Next big thing

Experts disagree over the impact the 'internet of things' will have on education, but all agree it is coming.
Daniel Thomas investigates

Picture a typical secondary school classroom in 10-15 years' time. Pupils wear smart wristbands that automatically register their attendance. Advanced analytics allow teachers to map performance against things like stress levels and room temperature. And the school's energy bills have been halved, thanks to the smart monitoring of electricity use around campus.

It may sound far-fetched, but these are just some of the ways experts believe the 'internet of things' (IoT) could revolutionise education in the not-so-distant future. But just how realistic are they? And when will such ideas be commercialised?

For the uninitiated, the IoT is the idea of connecting 'smart' enabled devices with other smart enabled devices to harness reams of useful data (usually by way of sensors). This is then analysed in real time and fed back to us, to help us improve or automate everyday processes.

Current market examples include smart thermostat systems or remote wi-fi monitoring of washer driers. However, Gartner says the trend could go mainstream in the next five to 10 years, as billions more devices are connected.

Proponents says we could see everywhere from hospitals, to sports fields, to traffic systems to whole cities rigged up and made 'smart, giving rise to radical new ways of working.

'Just getting underway'

Obviously, the education sector is crying out for such disruption, but ed tech expert Stephen Haggard warns that we shouldn't get our hopes up just yet. Most IoT ideas are still at drawing board stage and practical applications are a long way off.

"The government-funded stage of the research on IoT is just getting underway now, which is where people do crazy pilots and look around," he says.

"And in general the applications that are most touted are not in education – so if you look at the UK government's Walport report, it identifies transport, health and smart cities as the big areas but it doesn't mention education."

Perhaps not surprisingly, he says the IoT is more likely to have an impact on plain-old facilities management, rather than pedagogy, in the short term.

According to a research report from Cisco in 2013, titled 'Education and the internet of everything', schools are in fact already using early stage applications. It gives the example of Council Rock School District (CRSD), the ninth-largest school district in Pennsylvania, which has used Cisco tech to integrate its heating, ventilating and air conditioning systems.

This allows IT departments to power-off devices and computers remotely, wake up devices for maintenance work and turn off devices during holiday periods. Cisco says the schools saved $8.8 million (£5.8 million) through the scheme in 2012 and cut energy use by 40%.

Another example is the University of San Francisco, which is using an IoT-enabled surveillance system to improve security. It uses facial recognition technology to spot intruders (even in crowds), then automatically alerts front desk and security staff in real-time through their desktops or tablets.

Contextual circumstances

When it comes to how the IoT might help us learn, things get a lot more speculative – albeit in hugely interesting ways.

At the more plausible end of the spectrum, a recent report from Deloitte, titled 'Connected government and the internet of things', suggests that the IoT could be used to streamline time-consuming processes such as roll call, freeing up the teacher. This matters because about a third of all student time in class is lost to interruptions, such as

"transitions, materials distribution and starting or ending class", claims the report.

But as children took their seats in a connected classroom, attendance "could be logged automatically by a wearable smart-band, [akin to the] RFID bands that many theme parks already use to check in to rooms, rides, and even find lost children".

More ambitiously, wearables might be used to map student performance against contextual circumstances, such as mood levels, classroom temperature or even the teacher's own actions. And all of the data collected would be crunched in real time and relayed to the teacher to help them work more effectively, the report adds.

Richard Taylor agrees IoT wearables are interesting, but warns there would ▶

▶ be big barriers to take-up – one being convincing teachers to actually use these applications. "Some teachers will probably see it as an invasion of their professional privacy, almost akin to spying; getting them to buy in to the benefits of data will be essential but won't be easy."

He also questions whether parents would be happy given the privacy implications. Schools already face strict rules around data from both the UK government and EU, so moving to a point where significantly more data is being collected will require a lot more negotiation with educators, students and parents.

"These changes may technically be possible very soon, but in reality they will take time to implement if we want to avoid the sorts of problems that derailed InBloom [an adaptive learning company that had to close after a parental backlash in the US]," says Taylor.

A less obstacle-filled path would be to use the IoT to make education more engaging, through so called 'hyper situated learning' for example.

Galleries and museums already allow people to access location-specific audio guides through their smart phones as they move around an exhibition. But according to Bryan Alexander, an educational technology expert based in the US, the idea could be extended to a host of other locations for students.

