

What's Hot in 2017

Technology Trends

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Contents

| | |
|--------------------------------------|----|
| Executive summary..... | 2 |
| Parallel computing..... | 3 |
| Zero UI..... | 4 |
| Blockchain..... | 5 |
| IoT Security..... | 6 |
| Workforce (HR) analytics..... | 7 |
| Robo-bosses..... | 8 |
| Autonomous analytics..... | 9 |
| Shadow IT 2.0..... | 10 |
| Neuroscience and brainhacking..... | 11 |
| Energy storage inflection point..... | 12 |

Executive summary

The rate of breakthrough technologies can either appear as without end or else on repeat, depending on your perspective. There remains a gap between the actual emergence of technologies and their commercial and technical applications. Many of the breakthrough technologies we noted in 2015 and 2016 are still in the media spotlight.

Highlighting this point. Earlier issues we raised included automation, which continues to dominate studies, white papers, analysis and opinion pieces and could continue to do so for years to come. Our other 2015 technologies to watch included cognitive computing, social media, 3D printing, the "Internet of Things" (IoT) and Prescriptive Analytics and are all becoming increasingly standard in business plans, models and within digital transformation.

At the start of 2016 we identified the building of digital platforms, virtual reality, the rise and fall of apps, the move of I.T. to 'the edge' and a new era of cybercrime. By December 2016, filmmakers were claiming 2016 to be 'year zero' of a virtual reality revolutionⁱ, new vectors of cybercrime attack are now increasingly common whilst in November 2016 Harvard Business Review noted that '...companies everywhere are making investments to build their digital businesses. Decisions about digital platforms can make the difference between high growth and high margins or limited growth with declining marginsⁱⁱ.'

As we enter 2017, all of these technologies will continue to evolve, attract headlines and add to the illusion of nothing new under the sun. Whilst further evolutions will doubtless continue to shape business organisation and models, a range of newly emerging technologies and issues will start to impact the operating environment in which businesses find themselves.

The raft of new technologies represents new ways of doing things yet the risk remains that many will simply attempt to overlay digital on old processes and systems. This danger, and the friction that can result from dynamic technology grafted onto static models will result in disruption and challenges. The opportunities that can flow from them meanwhile will continue to shape ecosystems and industries and the winners within.

Parallel computing

To some people, learning about parallel computing will be akin to reading history; to others it still seems futuristic. The divide between those using it and still not with it could become divisive in 2017. Overall, computing is moving from serial processing, where each is sequential, to massively parallel processing. As a result computing power is rising, impacting business to a degree that many incumbents apparently remain unprepared.

What does it mean?

Several industries largely predicated upon serial processing – including swathes of the banking industry face key internal decisions. Nimble competitors, including FinTech start-ups are threatening to redraw the entire banking ecosystem. As with many technologies, grafting new processes onto older systems simply isn't enough of a response.

There are technical reasons – serial programs cannot be made to work in parallel. Instead there is a need for a complete system redesign, and given that such legacy systems support many incumbents within finance, health and

indeed most corporations, the level of disruption could be significant.

The balance of benefit vs cost of redesigning the billions of lines of code that underwrite such legacy systems is now becoming clear. Recently, a range of systems built on parallel architecture have been introduced to the marketplace, bringing benefits of speed and able to handle significantly more data than their serial counterparts. For example, MIT has developed a coding language that makes software programs four times faster than all other languagesⁱⁱⁱ.

What to do about it:

- The move to parallel computing represents a must-take opportunity to become more consumer-centric. Board and executive level education on this issue is critical.
- Organisations dependent on serial programs need to prioritise the reengineering of their systems to take advantage of parallel computing.
- Design thinking practices are necessary as the initiation of sessions designed to imagine a new direction for the given organisation.

Zero UI

New technologies or else different contexts in which technologies emerge usually require a different approach to design. For example, when the first cars were invented, navigation was via boat tiller – and to its' reach full potential the motor engine required a new design for its form of navigation – the steering wheel^{iv}. We are at a similar point with regards to our user interfaces (UI) we use to manipulate and converse with our digital world.

What does it mean?

The AI revolution is well underway, most visibly through the increasingly widespread use of IBM's Watson, but also virtual personal assistants and the like. It will increasingly require a re-think about how we design for interaction and ultimately focus on '...the experience rather than the actual screen^v.'

