

The Connected Business

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Expect the spectacular - but just not yet

Security and cost need to be resolved before the internet of things takes off, writes *Maija Palmer*

By this time next year, we may have become disillusioned with the internet of things. The idea that every object – from toasters to street lights – could be connected to the internet and be communicating with us has been hyped for several years.

It reached a peak this month at the International Consumer Electronics Show in Las Vegas, where more than 900 companies exhibited connected products. Samsung, makers of products from fridges to phones, said that within five years all of its appliances would be able to connect to the internet.

The predictions for the number of objects that will be connected are big – from technology research company Gartner's forecast of 25bn connected physical objects by 2020 to tech com-

pany Cisco's more bullish 50bn forecast. Cue the ennui. Just as the internet hype of 2000 led to disillusionment, the internet of things will struggle to live up to expectations in the short term.

Companies, certainly, remain unconvinced by the business case. A survey by Gartner of 1,500 chief information officers last August found that only 22 per cent had deployed or were experimenting with the internet of things.

The remaining 78 per cent either thought it irrelevant or at the too-early stage.

One problem is that the technology is still a little expensive, says Maurizio Pilu, partnerships director at Digital Catapult, a UK government organisation that helps support new projects.

The price of a simple wireless sensor will soon be as low as £1, a price point at



which this could become a mass-market proposition. But other parts of the kit, including communications and battery modules, might still come in at £20 to £40, which, Mr Pilu says, is too high.

"It needs to become closer to £3 to £4, [then] the business case begins to make sense," he says.

Telecoms networks have to change to meet the requirements of billions of low-power devices that need to connect constantly to the internet to transmit small amounts of data. The cost of sending such data over the network will have to come down.

"It is not scalable for a low-cost device to pay several dollars a month just to have connectivity," says Zach Shelby, director of technical marketing for the internet of things at Arm, the chip designer.

Security will need to be improved to ensure that internet-connected objects cannot be hacked and hijacked. Physical attacks over the internet are happening. At the end of last year the German federal office of information security revealed that machinery at a German steelworks was severely damaged when hackers gained access to control systems via the internet.

When everything from traffic lights and cars to home heating systems are linked online, the potential for harmful hacks increases further. However, the simple, low-power devices used for the internet of things might not be able to handle heavy encryption, or may not be patched and updated if a security flaw is discovered.

"There are big security holes and quite a lot of work needs to be done to fix

them," says Jim Tully, analyst at Gartner.

Interconnectivity of devices is an issue that needs resolving. If your toaster cannot talk to your TV, or if the street lights are not on the same system as the rubbish bins, the networks will be less useful. Persuading all manufacturers to agree looks tricky, as a number of competing industry groups are each pushing their own standard.

"Everyone says 'yes, lets ensure interoperability – as long as it is my version of interoperability,'" says Mr Pilu.

The internet of things will raise privacy concerns, as it makes a fresh level of tracking and data collection possible. In the same way that companies and governments can follow what people do online – the websites they visit, what

Continued on page 2

Inside

Internet of things keeps ahead of the law

Regulators have been slow to recognise legal implications

Page 2

Shining a light on smart cities

Sensors that receive and transmit data can increase urban efficiency

Page 2

Divide over a common language

A big name is likely to determine how devices communicate

Page 3



Technology that keeps your house in order

Smart devices now have practical applications to attract a wider audience

Page 4

The wealth of opportunity brings with it enormous risk

Security

Connected devices promise to transform the lives of consumers but they may also compromise privacy, writes *Hannah Kuchler*

One sober voice stood out amid the whizz-bangs of the International Consumer Electronics Show, the technology industry's annual world fair.

Edith Ramirez, chairwoman of the Federal Trade Commission, the US regulator, warned that the plethora of internet of things devices filling the show floor were a risk to consumers' privacy and security.

Cars, fridges, thermostats and even massive machinery are all going online, often being shepherded by start-ups more excited about their potential than worried about ensuring they are protected from the hands of hackers. About \$1.9bn was spent on connected devices for the home in 2014, according to the Consumer Electronics Association that hosts the Las Vegas show.

"These potential benefits are immense, but so too are the potential risks," Ms Ramirez says. "We have an important opportunity right now to ensure that new technologies, with the potential to provide enormous benefits, develop in a way that is also protective of consumer privacy."

The number of internet-connected devices first outnumbered the human population in 2008. It is set to grow to 50bn or more by 2020, generating global revenues of more than \$8tn, according to a report by the US president's National Security Telecommunications Advisory Committee (NSTAC).

A 2014 study by Hewlett-Packard found that more than 80 per cent of these devices did not require passwords of sufficient complexity and length, and 70 per cent of devices tested used no encryption when transmitting data online.

Jeff Greene, senior policy counsel at Symantec, the cyber security company, and co-chair of the NSTAC task force, says policy makers are paying more attention to the threat posed by internet-connected devices, which are often connected to each other – creating new



Rules: Edith Ramirez

vulnerabilities for cyber criminals to exploit.

"We have created a whole new playground for attackers to dream up things to do – whether it is nuisance, whether it is theft, or whether it is violence."

The report, still a draft, warns that not only could devices be used to harvest huge amounts of personal information, they could also be used to cause physical destruction that could lead to "significant

"We have created a whole new playground for attackers to dream up things to do"

consequences to both national and economic security."

Amit Mital, chief technology officer for Symantec, says the proliferation and affordability of the sensors used in internet-connected devices could result in a "very, very, very large-scale broad attack."

He adds: "If there are tens of millions of automated thermostats that could be

targeted with one compromise it could affect all, either as a nuisance for notoriety and fame, or, in an industrial setting, controlling critical infrastructure could cause significant risk and damage to life and property."

