

What's Hot in **2016** Technology Trends

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Contents

What's Hot in 2016 / Technology Trends:

Introduction	1
Executive summary	2
Building Digital Platforms	4
The new Digital (data) Divide.....	5
Analytics	7
Mobility in Everything	8
The Move to the Edge	10
IoT at the Edge	11
The Rise and fall of Apps	13
Virtual Reality	14
Software Robotics and A.I. go Mainstream	15
A New Era of Cybercrime	17
New Security Models	18
Evolving CIO Role	20
Positioning I.T. as the Engine of Change for the Company	21
Collaborating to Resolve Tough Business Problems	22
Building New Organisational Models	23
References	24
About Advanced 365 & Global Futures & Foresights.....	28



Few would doubt the impact that digital technologies are having on industries and the organisational set-up of companies. 76% of companies surveyed by MIT Sloan say digital technologies are already disrupting their industry to a great or moderate extent¹ and this number will likely rise as automation intrudes further into an increasing number of professional jobs.

Despite this recognition, the majority of companies are not ready for what comes next. More than two-thirds (68%) admit they are unprepared for the 'as-a-Service,' economy implied by digital technologies. The technical skills and cultural mindset needed to transform the potential of technology into technology driven results is often lacking. Furthermore, with only 13% of I.T. budgets on average spent on new opportunities, the business-value of I.T. is often missed³. CIOs are in many ways ideally placed to help deliver the change needed throughout the organisation – although they will need help from a tech-savvy board and other executives. At present, only 38% of executives think their company's senior leaders fully understand the Internet of Things (IoT)⁴. As the boundaries between business model and technology increasingly blurs, such a status will amount to a dereliction of duty in the very near future.

The creation of ecosystems will be key in addressing many of the issues, technological or not, that companies will face in the coming years. Nearly 80% of technology executives say their organisation can't keep up with cyber attackers' increasing sophistication⁵. Collaboration, tapping external experts and forming alliances to tackle big issues – such as software automation and robotics - will be critical. For example some 91% of R&D professionals agree that smart products will require them to expand their partner ecosystem⁶.

This report, sponsored by Advanced 365, is designed to provide an overview of the key technological drivers and CIO issues for the coming years, and offer critical insights on the potential implications and opportunities for a range of industries.

David Smith
Chief Executive
Global Futures and Foresight

Executive Summary

The list of breakthrough technologies and scientific advances appears without end, whilst the hype cycle for many technologies is leading several businesses to technological exhaustion and overload. Many of the technologies, or at least their predecessors, that will have the most impact in 2016 and even to 2020 are reasonably well known, and in many cases their implementation has not yet been met with unmitigated success. There remains a real need for businesses and the CIOs that guide them to '...understand how the competitive advantages on which they have based strategy might erode or be enhanced a decade from now by emerging technologies⁷.' In many cases this does not involve revolutionary technologies per se, yet how they are applied, implemented and internalised by specific companies (and consumers) will sort tomorrow's winners from losers.

Fundamentally, technology represents new ways of doing things; there is very little to be gained from simply laying a digital overlay on old processes and systems. The role of the CIO will be as much to implement the requisite cultural change that is needed for many benefits to be realised, as it is to introduce the technologies themselves. The need to craft fast and agile organisations, however daunting, will be vital to confront the number one change impacting the future of work. The speed of innovation in business technology will generate much friction when colliding with less dynamic organisation and business models. The disruption that will occur from this should not be underestimated, nor should the opportunities and benefits that could accrue to those bold enough to choose change.



"First we do things
differently, then we do
different things."

- David Smith, Futurist

Building Digital Platforms

Digital platforms are becoming the tools of choice for building next-generation products and services—and entire ecosystems in the digital and physical worlds. According to research firm IDC, one-third of leaders in virtually every industry will be disrupted by competitors, both new and established, by 2018⁸. Both will be able to leverage platforms to innovate new offerings, reach new customers, radically expand supply and go-to-market networks, and disrupt their industries' cost and profit models.

What does it mean?

According to the Massachusetts Institute of Technology, in 2013, 14 of the top 30 global brands by market capitalisation, were platform-oriented companies. In the next five years, CIOs expect digital revenues to grow from 16% to 37%⁹, but perhaps the greater use of digital platforms is to encourage parties and stakeholders to collaborate and engage to meet the needs of a given group or target market. This will increasingly include strategic internal issues for organisations, such as talent platforms – an area forecast to generate \$2.7 trillion per year globally by 2025¹⁰.