Audio, haptics and gestural interfaces all offer immediate alternatives, and advantages, vis-à-vis the screen^{vi} and such A.I dominated interfaces are forecast to replace smartphones as early as 2020^{vii}. In fact, the notion of screens could be eclipsed completely. The emergence of automatic and predictive technologies coupled with ever decreasing sizes mean that the next step could involve humans

becoming the next UI themselves^{viii}, as shown with projection and haptics technology that enables any surface including our skin to become the 'screen'.

The rise of virtual environments is also likely to bypass the need for screens, all of which means that companies – whether in their development of next gen apps or in supplying information to their workers – will need to think more of both the human as the user interface and of new ways for people to send and receive data and information using more efficient and intuitive mediums.

What to do about it:

- 'The non-linear design problems of zero UI will require vastly different tools, and skill sets^{ix}.' Design will become increasingly part of traditionally non-creative jobs whilst designers may need to augment their skills.
- Organisations will need to reimagine how their workers get things done and where. What would a screenless office or organisation look like?
- Our interfaces will need to become more anticipatory and predictive.

Blockchain

Blockchain is known most widely as being the public database created to track the cryptocurrency Bitcoin. Its impact is likely to go beyond the cryptocurrency however. The term is now used broadly to refer to any distributed electronic ledger that uses software algorithms to record transactions with reliability and anonymity^x. It forms a trusted and shared public ledger that is open for everyone to inspect, but whose control falls under no single participant. In a blockchain system, participants collectively update the ledger by general agreement and guided by strict rules^{xi}.

What does it mean?

In a digital economy, there are clear attractions of a technology that enables transactions and interaction to be recorded securely and transparently in addition to being auditable, efficient and resistant to outages. It therefore '...carries the possibility of disrupting industries such as financial services, remaking business practices such as accounting and auditing, and enabling new business models^{xii}'.

In the same way that P2P networks cut-out the middleman, blockchain's ability to use algorithms to cut out a level of intermediation is why this technology is so important. As such it

has the potential to oversee a reduction in overhead costs as parties '...trade assets directly with each other, or quickly prove ownership or authorship of information—a task that is currently next to impossible without either a central authority or impartial mediator^{xiii}'. Deloitte's David Schatsky notes that potentially transformational impact of blockchain, suggesting that '...it's like the early Internet. There's an inability to know in advance all the uses it could be put to^{xiv}'.

What to do about it?

- Ensure familiarization with the concept, and if necessary set up an action committee or team to track blockchain progress within your industry and in adjacent (or even unrelated) industries.
- Map out how the blockchain could enable (or require) new organisational models, and even new business models.
- Explore how others might try to disrupt your business with distributed ledger technology, and how your company could use it to leap ahead instead.
- Link your investments to your value proposition.
- Assess how blockchain could enhance customer satisfaction and organisational processes.

IoT Security

The IoT introduces a wide range of new security risks and challenges to the IoT devices themselves, the platforms and operating systems they use and the organisations to which they're ultimately connected. Some 30 percent of organisations admit to a lack of preparation for the security risks associated with the IoT^{xv} but it is likely that the real figure is much higher given the wider lack of general cybersecurity preparedness and perhaps of lack of IoT knowledge.

What does it mean?

New and innovative security architectures capable of adhering to a range of requirements will be required to protect IoT devices and platforms and enable the significant value at stake in the IoT to be unlocked. The IoT is non-viable without trust, hence the need to protect it from cyber and physical attack, hacking, ensure encryption machine-to-machine communications, and mitigate costly denial-of-sleep attacks that could drain batteries and render hardware ineffective. IoT security will be complicated by the reality that early many IoT items use simple technology that is not compatible with the technology needed to keep it safe.

The evolution of IoT security will not be defined in 2017, nor will the year see iterations of security capable of securing its expanding infrastructure for a significant period of time. However, 2017 could be the year at which the IoT approaches a tipping point, and this point does not seem lost on tech businesses. It is already reported that 74 percent have a '...security strategy for the Internet of Things in place or are currently implementing a strategy^{xvi}'. If all companies are now tech companies, or else on their way to being so, 2017 is the year in which IoT security must become central to their digital strategy.