One of the key problems for securing the internet of things is that devices are made by a large range of manufacturers, often with security as a bolt-on rather than integral to the platform, says Mr Mital. But progress has been made in trying to set standards in the past few months, with much less variation in how they are now designed than even six or seven months ago, he says.

Another potential difficulty is that because sensors are so cheap they could soon be attached to almost anything, employing people to monitor their security is unaffordable. When devices can speak to other devices with no human intermediary, it becomes harder to ensure they are behaving the way they are designed to.

"When you're paying \$1 for a device, it doesn't make sense for a human to manage. It doesn't scale so human intervention is often not feasible; it needs to be handled in a very automated, but managed way," Mr Mital says.

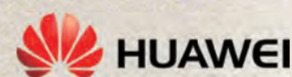
While the internet of things is often seen as devices for the connected human and the industrial internet, offices face both the challenges and opportunities that come with the proliferation of internet-connected devices.

Adam Conway, vice-president of product management at Aerohive, which provides wireless networking to offices, says workplaces may have internet-connected devices that their IT departments do not know about. "Video surveillance, installed by physical security [guards] not data security. It is a huge issue."

Hackers tend to seek out the easiest access point into an organisation and once inside, travel through the network to find the information they are seeking. If a device is allowed to roam online, rather than restricted to reporting one data point to one place, it could be a prime target.

"Even if the [information technology department] is fully aware of it they often don't have the resources to work on it," says Mr Conway.

"Their work is oriented towards big software systems . . . so they are not deploying their resources to the way we put this device on the network."



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The Connected Business



Expect the spectacular – but just not at the moment

Continued from page 1

links they click – it will become possible to track almost everything an individual does in the physical world.

Companies are interested in the marketing possibilities this presents. Yet public opinion will have to decide whether there should be limits on what can be monitored.

While these issues are being resolved, large-scale internet of things projects are rolling out slowly. The projects with the clearest business case have to do with saving money on municipal street lighting and bin collection. General Electric says San Diego will save \$254,000 a year by replacing some 3,000 street lamps with an intelligent lighting grid where each individual lamp can be remotely monitored and adjusted. The system makes it easy to pinpoint lamps that need changing and switch off those not in use.

Philadelphia, meanwhile, was able to reduce its rubbish collection costs from \$2.3m to \$720,000 in part by fitting rubbish bins with sensors that were triggered when the container was full, eliminating unnecessary collection trips to half-empty bins.

More complex projects are still in a development phase. Milton Keynes in the UK will this year fit parking spots with sensors that tell drivers when the space is free. Mr Pilu, who is helping to launch the project, admits that it will be difficult to measure the return on an investment like this.

Medical and research uses are being explored. Research from AT&T, the US telecoms multinational, for example, has partnered with 24eight, which makes pressure sensors that can be embedded into shoe inner soles. They have distributed slippers with an internet-connected chip to elderly people at a care centre in Texas, and are using the foot movement data they receive to diagnose health problems, such as the initial stages of Alzheimer's disease.

"In the early stages of Alzheimer's you might get up to make a cup of tea but for a moment forget where you were going. That small wandering pattern, which others might not initially notice, could be an early warning sign," says Mr Tully.

He believes some of the "wacky" personal items on display at CES may evolve into industrial-scale applications. Vessyl, a cup that identifies any liquid poured into it, might sound like a toy for those wanting to keep tabs on their drinks intake. But what about applying the concept to a car and monitoring that the right fuel is in the tank?

"We will see hundreds of little applications that will be eventually woven together to make a smart city," says Mr Pilu. "I believe this will develop in an evolutionary way."

But do not expect the internet of things to do spectacular things just yet. For the time being, expect more internet-connected bins and street lighting, while businesses work out just what else these ecosystems can do.

The internet of things keeps one step ahead of the law

Data protection

Regulators have been slow to act on the potential legal implications of connected devices, says *Jane Croft*

Since the advent of the internet the law has struggled to keep up with advances in technology.

While increasing numbers of everyday objects are being connected in the internet of things, regulators and lawmakers have been slow to recognise the potential legal implications for issues such as privacy and data protection.

Connected devices are often located in intimate spaces such as the home and the car or, in the case of smart pills, are ingested into the body. This increases the sensitivity of any personal data transmitted by such devices to companies keen to monitor what were previously private activities.

No specific new laws relate to the internet of things. Instead it is governed by existing legal frameworks.

In the UK, personal data remains subject to the Data Protection Act 1998 and across Europe there are EU directives, including the EU data protection directive which regulates the processing of personal data. Breaching these laws can lead to enforcement action and fines by national regulators such as the UK's Information Commissioner's Office.

The US Federal Trade Commission took its first action relating to the internet of things in 2013 and later settled a complaint with a company that markets video cameras designed to allow consumers to monitor their homes remotely. The regulator had claimed that the company's lax security practices led to the exposure of the private lives of hundreds of consumers on the internet.

Some data will need more protection than others. A sensor tracking pallets being shipped overseas is unlikely to

transmit much sensitive personal data by comparison with a wearable fitness device, for instance, which might be transmitting medical information.

Furthermore, some instances are not entirely straightforward. A fridge connected to the internet can inform the supermarket when it needs to be

"The challenge is how do you get information on [data] consent across in a meaningful way?"

restocked. However the data it is transmitting could give away sensitive details about its owners' health or religion, for example, if halal or diabetic food is ordered.

In an opinion adopted last year by the Article 29 data protection working party which advises the EU Commission, the working party found that in

many cases the consumer is unaware that data processing is being carried out by the companies that have supplied specific objects. It recommended that obtaining consent from individuals in relation to data collection is essential.