Such platforms will be transformational for companies and industries, owing to the ecosystems they create. 81% of 2,000 I.T. and business executives believe that in the future, industry boundaries will dramatically blur as platforms reshape industries into interconnected ecosystems. Huge efficiencies can and will be gained as businesses continue to master digital technologies and platforms internally¹¹.

One key platform is that of the cloud. Multi-cloud strategies will become common for 70% of organisations by 2019 says Gartner¹².

What to do about it:

- For CIOs, 'platformising,' their approach to delivery, talent and leadership presents an enormous opportunity to orchestrate these layers of the business, create value for their enterprise and become a key digital leader.
- CIOs need to craft agile, multi-speed operating models, although 81% of executives say I.T. can't support multiple objectives effectively¹³.
- Companies must apply their industry knowledge to build platforms that allow them to rapidly innovate, develop, and deploy the products and solutions needed to drive their digital business strategies. This foundation will enable better ways of operating, as well as create new kinds of revenue streams.
- Create platforms that integrate data with digital business partners and the wider business ecosystem.

The New Digital (data) Divide

Enterprise data remains vastly under utilised for the majority of organisations and it will continue to be so. Through 2017, 60% of big data projects will fail to progress beyond piloting and will be abandoned predicts Gartner¹⁴. Data ecosystems are increasingly complex and littered with data silos – meaning extracting key insights requires a shift not just in technological application, but in talent acquisition and retention, and corporate culture.

What does it mean?

Some of the key issues regarding data cease to be purely technological. The pace with which data can be gathered, sorted, and analysed in order to produce insights that managers can act on quickly is critical. As expectations of near-instant responses become the norm, business leaders will rely heavily on higher data velocities to gain a competitive edge.

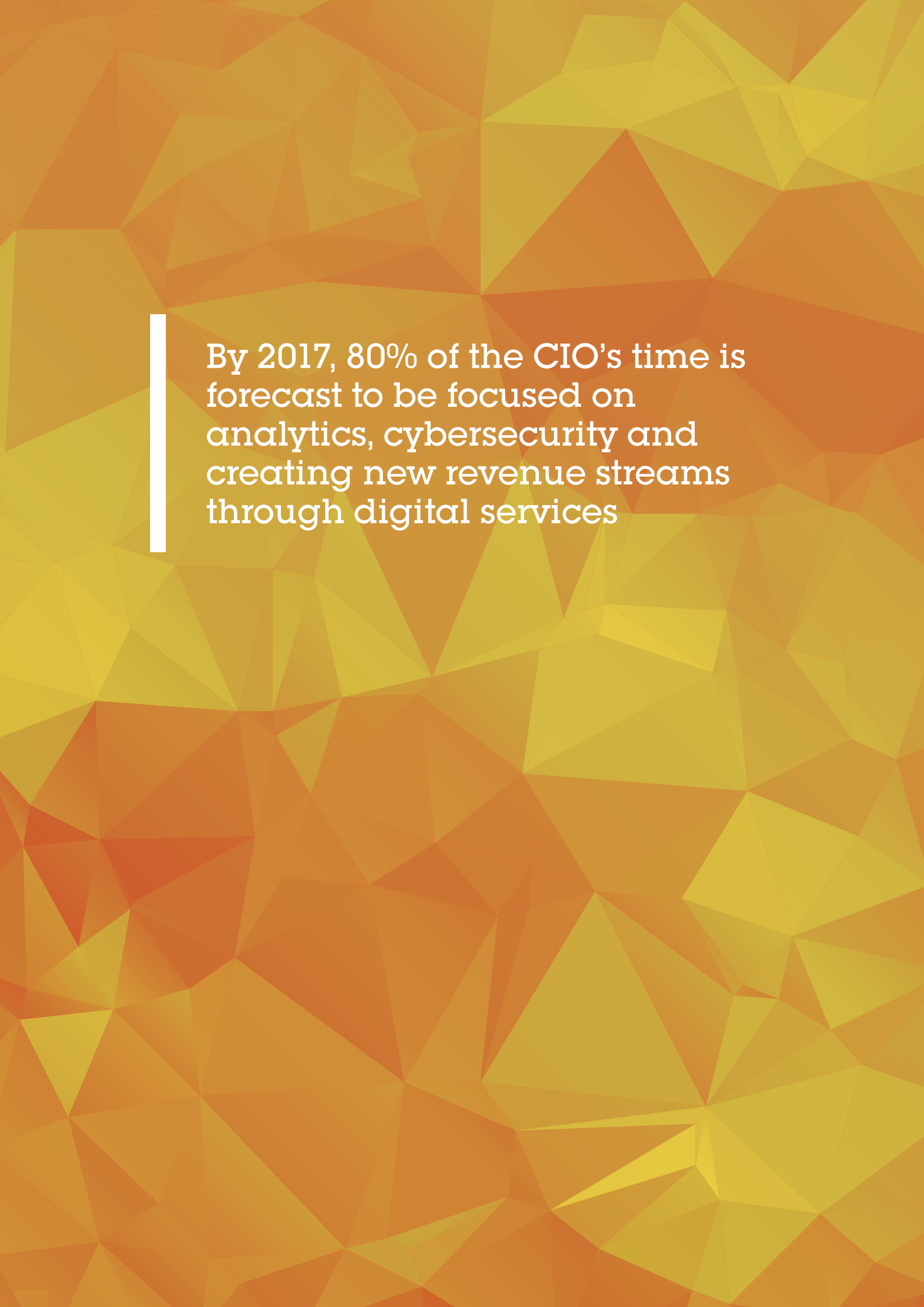
Sloan MIT notes that 50% of big data users cite turning analytical insights into business actions as one of their top analytics challenges. 43% of companies report their lack of appropriate analytical skills as a key challenge¹⁵.