What to do about it:

- All roles involved in IoT delivery or solutions must become familiar with IoT risks, the latest security architecture and technologies.
- Organisations must continuously review and assess the security in their IoT systems, whether developed internally or purchased.
- Training and compliance must be enacted since technology alone cannot address all IoT security issues; often people form the weakest link in systems, including the IoT.

Workforce (HR) analytics

Workforce analytics is an advanced set of data analysis tools and metrics for comprehensive workforce performance measurement and improvement. As a package, workforce analytics can deliver insight into otherwise somewhat opaque processes - from recruitment and staffing to training and development^{xvii}.

What does it mean?

Leading companies are already using predictive analytics to identify the risk of top talent quitting their jobs, devise ways of bettering staff engagement, pinpoint traits of the most productive workers, and help uncover hitherto unknown or unproven synergies surrounding the effectiveness of work and workers. In short, workforce analytics could help reposition HR as more strategic by working from an evidence-based methodology.

However, in 2016, only 20 percent of companies were thought to be on this path^{xviii}. This low rate reflects a significant imbalance in companies' priorities. Whilst companies spend \$1 trillion a year understanding and shaping their customers' journeys, they spend 1,000 times less gathering and acting on insights about their own employees^{xix}. 2017 could well be the year when the tools and techniques of the emerging field of workforce analytics are further refined to focus on learning what engages, frustrates, and inspires employees.

With a rising number of data points available, and from a broad range of possible measures, the development of enterprise-wide systems is surely upon us. For example, 81 percent of CIOs believe wearables will soon perform some sort of function in the workplace^{xx}. London based start-up, Saberr, uses algorithms to better predict team chemistry in the workplace^{xxi} by analysing shared values as opposed to characteristics or interests. Being able to predict the likelihood of team failure or success would be an extremely useful asset for a given business and could even perhaps in the longer term form the basis of new contractor based business models^{xxii}.

What to do about it:

- It is likely that the field of HR analytics (both predictive and prescriptive) will deepen in importance and utility in response to the challenges that businesses face. Acknowledgment of the need for digital transformation – culturally as well as organisationally, is critical.
- Companies should organise for technological success across their organisation, not just within the IT function. This may require the removal of silos or new cross functional teams to form.

Robo-bosses

Whilst we are early in the stages of introducing managerial artificial intelligence (A.I), it is undeniable that we have taken important steps in this direction. One of the core functions of management – thanks to data and analytics, advancing cognitive systems and machine learning and the general digitisation of business – is now to manage the artificial intelligence that increasingly manages the systems and processes within businesses. Increasingly, this transformation will redraw what it means to manage and to work and in the process, introduce A.I at ever higher levels of organisations^{xxiii}.

What does it mean?

Monitoring the array of codified emerging workforce analytics is more easily accomplished via cognitive systems and machine learning, suggesting that artificial intelligence will increasingly recommend courses of action that would usually have been proposed by mid-management.

McKinsey has already noted that between ‘...25-30 percent of current activities (at the C-suite level) can *already* be automated using currently developed technologies.’ These activities include the collation and analysis of data from various sources and translating them into meaningful insights for executives^{xxiv}. Indeed, 78

percent of managers believe they'll trust the advice of intelligent systems in making future business decisions^{xxv}. Additionally, some 62 percent of medium-to-large organisations expect to implement machine learning for business analytics by 2018^{xxvi}. Increasingly, with A.I influencing management decisions via provision of evidence-based models, the idea of such A.I generated insight being fed to workers via fully A.I mediums will become science fact rather than science fiction in coming years.

What to do about it:

- Create a robust data structure. A.I relies on data and could, in some circumstances, accentuate and spread the negative impacts of low quality data.
- Design and craft an operational model most suited to an A.I rich environment, starting with your key staff and positions and looking at how A.I can enable their overall goals and strategies.
- Create a culture willing and able to shed legacy ways of doing things and willing to experiment not only with new ways of doing things, but entirely new propositions.

Autonomous analytics

Exponential data growth is a well-established fact of modern business. A given minute in 2016 saw 2.4 million Google searches, 2.78 Youtube video views, 20.8 million WhatsApp messages and over \$200,000 sales via Amazon^{xxvii}. Since 75 percent of digital data is now created by consumers^{xxviii}, the need for a consumer-centric business model is more pressing than ever – and digital models are the most apt at providing better consumer-centricity at scale.

