discussion & Conclusions

The CSS similarities across the three main degree groupings suggest that there has been an evolutionary approach to the development of new degrees in Informatics, rather than a 'ground-up' construction of degrees based on specific industry requirements.

The evidence points to the possibility that Computer Science, as a loose discipline, provided the core '*DNA*' for the evolution of the other two groupings (Business & Software) and that only minor or incremental changes were made to the original Computer Science degree programmes over a period of time.

Detailed analysis of the taxonomy of modules, that can be classified as being business oriented, shows that there is little regard for specifying a distinctive core (mandatory or designated) program within Business Computing degrees.

The results demonstrate that there is a mismatch between Government and Industry perceptions and requirements and what the HEIs believe they are delivering.

The initial conclusions are that:

- the CSS proves that degree differentiation at the core of each subject grouping is virtually non-existent. This could be a 'limiting' factor in the degree marketing and student choice process and thus may have an influence on the recruitment pattern shown (*fig 2.*)
- the current structure of Informatics degrees is not fit for purpose
- the fundamental research to inform both Government policy, agendas and interventions requires a specific and significant independent focus
- significant and substantial mediated engagement between interested parties (Government, the profession & academia) is required to affect a turnaround and provide a good roadmap that will help develop the UK KE as hoped for.

Importance & Impact

This unique, ongoing research into policy, professionalism and the UK software and IT economy is seen as being pivotal by Government Departments, the Profession and the British Computer Society.

fig 5. Key Reports from this Research

The work has been used to write several key reports (*fig. 5 below*) two influential reports backed by Microsoft '*Developing the Future' (2006 &2007),* the Government dBERR i2010 report on ICT and the KE as well as providing input into the Government DCMS report on the Creative Economy. With workshops across Government, academia and industry and keynote addresses at two conferences in 2007 (Sweden, UK) the work continues to set the agenda for the future for Informatics and the UK Knowledge Economy.

This summary paper forms part of ongoing research and analysis into policy, professionalism and the UK software economy in association with the City University London.

References

Bowkis, M. (2006). Developing the Future: A report on the challenges and opportunities facing the UK software Development Industry Reading, Microsoft UK.

Bowkis, M. (2007). Developing the Future 2007: A report on the challenges and opportunities facing the UK Software Development Industry Reading, Microsoft UK.

Bowkis, M. et al, Delivering i2010: Ensuring the Right Conditions for an Innovative, Inclusive & Competitive UK Knowledge Economy, i2010 Committee (2007), UK Government, Department for Business, Enterprise and Regulatory Reform.

DCMS and Work Foundation (2007). Staying ahead: the economic performance of the UK's creative industries. London, UK Govt. DCMS, Work Foundation.

Leitch, S. (2006). Prosperity for all in the global economy - world class skills: Leitch Review of Skills. London, HM Treasury.

QAA Subject benchmark statements Computing 2007 http://www.qaa.ac.uk/academicinfrastructure/benchmark/honours/computing.asp

Acknowledgements

Dr. A. Tuson, Head of the Department of Computing, City University, Northampton Square London EC1V 0HB