Ruth Boardman, who jointly heads the international privacy and data protection group at law firm Bird & Bird, says the current legal [EU] framework is well equipped to deal with issues.

"The existing directive gives high-level principles rather than being prescriptive so I think it is able to cover the new technology," she says.

"At the moment people have to ask on some issues of data collection whether consent has been given, and whether it is transparent or proportionate, and it is for people to work out how the principles apply."

"The challenge is, how do you get that information on transparency and consent across to people in a meaningful way? It may be easy to get someone to sign up to consent when you have to set

up a device but what about a toothbrush which is connected to the internet?"

Vin Bange, head of data protection at law firm Taylor Wessing, says the EU is strengthening the directive with the forthcoming General Data Protection Regulation.

The UK's ICO can fine up to £500,000, for example, for serious breaches of the Data Protection Act, but the new EU regulation means that fines are tiered and could be tied to a proportion of a company's global annual revenue.

Lawyers say that those companies selling internet-connected devices would be expected to offer a duty of care by installing security measures to foil hackers. Breaching that perceived duty of care could lead to civil litigation.

But for some low-cost, disposable connected devices – such as an internet-connected toothbrush, for example – obtaining consent from consumers about the use of their data or improving security may be more difficult.

Systems may struggle under sheer diversity of applications

Congestion Consumer devices are expected to favour 2G and 3G networks, writes *Daniel Thomas*

Imagine a smart car suddenly losing its connection with the network that helps control its driving functions remotely. The results could be fatal.

Likewise, what would happen if connected city functions – traffic lights, for example, or energy supply – suddenly become less smart owing to a network outage or congestion?

Or if police monitoring a street carnival suddenly lost their signal?

These are the sorts of problems that network providers need to solve. The fact that tens of billions of devices comprising the internet of things will join the network is often overlooked amid the ambitious talk about growth in wearable devices, connected cars and smart cities.

Consumer devices in the internet of things are mostly expected to run over mobile networks or home WiFi. However, Martin Garner, analyst at CCS Insight, says the sheer diversity of the internet of things will mean a variety of challenges.

"Some segments will need excellent in-building coverage and will be fine with the low data rates that 2G offers, such as smart meters," he says. "Others will need much higher data speeds, such as security cameras."

Costs will be important. Existing consumer networks could be expensive for a sensor required to send out only a few messages every year – for example, to help monitor crop rotation for a farmer.

Phil Skipper, head of M2M (machine-to-machine) business development at Vodafone, says the internet of things will be characterised by "very high numbers" of static and only occasionally connected devices that need to preserve power.

"Telecoms networks are already well

suited to provide reliable, immediate connectivity in areas like smart metering through to high-bandwidth applications like the connected car," he says.

"However we are also focusing on WiFi and low-power wide area networks to cater for the low end; 2G networks currently play an important role in enabling machine-to-machine applications and we see this continuing until other lower-cost technologies are proven."

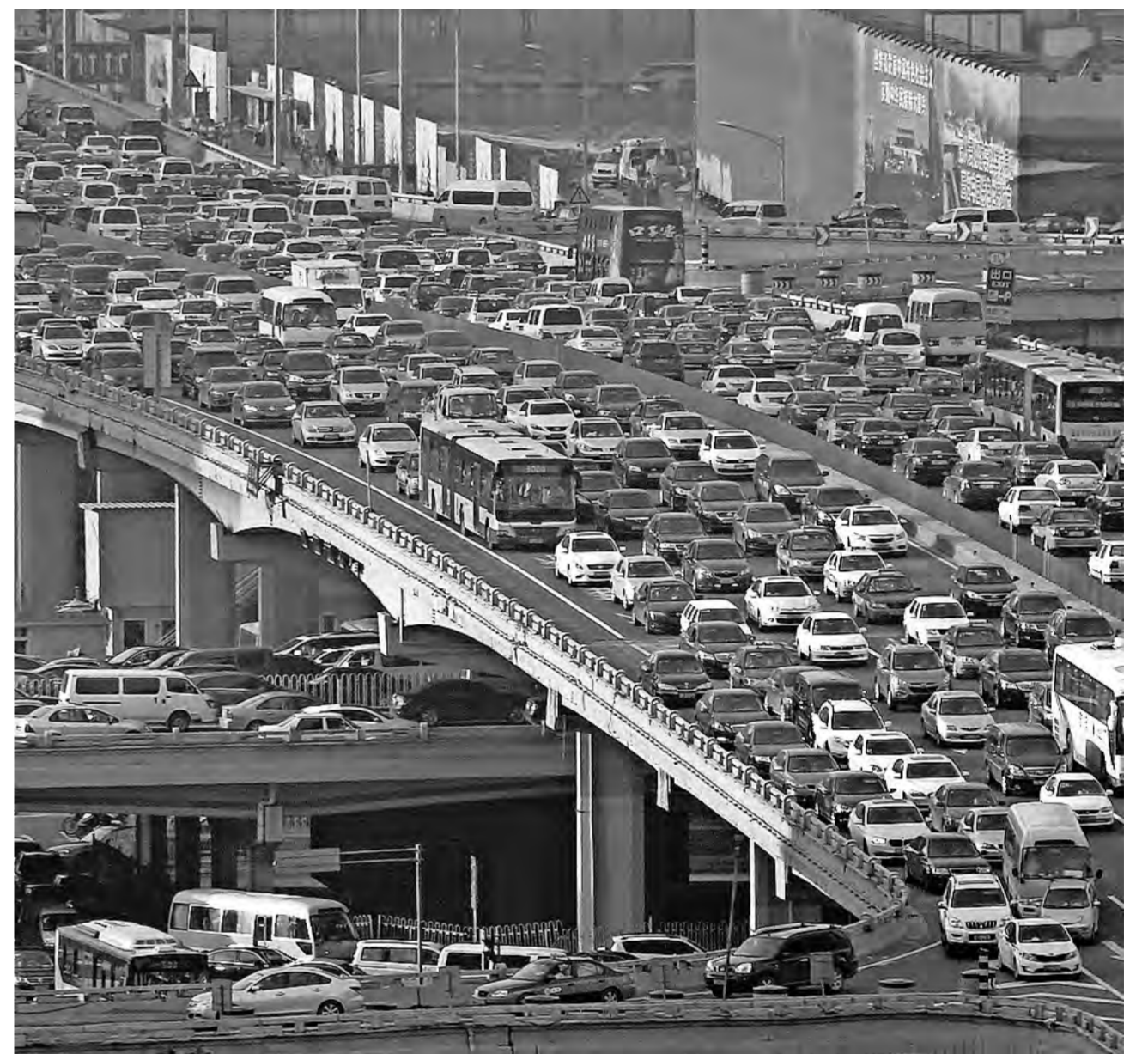
Cost, Mr Garner agrees, will mean the internet of things may favour 2G and 3G over 4G for a few years.