What does it mean?

The model of data analytics prevalent for the past couple of years is already approaching obsolescence. Data volume is the driving reason yet several secondary factors – such as data talent within the workforce also needs considering. In 2016, a survey found that 83 percent say there aren't enough data scientists to go around – up from 79 percent in 2015^{xxix}. The hitherto common D&A model – sometimes dubbed artisanal analytics – has not always lived up to the hype surrounding the successes in some well noted case studies. Only 27 percent of executives suggest their company makes highly effective use of data, whilst 32 percent suggest that access to more information has in fact made things more difficult for them^{xxx}. In other words, investing in D&A or

even having a D&A strategy doesn't in and of itself guarantee a winning outcome.

Autonomous analytics promise to radically alter the output as well as input needed to create effective models. One study suggests a move to autonomous analytics can enable one data scientist to do the work that would have previously taken about 200 data scientists to produce^{xxxi}.

What to do about it:

- Analyse the state of your own D&A and map out where your current weaknesses and challenges lie. Not all can be remedied by automated analytics but many can, at least in theory.
- Invest in managers to help ensure data comfort and competency. The outputs of machine learning are not always easily interpreted; meaning that managers could be reluctant to implement models of which they have little to no intuitive understanding^{xxxii}.
- Investigate leading edge practice – and how companies enacting them went about it, via case studies, white papers and industry contacts.

Shadow IT 2.0

The technologies underpinning digital transformation – such as data analytics, mobile capabilities and social highlight the issue. They are relatively prosaic, technologically speaking, yet nine in ten organisations in 2016 still report the implementation of digital transformation a significant challenge, with 70 percent of these citing internal complexity as an inhibiting factor^{xxxiii}.

What does it mean?

Digital technology and thinking now permeates every business function. Concurrently, nearly 60 percent of IT organisations worldwide are estimated to be unprepared for digital disruption, with IT professionals indicating that their investment priorities, infrastructure changes, skills development and business-IT interactions are in flux^{xxxiv}.

The result of these differing speeds of change is friction and complexity. 68 percent of tech spending now comes from budgets outside of IT, up from 47 percent in 2014^{xxxv}. One in ten CIOs, meanwhile, report over 50 percent of individual company technology spending is now controlled outside IT^{xxxvi}. The impact on the overall organisation – in terms of security, data access and utility not to mention different cultures and so on, represent major issues for an organisation –

irrespective of the benefits of decentralising I.T.

This new era of not so much shadow I.T as alternative I.T demands a strong CIO function. Organisations must ensure that, with different business functions purchasing their own systems, that data can still flow between and across functions. A key role for both CIOs and their technology peers, therefore, is to create an architecture that ensures tactical technology use leads to strategic business benefit.

What to do about it:

- Around 35 percent of IT talent may need to be reskilled to operate in a digital world^{xxxvii}. This is critical if I.T is to act as a platform provider, advisor, integrator or any other of the new roles proposed throughout 2016.
- One-third of companies are investing more than 15 percent of revenue into technology investments that span all areas of the business, not just IT^{xxxviii}. Business-wide digital impact should therefore be the focus of whichever executive is ultimately tasked with knitting together disparate tech agenda.

Neuroscience and brainhacking

AdAge notes that ‘...Major brands and publishers such as Coca-Cola, Campbell's and Turner have begun using eye tracking and facial coding, functional magnetic resonance imagery (fMRI), biometrics that measure heart rate, and galvanic skin response (GSR) to understand how a person reacts to visual and audio stimuli^{xxxix}.’ Developments over the next year will be fascinating in discovering how neuroscience applications could impact us – not just as consumers – but as workers and beyond.

What does it mean?

Advances in neuroscience are already in the realm of science fiction. Neuroscientists Brice Kuhl and Hongmi Lee from the University of Oregon have used an fMRI machine to read a person's mind, noting that ‘...we can take someone's memory — which is typically something internal and private — and we can pull it out from their brains^{xl}.’ The commercialisation of such things may take a while and need to overcome barriers, whether ethical or regulatory, but less intrusive neuroscience could still prove a rich environment for companies.