"We could see really new ways of learning, like having students explore an environment (built or natural) by using embedded sensors, QR codes, and live data-streams from items and locations.

"And people will increasingly come to campus with experiences of a truly interactive, data-rich world. They will expect a growing proportion of objects to be at least addressable, if not communicative."

This logic could be easily extended to special educational needs (SEN) education, argues Cisco, which says we could see IoT headsets for learners with attention deficit hyperactivity disorder (ADHD). These would detect brain activity and offer rewards when a learner demonstrates improved concentration.

Pilots and soft money

Whether you believe such innovations could become reality or not, the IoT is clearly evolving fast, and this increases the likelihood we'll see more solutions focused on education.

In February, TechNavio predicted that the number of connected devices globally would grow to exceed 17 billion in the next five years, while some put the figure much higher. And in 2013, Cisco, perhaps prematurely, said that the internet of things had a 10-year "net present value" of $175 billion in education, to be delivered through "streamlined and personalised instruction [and] the collection of data for making better decisions and reducing expenditure".

In the near term, it seems that most of the opportunity will go to existing vendors in the facilities management side of the market, such as Cisco. And as Haggard suggests, commercially viable pedagogical solutions remain at proof of concept stage.

"For now there are a lot of reasons for people to say, this isn't mature and it's too early to be commercial. So I would expect for the next few years it's just going to be pilots and soft money – one to watch rather than to throw your money at," he says.

Taylor adds that another barrier will have to be overcome for IoT solutions to gain critical mass – the cultural aversion of many schools to cutting edge ed tech. This may be based on conservative procurement policies, budget fears or a general lack of evidence that solutions work.

He says that what "many teachers really want is something that is a bit better than what they have now, not something transformational. Schools are complex organisations and any serious transformation is complex and requires significant investment in professional development." ∎

FIGURE 1
THE INFORMATION VALUE LOOP
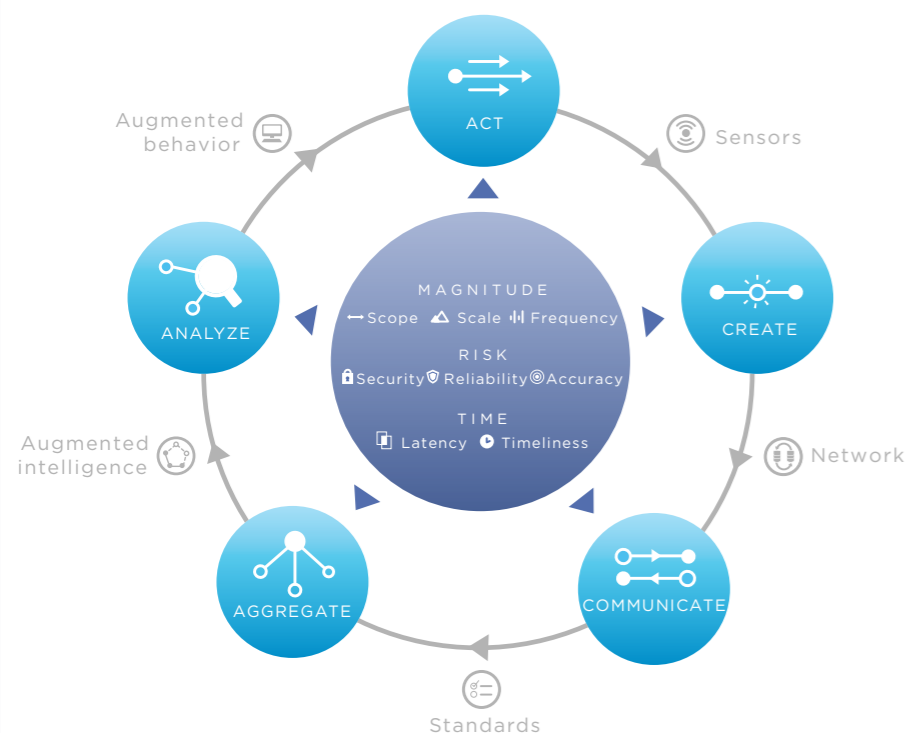
VALUE DRIVERS STAGES TECHNOLOGIES

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