"Many internet-of-things applications, such as sensors for monitoring river water levels or smart meters, will not load the networks heavily and can be supported well. Others, such as video from a police car chase, will be much more challenging for network operators because of the need for high data speeds with good coverage and priority data traffic."

Gradually such "heavier" data traffic is expected to move to 4G networks. Andy Sutton, principal network architect at EE, the British network operator, says 2G networks will soon begin to be shut down in leading markets such as the US.

Mr Garner says that "4G has the scale needed to be able to manage the internet of things – not just in the capacity of spectrum and backhaul [underground cables], but in the natural separation of data traffic from signalling traffic. Typical applications to date have been low-bandwidth, but an ultra-HD uplink security camera stream simply wouldn't be possible on 2G."

Network standards for 4G use in the internet of things have already been drawn up by the European Telecommunications Standards Institute (ETSI).



This will allow object connections for a few euros per year, with a few milliwatts for transmission and a modem costing less than €1. These also enable long-range data transmission – of distances of about 40km – and communication with buried underground equipment for several years of operation, even with standard batteries.

Telecoms executives also point to the next generation of 5G mobile as useful in supporting the internet of things. Such 5G networks have yet to be defined, with tech labs around the world continuing research into standards. But experts say that 5G will be perfect to connect things such as cars and homes to the internet.

Even here there will be problems – for example, the connectivity of a car, or a lorry being tracked remotely, needs to function even if it has crossed the border between France and Belgium. Operators such as Vodafone are coming up with solutions, such as a global sim card that can be used in a connected car without international roaming costs.

Miguel Blockstrand, head of M2M for Ericsson, the Swedish technology group,

says systems will have to be created to run internet-of-things networks efficiently, with systems needed to monitor how well devices are working. "What happens when your fridge stops talking to you?" he asks. "You need systems overlaid on the network to monitor diagnostics."

Other alternatives are being developed by companies aiming to provide reliable connectivity without too much cost for more basic devices that will make up much of the fabric of the internet of things. Sigfox, a French start-up, uses unlicensed radio spectrum – which means that it does not need to acquire or in turn charge for use of expensive licensed airwaves – to provide a basic, cheap network dedicated to linking up machines in the internet of things.

While telecoms providers will need to support the rapid growth in smart devices and real-time services with a variety of options, the provision of such ubiquitous, secure and preferably cheap networks will be the bedrock of much of the traffic – at least to begin with.

Slow lane on Guomao Bridge in Beijing: a network outage could lead to widespread traffic congestion
Reuters

The humble lamppost helps to shine a light on smart cities

Infrastructure

Sensors that can receive and transmit data can help to increase urban efficiency, writes *Sarah Murray*

As Christchurch in New Zealand is rebuilt after the 2011 earthquake, it is seizing an opportunity: to install sensors that will collect real-time data on everything from water quality to traffic flows. While Christchurch may be using reconstruction as a chance to create a new kind of city, it is not alone in recognising the potential of the internet of things to increase urban efficiency.

For cities, equipping infrastructure with sensors that can receive and transmit data creates opportunities to cut costs and increase environmental sustainability. Water pipes equipped with sensors can detect leaks, for instance.

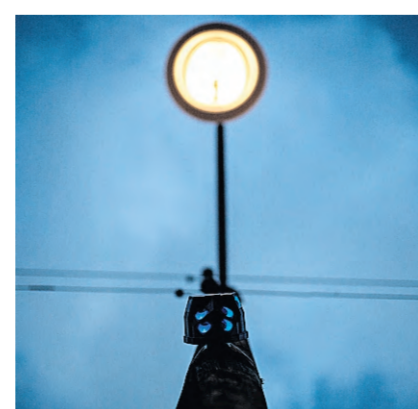
In the Port of Hamburg, Germany, sensors on roads, bridges and other infrastructure are being used to monitor ships and vehicles and to cut the environmental impact of operations.

Søren Hansen, senior chief consultant at Ramboll, the Danish engineering, design and consultancy company, cites embedding sensors in the tarmac of car parks so that empty spaces can alert nearby drivers.

"It's an efficiency tool, and because you save time for drivers and passengers, that's converted into productive time and you reduce air pollution and energy consumption," says Mr Hansen.

And if the internet of things can promote greater efficiency and productivity, it is also relatively cheap to install, especially when done at the same time as big rebuilding projects.