Basic forms of brain hacking/boosting that involve transcranial direction current stimulation (tDCS) machines are available online and their components can be bought at hobbyist

stores^{xli}. The U.S. military is likewise involved in producing a wearable that can likewise boost performance. The Halo Sport device, visually resembling a pair of earphones, directs a flow of electrical pulses to the brain's motor cortex. Initial results would appear promising: ‘...members of the U.S. Olympic ski team have reported a 31 percent improvement in their propulsion force, and the Air Force noted a 50 percent reduction in training time for drone pilots^{xlii}.’ Better skill acquisition and strength generation would be of interest to a wide range of companies looking to boost productivity.

What to do about it:

- Advances in neuroscience and wearables measuring happiness, engagement and mood could combine by the middle of the next decade to form a new set of workforce analytics. Preparing for this today by researching some of the constituent technologies could help guide future involvement.
- Neuroscience is already a driver of marketing, allowing a range of powerful new insights to be gleaned. As the technology involved is relatively prosaic, companies should acquire knowledge and expertise in this area first.

Energy storage inflection point

The sustainability agenda has gained traction within business, most ostensibly because the economics of it have started to make sense. Nowhere, perhaps, is this more prominent and important than with respect to energy storage – the secret ingredient in the revolution unfolding within the energy ecosystem. Whilst solar and wind power are increasingly competitive with traditional fossil fuels, the drop in energy storage costs is set to become the real trigger for change that will disrupt business models and practices for a range of non-energy related businesses.

What does it mean?

If energy storage makes sense economically independent of renewables usage, it creates significant incentives for mass adoption; a scenario that looks probable within a couple of years. Whilst this move could potentially save millions if not billions for organisations, it also shifts business models in other ways. For example, IKEA plans to completely shift to renewable energy by 2020 and will invest up to €1.5 billion in wind and solar energy^{xliii}. Furthermore, the retailer does not rule out becoming a net energy exporter, potentially selling the surplus of energy to suppliers or customers. Anchoring itself to the community in demonstrably positive ways could fundamentally reposition the role of such businesses in society. It is also worth noting that

the microgrid market could reach \$3.5 billion by 2020^{xliii}.

The role between competitor and customer could also blur, whilst the push for self-sufficiency among business, and as highlighted in Apple's search for European sites with renewable energy sources to power its data centres, will strengthen. The key question that companies will need to answer is whether they can position themselves to capture the value of both broad trends in energy management and of new angles to their business model that could result. The World Economic Forum notes that '...the aggregation and centralized management of these distributed energy resources – sometimes referred to as "virtual power plants" – can transform zero-energy buildings and community-scale microgrids into regional resources by providing, or freeing up, critical electrical system capacity when needed^{xliv}.'

What to do about it:

- It is now possible and perhaps even necessary, for a much broader range of leaders to think strategically about energy.
- Assess the viability of becoming a producer.
- As markets shift from fossil fuels to renewable energy such, '...markets for flexibility will need to be established to reward the shift of electricity demand^{xlvi}.'



About David Smith

David is recognised as a leading strategic futurist who combines the experience gained from a 35 year IT and business career with strategic visioning to help organisations better prepare for the future. His career has spanned European and US corporations. He is a much sought after keynote speaker and is the author of many works on embracing change and the drivers of change.

Before establishing Global Futures and Foresight, an independent futures research firm, he created and ran the Unisys internal Think Tank, The Global Future Forum. Prior to this he was head of strategic marketing for their \$2bn global financial services business.

David and his organisation has been engaged by some of the largest and most prestigious firms from around the world including: The European Commission, NATO, BBC and financial services firms including HSBC, Lloyds/TSB, Atom Bank, RBS, Lloyds, More Than, e-sure, Travelers, Allianz, QBE and Lloyds syndicates along with many other prestigious firms including CSC, Unisys, Cisco, Microsoft, Siemens, Deloitte, Ernst & Young, PWC, Bausch & Lomb, Linpac, Kraft, Heinz, John Lewis, Roche, Philips etc. He is also a regular lecturer at business schools across Europe.

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About Global Futures and Foresight

Global Futures and Foresight is a research and consulting organisation that helps organisations be better prepared to embrace change, innovate and develop new strategies and solutions and helps clients to avoid the risk of being blindsided by external disruptive change.

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