

## Facing the ICT Crisis

The classroom is empty. The enthusiastic teacher has been moved to teaching physics. The computer laboratories, once crowded with eager students are now deserted, except for the occasional lone student, isolated, immersed in some obscure programming language. The ICT classes are well-undersubscribed. Too few students are taking A level ICT or A level Computing. The viability of courses is being questioned by schools and colleges.

It would not be too wide of the mark to suggest that there is a crisis in ICT education. The number of IT qualified students has plummeted. In 2007, the number of A level computing candidates dropped to 5610 from a low-level of 6233 in 2006. Additionally A level ICT candidate numbers dropped 6% between 2006 and 2007. Computing represents 0.7% of total A levels sat and ICT 1.7%. Compare that with 10.6% sitting English and 2.5% sitting drama.

In universities, the number of students studying IT subjects has dropped drastically. This fall is not limited to the UK but is experienced across all OECD countries. In Australia, university applications for IT subjects dropped 17% in 2006 and 12% in 2007. In the UK, by 2009, the output of IT graduates will be 40% down on the levels in 2000.

If such a loss of interest in a subject was being discussed in the case of Welsh or Celtic Studies, it would be a matter of concern. The loss of any subject leaves us culturally worse off. But we're talking about ICT which accounts for 5.3% of EC Gross domestic product, which is a leading source of innovation, and which is a prime source of competitive advantage in companies and countries. This is not just an academic concern, it's an economic disaster.

As the IT industry continues to grow between 5 and 8% faster than other sectors, it will need 150,000 new entrants each year. An ICT professionals shortage of 300,000 is predicted in the EU by 2009. There will be a massive gap between the numbers of people needed in industry and the number of students qualifying in ICT-related subjects. But what is the nature of this gap, and how do we bridge it?

It has been suggested that there is a gap in perception. Parents don't believe there will be jobs in ICT and their offspring perceived ICT as boring and geekish. Perhaps ICT teachers are inadequately trained, often being enthusiasts who come from other disciplines. Or perhaps it's the curriculum, boring, out of date, irrelevant to the students and industry?

Certainly there is a poor perception of ICT and its prospects. Following the bursting of the Dot.com bubble, there was a reduction in the number of ICT jobs. The expectations for jobs and earnings had been inflated, so the bubble had to burst. Additionally people are well aware of the effect of global outsourcing. Basic programming skills and helpdesk jobs have migrated to India, China and Russia.

British software companies may well contract software development to Sri Lanka or Brazil.

But that doesn't mean that there aren't IT jobs in the UK. Only the nature of them has changed. IT jobs have become more service-oriented, involving more connection with the customer whether internal to the organisation or external. The range of skills required is much wider. Being able to program in Pascal is not enough and may not even be required. Being able to negotiate with suppliers, to understand the user's needs and provide a responsive service are considered more important. However, companies are not going to stop requiring the skills to procure, implement, support, and manage the wide range of ICT which they depend on for survival and growth in competitive markets.

There is also a widespread perception that ICT is boring, an introverted subject for geeks and social misfits as seen on The IT Crowd who are happy to hide in basements, to huddle in cubicles, to hunch over terminals ignoring people and the outside world. That itself is a false picture.

IT professionals are more often than not bright, sociable people, aware of the needs of the business and connecting with the business. For example, Marks and Spencer's have restructured their IT department to embed it in the business units. The IT director at M&S sees that the nature of the IT department is evolving into a service function. IT people need to be business-savvy. Hence IT is more and more about communicating, connecting with staff and implementing the best technology to support the staff and the business in its goals.

Organisations need more people with an interest in people as well as technology. The application of ICT is an exciting and rewarding area. ICT is a subject that bursts with interest. The range of applications out there in the real world, the impact of ICT the potential for new applications, new technology, new social impact even at a global level is immense.

ICT teachers have a hard job. They try hard to interest students who are spending hours on computers at home, even if only on playing games or social sites and may not be interested in exploring the underlying technology at school as well. They struggle with a changing technology. New hardware, software and applications appear on TV every week. They struggle to stay ahead of their students who may spend hours at home programming while the teacher keeps up with marking and lesson planning. Teachers have to stick to the curricula, students can go where they like.

Do history students spend hours at home pouring over original medieval sources? I doubt it. Do biology students spend hours at home dissecting xenopus toads and extracting DNA? I doubt it. Do geography students rush off outside school hours to examine coastal structures? I doubt it. Do ICT student rush home to create application, write games, run open source applications. Quite likely. So ICT teachers are likely to struggle with such a rapidly changing subject area whose advances are often more accessible to the students at home than at school.

Of course ICT teachers, whether teaching ICT, Applied ICT or Computing would benefit from more exposure to industry. The way IT departments work has evolved

rapidly in the last few years. Gone are the serried ranks of software developers in huge application development departments. Gone is the emphasis on the software development life cycle, on producing large amounts of code. Such ideas are replaced by agile development methods, componentised systems and user-centred design.

ICT departments are more interested in the concepts of IT service management. Processes are run according to best practice procedures described in ITIL (IT Infrastructure Library) manual. IT departments pursue ISO20000 certification. Configuration management, availability management, release management and disaster recovery occupy the minds of IT directors. Abilities to manage and maintain levels of service, to communicate effectively with employees and customers through the service desk, and to translate business needs rapidly into useful information systems are the order of the day.