"The cost of this is marginal compared to the cost of the actual infrastructure, so it is a great opportunity to try new things," says Léan Doody, smart



Lighting the way: sensors save money

cities lead consultant at Arup, which is working with the city of Christchurch.

One piece of city infrastructure that is seen as having great potential to harness the internet of things is the lamppost.

Lampposts, equipped with motion detectors, can light up only when a person or vehicle approaches, saving energy. However, street lights

also have the advantage of height, allowing the installation of sensitive equipment high above cars and pedestrians, and are widely installed across most cities. They are also connected to the power supply.

This means they can be used to monitor everything from electric meters and vehicle charging stations to traffic lights and parking spaces. Sensors can detect changes in noise levels that might indicate incidences of crime or civil unrest.

"The lighting installation in the urban space is the most important piece of infrastructure in realising the smart city," says Flemming Madsen, head of secretariat at the Danish Outdoor Lighting Lab, a Danish consortium that is developing and testing smart lighting systems in Copenhagen.

"We've developed a smart city lighting pole, so you have more space at the bottom for the intelligent applications, electronics and software controls."

"And all the luminaires [light fittings]

have an IP address so they can talk to us and we can talk to them," he adds.

Mark Skilton, a digital expert at PA Consulting Group, sees broad applications for smart technologies in cities. He sees the internet of things linking the physical world with "the cyber world of connected digital services, smart buildings, mobile citizen data and connected services".

But despite the tremendous opportunities the internet of things presents to cities, municipal administrations face several hurdles in implementing these kinds of technology initiatives.

Municipal procurement processes – favouring large, established companies – can be at odds with the need to work with nimble, start-up IT businesses. "They [city governments] might arrive at better solutions if they were able to work more collaboratively with the supply chain than procurement sometimes allows," says Ms Doody.

The siloed nature of many city gov-

ernments also acts as a barrier to implementing projects, with technology investments made by individual departments rather than in support of overall city objectives.

"There may be smart parking pilots and journey planning information being made available but they're not joined up to policy objectives, such as getting more people on to public transport," says Ms Doody.

Some cities have recognised the need for more joined-up technology thinking. In the US, for example, cities such as Chicago, San Francisco, Boston and New York have chief information officers or commissioners to oversee city-wide technology developments.

Mr Hansen believes governance and leadership is as critical as the technology itself. "City governments have to develop a strategy. They need to know exactly what they want the smart city to do. Otherwise development can go in any direction."

The Connected Business

Big names dash for line in race for a common language

Interoperability Smart appliances still lack the ability to talk with each other, writes *Murad Ahmed*

What is the point of being able to talk to your fridge, if your fridge cannot speak to your vacuum cleaner? This may appear to be a nonsensical question, but it is one many of the world's leading technology manufacturers are taking very seriously.

Companies such as Google and Samsung are betting that the next big thing in technology will be the internet of things – a catch-all term for physical goods, often home appliances, that are embedded with sensors and able to connect to the internet.

However, although considerable effort has gone into how these devices can interact with humans, there are concerns about how smart appliances will communicate with one another.

These fears are often referred to as the “interoperability” issue – where devices, though made by different companies, are able to work with each other. Currently, rival manufacturers frequently build gadgets that use different standards, controls and digital languages, meaning that devices “talk” at cross purposes and cannot work with one another.

The best way to solve this would be for gadget makers to use the same, universal set of technical standards. The

benefits are clear. If consumers know that their “smart” watches, thermostats and lighting systems will work smoothly with one another, they will be willing to spend more to fill their homes with these devices.

“I believe that businesses and industries that quickly harness the benefits of the internet [of things] will be rewarded with a larger share of . . . increased profitability,” says John Chambers, chief executive of Cisco Systems. “This will happen at the expense of those that wait or don’t adapt effectively.”

The problem with such optimism is that these same tech groups are unable to agree on which standards to use. In July 2014, Intel, Samsung and Dell said they were joining forces to create the Open Interconnect Consortium, with the aim of creating a new wireless standard for the internet of things.

This powerful grouping is seen as an attempt to take on the AllSeen Alliance, a consortium of about 60 companies, including Microsoft, that is working to develop a common language based on Qualcomm’s AllJoyn software.

Both groups say they are building free “open source” software, available to all, and that anyone can contribute to the creation of their standards. Some observers say it is no surprise that rivals should emerge, claiming to have simi-



larly altruistic principles, to challenge each other for market share.

Intel and Samsung are large chip-makers that have no intention of allowing their biggest competitor, Qualcomm, which has dominated the world of smartphones, to lead the charge on the internet of things. The winner of the standards war could find itself at the forefront of this new industry, with billions of dollars flowing to the victor.

Although AllSeen Alliance and OIC are among the frontrunners, there are other groups trying to create alternative standards.

An added complication is that some companies are members of more than one standards group. For example, Intel is also part of the Industrial Internet Consortium, along with AT&T and Cisco, which has a stated goal to “influence the global development standards process for internet and industrial systems”.

Others are working together on more specific technologies related to the internet of things. Samsung has joined Arm Holdings, Google and others to create the Thread Group, which is working on a system that can improve or replace WiFi and Bluetooth wireless networks.

“A battle is one way to characterise it, but another way is that it’s a bit of a mess,” says Martin Garner, an analyst

at CCS Insight. “I get the sense that it’s such early days and there’s so much to play for, the companies think they may as well all have their own standards position now, in the hope that they get a decent share of the pie. But now it’s got to the point that there are too many [types of standards] from the consumer’s point of view.”

Perhaps the only thing that will tip the scales in favour of one group or another is if Silicon Valley’s big two in mobile devices – Apple and Google – back one or other standard. However, that looks unlikely.

