Supplying Industry With Computer Engineers: Where Do We Start?

Jeremy Bennett, CEO, Embecosm

Open up a smartphone and you will typically find it full of British technology. Almost certainly the main processor is from ARM plc in Cambridge. The Bluetooth chip is probably from CSR plc, also in Cambridge. There is a good chance the graphics is from Imagination Technologies in Kings Langley. Even where the chip is from overseas, very likely it was designed here.

Embedded engineering, that is computers and software that are embedded within devices such as mobile phones, is a British success story going back decades. As Simon Knowles, founder and CTO of Icera put it at last year's Future World Symposium (www.nmi.org.uk/events/nmi-international-conference-2010), "we based our engineering team in Bristol, not because we come from the UK, but because they are the only engineers in the world that can design our type of chip".

Britain is not just good at this, it is the best in the world. If it can be done anywhere, it can be done here.

When I wrote an earlier version of this article, it was for teachers of children up to the age of 13. So why is this relevant to those teaching children at a young age?

The current leaders of this British expertise, the CTOs of these world leading companies, grew up with the BBC Microcomputer. In the early 1980s, a brash young IT Minister, Kenneth Baker, a ground breaking TV series and a high performing and modestly priced personal computer made technology fashionable both politically and socially. In 1983 there were more computers in the UK than in the USA, and teenage programmers gained national celebrity (and substantial fortunes) for their skills.

That wave of enthusiasm didn't come from nowhere. The BBC microcomputer drew on the skills of the Cambridge University Computer Laboratory, and their ground breaking research over the previous three decades. It led to a generation of children who chose to study computer science and electronic engineering at University, who became today's global industry leaders.

But recently we have run into a problem. We've stopped producing graduate engineers in electronics, software engineering and computer science. Companies like ST Microelectronics, with its huge UK research base, have been warning of the problem for some years. It seems all the more surprising, given that according to the government, software engineers can expect to make the most from gaining a degree of any subject—nearly a quarter of a million pounds over a career on average.

Up until now, it has been possible to replace lost team members with experts from overseas, who are only too happy to come to the UK to work and gain expertise. But the new government's decision to freeze immigration last year stopped that, and the problem was thrown into sharp relief. In the absence of any British candidates for jobs, major companies were forced to move their teams overseas to keep working, jobs that were then lost forever. The new regulations have somewhat eased that problem, but the underlying issue remains. There are not enough UK graduates to hire.

Talking to industry and universities, it becomes clear that the problem is not primarily in higher education. True there are problems with some newer universities turning out IT graduates with skills that are of no use to the engineering community. But the problem is the lack of supply into university courses in the first place—even Cambridge University Computer Laboratory has trouble finding suitable applications.

The problem is in schools. All too often the pressure to deliver exam results means students are steered into soft “IT” courses, rather than the more rigorous “computer science” GCSE. Most teachers think these are the same subject, just one is a bit more difficult than the other. But IT GCSE grew out of the old secretarial skills courses——which is why it is primarily about learning word processor and spreadsheets—while Computer Science GCSE is designed as a science course.

In fact for university courses, GCSE or 'A' level computing is far from necessary. But where schools have good students with maths and science qualifications, they are rarely inspired to consider computer or electronic engineering as a degree subject, having been brought up to believe it is all about entering data into word processors.

Underlying this is the lack of trained engineers teaching in schools. A recent survey suggested that of 18,000 schools nationally, there were only 1,800 teachers who considered themselves qualified to teach IT. I have to confess that I had never met a school teacher with a degree in computing or electrical engineering until this January.

The result is poorly taught courses, which inspire no one. The problem is long before GCSE, which is why those teaching under-13's are so important. I see it personally—my son frequently comes back with homework of a screenshot of Microsoft Powerpoint or similar, asking him to label what the various buttons do. Yet this is a child who, like many of his friends has been writing programs in scratch (scratch.mit.edu) for several years. 30 years ago, his age student would have been writing programs in BBC Basic.

It doesn't have to be so. The solution may not lie within formal lessons, but in inspiring after school clubs. In many schools near Cambridge, ARM engineers give up part of an afternoon each week to take MBED systems (mbed.org) into schools, to allow children to learn hands-on about modern electronics. Ten minutes to show children how to plug in the device to program it (using a standard PC), and then they are left to learn from themselves what they can do with the various displays, sensors and actuators, programming in C++. ST Microelectronics have their own equivalent Discovery Board (www.st.com/internet/evalboard/product/250636.jsp). None of this is expensive kit—the Discovery Board is around £10, while the MBED board is around £40. A more packaged (and expensive) alternative is the Lego Mindstorms (mindstorms.lego.com/en-us/Default.aspx) robotics technology. Something that all children take to very quickly.

These approaches show that it is possible to inspire young children to take an interest in engineering. It also shows that industry needs to help create the next generation. We cannot just blame teachers who do not have the skills necessary—industry can provide a way to supplement those skills. ARM shows how it can be done, and being a large corporation does so in a very planned and organized way. But this approach will work just as well with an informal relationship with a local computer or engineering company.

So how can we, as professional computer engineers help? The approach used by ARM in supporting after school clubs is highly effective, but we need more of them and that needs more individuals and companies with the right skills to take part. We need to push this strategically at a national level, and also participate as individuals.

As well as running my own embedded software company, I spend two days each month working as the embedded systems champion for the Electronics, Sensors and Photonics Knowledge Transfer Network (ESP KTN). This is how I try to influence strategy at a national level.

The KTNs are funded by central government through the Technology Strategy Board, and are charged with improving the flow of knowledge between the academic and industrial worlds. We do not have a direct responsibility for education, but we are charged with using our resources to boost the competitiveness of UK industry. So that is why I encourage industry to reach out to schools to help boost the future supply of engineers.

The ESP KTN is free to join (ktn.innovateuk.org/web/espktn) and currently has around 7,000 members. We run a range of events, including seminars, industry brokerage and

training courses, as well as running a website for the entire community. In the last few months we have worked with industry to put on a series of training courses on the MBED system, and in future plan to offer training courses on alternative systems, such as those from ST Microelectronics.

These low cost courses have a broad remit of helping train up current engineers to learn more about embedded systems. But they are also highly suited to technology leaders within the school system, who we encourage to attend by waiving the attendance fee.

The other way to reach out to schools as an individual is to become a STEM Ambassador. The STEM scheme is for professional scientists, technologists, engineers and mathematicians who wish to make their skills available to schools. This can be as simple as attending career days, or can be more substantial, providing teachers with specialist input for lessons, or helping to set up after school clubs. The STEM scheme provides some basic training, a network to link schools up with ambassadors and insurance for individuals taking part. You can sign up via the STEMNet website (www.stemnet.org.uk).

Industry have identified the problem, and also shown one way it can be solved. In an ideal world we would have a BBC Micro for the 21st century. But in the meantime, opening children's eyes to the potential, by using technology such as MBED, and drawing on the skills of local engineers provides a way to inspire a future generation of British technologists.

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This article was first published in "The Ring", the journal of the Cambridge University Computer Laboratory Ring in May 2011. An earlier version of this article was published in the ICT Broadsheet of SATIPS, the Society of Assistants Teaching in Preparatory Schools in January 2011.