From an executive's view point, there is a need to develop a more data literate workforce. 86% of business decision makers believe that knowledge workers will need to become '...data geeks.' An equal, if not greater need, is for executives to develop a capacity themselves. 58% of executives make decisions based on intuition or experience, whereas only 29% rely on data driven insight¹⁶. Over half of C-suite respondents admit to discounting data analysis that they do not understand¹⁷.

The wider backdrop is of a shift of business operations from labour driven and technologically enabled to a new model that is digitally driven and human enabled. Since access to talent is one of the defining data issues, those wishing to be data driven face an incredible battle that will likely result in third party collaboration becoming key in the data ecosystem.

What to do about it:

- Cultivate your data science talent—develop a plan to build, buy, and/or partner to support your machine-learning and advanced-analytics know-how.
- Look outside of your company for data sources that will enhance your understanding of what your customers are trying to achieve.
- Companies should make sure that executives possess the skills to make use of the resulting insight.
- CIOs must think about talent as a platform.



By 2017, 80% of the CIO's time is forecast to be focused on analytics, cybersecurity and creating new revenue streams through digital services

Analytics

Businesses are increasingly applying more sophisticated statistical techniques to make predictions, and to spot subtle but important trends in data. Analytics can establish links between entities and make intelligent predictions about customer behaviour based on knowledge a system has about a customer. Predictive Analytics requires structured and unstructured data to comprehensively describe, explain, predict or prescribe behaviour.

What does it mean?

Companies are looking for new ways to transform their business using data and analytics to get the insights they need to make the best decisions. As analytics inform the key processes, and even overall strategy, it is not surprising that this is shaping up to be a defining issue for CIOs. By 2017, 80% of the CIO's time is forecast to be focused on analytics, cybersecurity and creating new revenue streams through digital services suggests IDC¹⁸. However, by 2018, less than a third of CIOs of global organisations are expected to have rolled out a pan-enterprise data and analytics strategy¹⁹. The need to deliver self-service analytics/data and insight to the right person at the right time will become critical for future success.

Many continue to rely on traditional Business Intelligence, yet the rise of unstructured data demands a new approach. IDG notes that by 2022, some 92% of the digital universe will comprise unstructured data, whilst Gartner foresees 80% of the 800% growth on data over the next five years to reside as unstructured data²⁰.

As with other technologies, it is the synthesis with other emerging technologies that could define analytics. Analytics look set to mature to a point at which, via cognitive computing capabilities, they could recommend decisions and opportunities for individuals within an organisation.

What to do about it:

- Undertake organisational and cultural change to enable data and information to flow without silo hindrances. The move towards a more entrepreneurial mindset – especially when it comes to failure – is important.
- Establish a pan-organisation data and analytics strategy.
- Develop executive level technological literacy and capacity. Leveraging stronger talent requires more robust executive level skills.
- Invest in talent, but do not neglect the tools and teams in which they will operate. All need to be given attention and purpose if they are to flourish.

Mobility in Everything

Consumers and workers are both increasingly demanding access to the information they need, when and wherever they need it. User experience is demanding the right information via the right medium at the right time. Wearables are the most overt example of devices that are expanding the possibilities for how and when people interact with data and apps, but they do not represent the extent of the evolution.

What does it mean?