Apple wants the internet of things to be built around iOS, its mobile software used on iPads and iPhones.

It has recently released the HomeKit software development kit, allowing app developers to build features for Apple devices that can sync easily with home appliances.

Meanwhile, Google would prefer the connected home to be built around Android, its software for mobile devices. It is making its own big bets in

Cool technology: Companies aim to have most smart home appliances connected to the internet and working with each other

Getty Image



this area, paying \$5.2bn for Nest, a maker of smart thermostats and smoke alarms.

For now, Apple and Google appear less interested in making all devices speak to one another and are instead concentrating on creating the best experience for customers using their connected gadgets.

“These standards groups are all at different stages of their development,” says Mr Garner. “But there are so many of them and they are so confusing that Google and Apple, because of their brand if not their technology, will kick off the major adoption of the internet of things.”

As with previous interoperability battles – the most notorious being between the VHS and Betamax videotape formats – the winner will probably be the group that combines the best marketing with securing the greatest number of partners. But in these early days of the internet of things, such a clear victory still seems a long way off.

Poor design blights progress in making a game of working life

Gamification

Disillusionment has set in as technology fails to live up to ambitious expectations, writes *Jessica Twentyman*

Work can be dull and repetitive. Games are fun and engaging. So why not turn work into a game?

That is the thinking behind gamification – injecting everyday workplace tasks with elements taken from computer games. As more devices become connected to the internet it will become easier to track individual behaviour and the gamification of many chores is the natural next step. For example, employees who are set the challenge of beating time limits, collecting points and progressing to new levels will become more motivated and productive, say its proponents.

But the concept, which emerged at the start of the decade and quickly achieved IT-industry buzzword status, has stumbled into a morass of confused definitions and unmet expectations.

In 2011, for example, analysts at research group Gartner were predicting that more than two-thirds of the world’s top 2,000 companies would use gamification by 2014. A year later, they stated that 80 per cent of gamified applications would fail to meet business objectives by 2014, mostly due to poor design.

Today, Gartner analyst Brian Burke acknowledges that gamification was “oversold” and “overhyped” in its early years, but still insists the idea has value.

“We may be in a phase of disillusionment right now, but I still believe that this will give way to a more mature understanding of gamification’s opportunities and limitations,” he says.

The psychological urges that drive individuals to seek reward and recognition for their achievements are powerful. Boy Scouts are rewarded for

learning skills with badges, while frequent-flyers accrue air miles to achieve higher status levels and receive additional perks.

With that in mind, many of the apps that people use outside work – such as Duolingo to learn another language – have gamification at their core. These gamified apps encourage positive behaviour, promote friendly competition and track progress against goals.

The quest for reward and recognition is no different in business, where employees are accustomed to competing for promotions, year-end bonuses and outstanding service awards.

So what is holding workplace gamification back? In part, it is an issue of availability. The glare of industry hype has not been matched by enough enterprise software that cleverly incorporates gamification into the business processes it is designed to support. That leaves organisations keen on gamification in the unenviable position of having to pick from a limited range

‘There’s a tendency to dismiss gamification as a passing fad or feel it trivialises important work’

of gamified enterprise applications or retrofitting existing systems with game mechanisms.

“For many companies, that’s a big hurdle,” says Maggie Buggie, vice-president and global head of digital sales and marketing at consultancy Captergini.

Gamification is a software design principle – but even where it has been applied by software developers, the term “gamification” can still be a turn-off for buyers, according to Neil Penny, product director at Sunrise Software. The company’s applications, he explains, can be configured to enable helpdesk and call-centre staff win badges and work their way towards attaining new achievement levels – but that proposition does not



Software is not yet hitting the target

always play well with sales prospects.

“I think it’s fair to say the term ‘gamification’ is not well loved,” Mr Penney says. “There’s a tendency to dismiss it as a passing fad, or feel that it trivialises important work, or see it as a tool of manipulation that employees will resist.”

“But when we talk to customers about reward and recognition and employee motivation and boosting productivity, they start to listen. Gamification, applied well, can support all those things – so perhaps it just needs a bit of an image makeover.”

Kevin Werbach, professor of legal studies and business ethics at the Wharton School, the business school at the University of Pennsylvania, and co-author of the 2012 book, *For The Win: How Game Thinking can Revolutionize Your Business*, agrees.

“I completely understand the scepticism about gamification,” he says. “It’s often overhyped as a ‘magic key’ to changing behaviour. Poorly implemented, it can be a big turn-off for employees. And it isn’t the right approach for every situation.”

But gamification’s complexities and challenges have not deterred the “thousands” of companies that Prof Werbach says have already used gamification or are in the process of implementing it.

“In the space of a few weeks over the summer, I got calls about potential consulting engagements with one of the world’s biggest hotel chains, a major international organisation and a top management consulting firm,” he adds.

However, few organisations are talking publicly about their gamification success stories. Until more evidence emerges that it is a winning strategy for business, most bosses simply are not ready to play.

EDF Energy takes the fun route to encourage employee engagement

Case studies

Utility uses digital games to tap workforce for ideas, says *Jessica Twentyman*

Could the combination of computer-game techniques and workplace applications hold the key to persuading workers to share their ideas on how their organisation might innovate?

At UK-based utilities company EDF Energy, executives had an inkling that it might. They also suspected that the best suggestions could well be squirrelled away in parts of the business where employees were not regularly canvassed for their opinions. What was needed, they decided, was a digitally based workplace “game” that could cut across the functional, geographical and hierarchical boundaries of the business.