In the end, the ICT teachers are snookered by the curricula, by computing and ICT syllabi that are boring, irrelevant and pedestrian. The popularity of a subject must to some extent depend on the curricula. Boring curricula will result in frustrated teachers and bored students.

Recently, the major boards have revised their specifications for 2008 onwards to align with an A level model of four units. One might expect that this would be an opportunity to renew the syllabus, to develop exciting direction. Instead we get a rearrangement of the same old material resulting in syllabus specification which would be more at home in the Museum of Computing than 21st century schools and colleges.

Take a look at the computing and ICT specifications for the three main boards. Both OCR and AQA offer new syllabi in Computing and ICT based on the four unit model. Edexcel's Applied ICT dates from 2005. Computing has been abandoned (although circus skills remain part of their A level portfolio). Reading the A level specifications for OCR and AQA is somewhat shocking. We are offered a nostalgic trip into the past.

OCR's A level Computing involves units in computer fundamentals (hardware and software), programming, and computer architecture which lead to a programming project. Social issues are mentioned, HCI is touched on upon. Object-oriented programming and UML get a mention, but no more than reverse Polish notation. AQA computing is not much different.

Both are frozen in time. Such a computing syllabus would not be out of place or that much different in the early 1970s. Indeed AQA still supports Pascal, a language of the 1970s. Like ICT syllabuses, they are wedded to the systems development lifecycle view of computing practice, somewhat of a rarity in an industry where rapid development methods, agile methods, evolutionary development and systems integration are more common practices.

These extraordinary syllabuses are neither new, relevant or interesting. They read like a biology syllabus that went no further than taxonomy, a chemistry syllabus obsessed with the periodic table or a history syllabus that was a catalogue of dates. Even from the point of view of a focus on the technology, the plethora of interesting technologies

that are about in computer science get little mention. They seem to be designed to discourage even the most dedicated student.

The AQA syllabus states that computer science is no more about computers than astronomy is about telescopes and then presents a syllabus whose astronomical equivalent would involve lesson after lesson about glass grinding. These syllabuses are a disaster for ICT education and an inhibitor for developing a strong ICT profession.

In an industrial ICT world where complex systems can be generated from components – as is done in Ruby on Rails, where systems development is more a process like jazz improvisation or film production, such syllabi are irrelevant.

In an education world, where children right from primary school can generate complex programs using Scratch or Starlogo and 10 years olds are taught to develop Excel macros and dynamic Powerpoint presentations which are beyond the skills of most university lecturers, a course which starts with programming 'Hello World' in Java or involves more Excel macros is hardly a mouth-watering prospect for anybody. ICT teachers are left struggling to inject creativity and interest.

A level ICT fares a little better than computing. While OCR's Applied ICT loses the plot and retreats to the traditional world of programming and classical systems development, using visual basic presumably to differentiate it from computing, AQA's ICT A level engages with industry and explore subjects and areas you would actually find in an IT department. The unit, 'The Use of ICT in a Digital World' explores topics and techniques such as the implementation of large scale systems, backup, recovery, availability management are all areas of great concern in IT departments where the focus is on services and the range of skills and processes required are defined in ITIL 3, a set of manuals developed by the Office of Government Commerce which form the benchmark of best practices for IT departments.

It is not as if industry is failing to provide clues on what the skills and study base should be. E-skills, the government organisation which promotes ICT skills, in conjunction with a wide range of industry partners and professional organisations has developed the Skills Framework for an Information Age (SFIA). This defines the range of skills needed to run a modern IT department and to use IT effectively in an organisation. Some 53 skills cover strategy, support, identifying and managing the benefits of ICT, training, implementation and integration of systems. Of those 53 skills, only one involves programming. And yet programming constitutes the be-all-and-end-all of computing and the predominating theme of ICT.

EdExcel's ICT syllabus make reference to SFIA but fails to deliver, still focussing on programming and website development. It lacks context. It misses areas such as service, commodity ICT and entertainment. It still has large amounts of programming, spreadsheets and databases. You are left with a syllabus which one student described as pointless and lack real-world application.

Here we have a set of specifications for A levels which neither engage with industry requirements nor draw in students by connecting with their everyday interests and

technological experience. They sit in a sterile academic desert, entered with trepidation by teachers and students alike.

It is at the level of curricula that the drastic failure of computing and ICT education lies. Rearranging the tired topics of computing and to a lesser extent ICT into four units does not constitute a new syllabus. Nothing less than a complete renewal, revision, re-branding and renaming is required.

At the end of the day, the A level syllabus reflect the stagnating courses offered by many universities where computer science is seen as a traditional, mathematical discipline. New courses are needed which connect with students and industry, At De Montfort we offer a forensic computing course developing analytical skills, a games programming course developing technical and conceptual skills in a student-relevant context, and ICT which connects the student with the concerns, skills and strategic thinking needed in industry. All these represent a shift away from the traditional ICT and computing courses which date back to the seventies. This same evolution of courses is needed at A level and even GCSE.

We must interest and excite the student, connecting with their understanding and experience. We must connect with industry, its changing requirements and the real-life problems it faces. And we should provide intellectual edge and depth.

This is all missing in A level syllabi. Until the curriculum developers grasp the nettle and reform ICT and computing syllabuses, the downward spiral of student numbers and interest in these economically vital subjects will continue.

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