With that in mind, EDF Energy worked with management consultants from Captergini to build a gamified platform designed to “crowdsource” ideas and inject the process of contributing with a sense of fun and competition. Participation was rewarded on a points system. Employees that contributed the best ideas saw them developed. As an added incentive, the contributors of the top five ideas could present their ideas to a senior-executive panel.

With its gamified platform, EDF Energy found that 92 per cent of its

workforce was actively involved. Some 117 ideas were introduced at the company – a fivefold increase on a previous initiative using a more traditional approach, reports Maggie Buggie, vice-president and global head of digital sales and marketing at Captergini. “By adding elements of fun, challenge and competition, the number and the quality of ideas increased dramatically.”

India-based IT services company Tata Consultancy Services has taken a similar approach to encourage participation on Knome, its internal social network for employees, according to Satya Ramaswamy, head of digital enterprise.

“Knome is the source of some serious ideas on how we can serve our clients better and apply technologies to help them solve business problems, but it is also a highly gamified experience,” he says. “Good gamification, in my experience, is driven by having a very specific business objective in mind. For us, getting 300,000 employees working in 40 companies worldwide to share their knowledge and experience of different projects, industries and clients is vital.”

Employees are awarded “karma

‘Gamification helped us to supercharge user adoption, by making it enjoyable’

points” and badges based on how involved they are on the network, how popular or useful colleagues find their posts and how many “connections” they make outside their own team. The rewards for scoring well are very real for employees in terms of their career development, says Mr Ramaswamy.

Employee-engagement was the motivation for using gamification at vehicle management company LeasePlan UK. Tom Brewer, LeasePlan’s commercial performance director, says the company was introducing a customer relationship management platform from cloud provider Salesforce.com and wanted to ensure staff used it.

LeasePlan used Sumo for Salesforce, a plug-in application from UK software company CloudApps, to gamify the process of familiarising sales staff with the system. Based on a World Cup theme, to tie in with the 2014 football tournament, LeasePlan’s Amplify game saw sales executives compete for FitBit fitness trackers and champagne – as well as a place on the leader board – by inputting details of new contacts into Salesforce and following leads through to a successful sale.

“CRM projects have a reputation for failing to deliver if users don’t accept the system,” says Mr Brewer.

“Gamification helped us to supercharge user adoption, by making it enjoyable, even exciting, for employees to adapt to the changes that were being brought in, both in terms of the system itself and in day-to-day working practices.”

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The Connected Business

Technology that will help you keep your house in order

Smart homes To appeal to a wide audience, devices need to have practical applications, finds *Jane Bird*

When Daniel Dietrich turns on his TV, the room's lighting automatically dims to a warm yellow-orange glow, which he says creates the best background for watching movies.

The lights are fitted with a "smart plug" which he controls using an app on his mobile phone, tablet or PC. In addition to adjusting brightness and colour, the app can turn devices on and off remotely and monitor energy consumption.

Mr Dietrich, a "technology enthusiast" who lives near Frankfurt, Germany, bought a Qivicon smart home starter pack a year ago from Deutsche Telekom, priced at €300. It is easy to install with no wiring, he says.

"The app can learn what I want to do, for example, to turn down the radiators when I open the windows," says Mr Dietrich, who has bought additional radiator thermostats, contacts for windows and another smoke alarm. He has also installed a camera to see who comes through the door, shutter controllers and a water detector that sets off an alarm if the washing machine leaks.

Saving energy and improving security were the main motivators for Mr Dietrich. Such practical applications are essential if the smart home is to gain mass-market appeal, says Jon Carter, UK head of business development, Connected Home, Deutsche Telekom.

"In the past, there was too much hype, and expensive, gimmicky products with niche appeal, but now there is more focus on meaningful benefits," he says.

"We have seen a [price] reduction of about 10 per cent over the past year or so and we expect that to continue over the next few years as volume increases."

Elaine Cook, strategic marketing director, internet of things, Intel Europe, agrees. Three years ago, all the talk was about fridges that would prompt you to buy milk on the way home from work, Ms Cook says.

"Most people could manage this already. But the industry now realises that to appeal to a wide audience, products must solve real problems or improve an aspect of someone's life."

She cites the example of sensors placed in the homes of elderly people so that relatives know whether they have got out of bed, had a hot meal and taken their medication.











"Being able to do this remotely thanks to sensors in a bed, oven and bathroom cabinet is less intrusive," she says. "And they can be linked to a doctor or hospital trust."

Devices must be easy to operate, adds Rainer Kallenbach, chief executive, Bosch Software Innovations, part of the Germany-based appliance company. Today's smart home market is based on do-it-yourself and expects people to be able to assemble systems, he says.

Bosch, which sponsored the smart

The smart house



 <p>Smoke/CO2 sensor</p> <p>Sounds alarm including outdoor siren. Turns off gas in case of fire. Switches on lights if smoke alarm activated at night</p>	 <p>Water leak detection</p> <p>Shuts off s o p cock if there is a water leak or flood and alerts owner, could link to insurance</p>	 <p>Shutters/curtain controllers</p> <p>Shutters and curtains automatically open and close based on light level</p>	 <p>External thermometer</p> <p>Measures external temperatures and adjusts internal temperature accordingly. Warns of ice risk on footpaths and road</p>	 <p>Cameras</p> <p>Check if/when children reach home, whether pets are OK</p>
 <p>Door and window contacts</p> <p>Alert householder if window left open when property empty. Digital door lock enables remote control, allowing care workers or tradesmen entry when not at home. Intruder alarm, link to insurance company reducing premiums for good security</p>	 <p>Radiator thermostats</p> <p>Switch off heating when room unused. Maintain pre-set ambient temperature. Activate heating if outdoor temperature falls below 5° centigrade</p>	 <p>Motion sensors</p> <p>Switch lights on and off. Check elderly relatives have got up. Intruder alarm; connect to monitoring services or community organisations</p>	 <p>Appliance control</p> <p>Connect to smart grid so that devices operate when energy is cheapest. Non-essential appliances not left on when occupants are out. Energy company can offer more flexible tariff</p>	 <p>Home entertainment</p> <p>Early warning of component failure. Manufacturers improve development of products and services by learning how devices are used. Customers offered usage-based insurance. Music played around the home, linked to wearables</p>

FT graphic; Dreamstime. Source: FT research

home section at the International Consumer Electronics Show in Las Vegas earlier this month, was "overwhelmed with interest" [in its smart homes], says Mr Kallenbach. In the US, the main focus is on security systems, which are often linked with community organisations such as Neighbourhood Watch and Nextdoor.com, he adds.

"In Europe, where there is greater awareness of the need to save energy and reduce carbon footprints, environment sensors are particularly popular," he says. Bosch has a device that can measure room climate including temperature, air pressure, humidity and the organic content of the air.

Data privacy is crucial if people are to be persuaded to increase the connectivity of their homes. Manufacturers, warranty providers and insurance companies will be able to customise their products and services based on data captured from the connected home, Mr Carter says. "But only if people believe their data will be kept confidential and agree to share it."

The industry has not taken this seriously enough yet, he adds. "Some companies are woefully lacking in data security. This will matter increasingly, because the average eight or nine connected devices in homes today will double by 2020 and reach 30 within 10 years."

'Products must solve real problems or improve an aspect of someone's life'

Lack of protection from hacking would immediately impact growth in the smart home sector, Mr Carter says.

Interoperability — the extent to which devices can work with each other — is also important. Mr Dietrich chose Qivicon because it works with manufacturers such as Philips, D-Link and Miele.

"Open systems are essential," says Mr Kallenbach. "Nobody will want a home that functions only with devices from one manufacturer. The problem at present is that there are thousands of standards with more being generated all the time."

Most consumers are moving to the smart home gradually, says Ms Cook, for example wanting to access their photos and music wherever they are, or to set their personal video recorder or control the door lock. "It's evolution not revolution," she says.

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Keeping tabs on my coffee habit is just a step too far

INSIDE TECH

Maija Palmer



How comfortable am I with companies knowing, real-time, when I drink my coffee and how I arrange my furniture?

Gartner, the technology research group, recently sent me a paper entitled "How to convince your chief executive to invest in the internet of things when you don't know how you'll make money from it". It listed scenarios that the internet of things advocate might put to the Luddite chief executive to explain the merits of a world where all objects are connected to the internet and spewing out data. Mostly it was about using said data to sell more stuff. One example suggested that a company selling internet-connected coffee machines could track the time the machines were being used by customers. Those users brewing up before 6am could be targeted with an offer for an "extra strong" coffee blend.

A furniture company would be able to keep tabs on the location of all its internet-connected chairs and might be able to detect sales opportunities because "organisations that were frequently moving furniture around might have a chair shortage".

I'm not sure if these examples would inspire the chief executive to get out the cheque book, but I have mixed feelings about them as a consumer. I'm not sure I want my coffee maker to become an advertising billboard at any time of the day, but definitely not before 6am.

As for the chairs, the idea of a furniture company watching its products moving about in offices around the world falls into the category of "creepy". I imagine a giant screen in a Spectre-style operations room where they would plot these movements: "Must be something big going on at BP's London office. There are at least 100 chairs moving around — that is not the normal Monday morning team briefing..."

A truly enterprising office furniture company would sell this real-time chair



Watchful eye: connected devices will lead to greater surveillance — Getty

shuffling data to hedge funds and traders, who could use it as an early signal of corporate fortunes. "They have bought 50 new chairs in the last month — they are expanding even faster than we thought. Buy!"

Alternatively chair companies could sell the data back to their customers. This is not at all far-fetched, it is merely a variation on workplace tracking systems that are being used by a number of companies. Bank of America, for example, has put sensors on employee name badges to track how they move about the office.

Such deals will be interesting — and lucrative for lawyers — because there are no clear rules on the ownership of the data created by early-morning coffee machine use or shifting chairs. You cannot own a single piece of data, although you can own a database if you put the information together. Deciding who is doing the collecting in a world where the information streams through multiple different organisations is unlikely to be straightforward. One thing that is clear however, is that I, as a consumer, will not own my own coffee-drinking

The idea of a furniture company watching its products moving about in offices falls into the category of 'creepy'

data, which makes me feel uneasy.

Despite many companies claiming that consumers care little about privacy and are ready to exchange it for a 50p money-off voucher, out-of-bounds areas do exist. At my children's primary school no filming or photography is allowed. These are not places where additional data collecting objects are going to be welcomed.

In the home, I suspect sensors will have to be seriously useful to be invited in. Predictive maintenance for household appliances is one service I would welcome. If Rolls-Royce and General Electric can put sensors on their jet engines to alert the mechanics to any developing faults, why not do the same for the domestic boiler or washing machine? Never mind a Google's Nest thermostat learning my schedule and programming itself to turn the heat up and down. In a world of connected devices, I would like my boiler to receive an alert from the national weather service ahead of any cold snap, prompting it to run diagnostic tests, ordering any spare parts needed and making sure that it does not — as so often happens — stop working on the first cold day of the year.

I am not sure why a company tracking my hot water use feels less personal than a company knowing my coffee consumption, but it does. And because this application would be solving a real, existing problem — rather than just selling me more stuff — I can even imagine paying a few extra pounds a month for the "service", with rights to my data thrown in as a bonus.