Since consumers are already expecting utility in their wearables – some 50% expect wearables to provide full health monitoring²¹, it should be of no surprise that growth forecasts seem upbeat. Some forecasts suggest 21 million units in 2014 could grow to 150 million units in 2019²², and reach \$74 billion in value by 2025²³. By then, the wearable tech market could reach 385 million people and fundamentally change how we consume and use information²⁴. The technology itself will evolve – 72% of consumers believe wearable technology is the future of in-store shopping²⁵. Biobatteries where wearables harvest kinetic energy from users have been mooted²⁶, whilst implantables are likely to represent the next iteration of wearables that could emerge as early as 2016. Either way, it is expected that within five years, 40% of wearables will have evolved into a viable consumer mass market alternative to smartphones²⁷.

Mobility will ultimately necessitate a new data architecture. Many big tech companies are working on deep linking content inside standalone apps and wearables to make it possible to automatically find — and use — the information in other contexts. Virtual Personal Assistants (VPA's) could likewise break free of the notion of the app by allowing data to flow more continuously and using cognitive technologies to draw from a range of hitherto siloed data.

What to do about it:

- Develop a sense of which emerging technologies could enhance overall company strategies and deliver what workers and consumers want.
- Provide a wider array of devices (or else BYOD permission) to allow workers to maximise their technological efficiencies.
- Develop a security policy and architecture that moves away from managing devices to managing data.
- Adapt organisational models to allow for greater mobility of people, information and even decision making.



IBM cites less than 10% of organisations are prepared to address mobile, social, big data analytics and cloud

The Move to the Edge

IBM cites less than 10% of organisations are prepared to address mobile, social, big data analytics and cloud²⁸. Since these four technologies are central to connected consumerism and connected work, this indicates a real problem for any organisation grappling with the implications of such moves. Distributed networks and users are increasingly critical constructs and business must move to the edge in 2016 or risk being irrelevant. From occupying centre ground to being outsourced and distributed, organisations need to plan for the significant ways in which embedding technology in and on everything will impact consumer sentiment and demand. Organisations also need to ensure corporate users can access the system when and how they need to.

What does it mean?

John Seely Brown of Deloitte's Centre for the Edge believes that in today's '...world of exponential change ... we need to be able to learn blindingly fast and produce with agility,' but suggests that 'companies do not understand this²⁹.' Clearly many within companies do understand this; some 93% of companies are using the cloud but 61% are bypassing the I.T. function completely to do so³⁰. 2016 needs to be the year in which executive levels grasp the importance and possible dangers inherent in this.

I.T. ecosystems will increasingly need to exist 'out there' – at the edge - rather than within the organisational walls; in other words business will need to operate on platforms that connect themselves with their customers and the wider ecosystem. The way we will buy, build and use technology is changing rapidly, which means the teams and ecosystems that build it and run it will need to change too. Indeed, IDC predicts that in 2016, there will be an 11% shift of I.T. budget away from traditional in-house I.T. delivery, toward various versions of cloud computing as a new delivery model³¹. As working from home becomes increasingly popular, the need to develop new delivery models will accelerate.

What to do about it:

- Data is continuing a migration from central I.T. repository to an increasingly democratised and distributed consumer output. Organisations should organise around this very fact and aim to deliver computing capability to the edge where it is needed.
- Several new processes and systems will exist at the edge of, or beyond, traditional organisational boundaries. Developing an I.T. strategy and corporate culture able to operate in more fluid environments is of great importance.

IoT at the Edge

The early days of the IoT and its conceptual precursor, Machine-to-Machine (M2M), have been characterised by the critical role of cloud platforms as application enablers. This premise is currently being shaken up, as the computing capabilities on the edge advance faster than those of the cloud. ABI Research refers to this trend as a paradigm shift—from the connected device paradigm to the intelligent device paradigm³².

What does it mean?


The intelligent device paradigm has a few important implications. The first is to place increased emphasis on the network; by 2018, 40% of IoT-created data will be stored, processed, analysed, and acted upon close to, or at the edge, of the network³³. Furthermore, it is predicted that by this date, some 60% of I.T. solutions originally developed as proprietary, closed-industry solutions will become open-sourced allowing a rush of vertical-driven IoT markets to form.

The following implication is that data centre and enterprise systems management will rapidly adopt new business models to manage non-traditional infrastructure and BYOD device categories. Indeed, by 2017, 90% are expected to attempt this³⁴. Since, M2M communication standards are closer to reaching maturity, allowing for more localised and real-time decisions at the edge of networks, significant value is likely to emerge from new business models. In 2014, 22% of organisations had M2M solutions in place, and 42% of the rest expect to implement M2M solutions by 2016; by 2017, 75% of organisations aim to have M2M as part of their strategic roadmaps. As alluded to, these machines will not merely be connected, but smart.

Examples already include Emotient, which allows retailers to detect when consumers react positively or negatively to things such as signs, product displays and interactions with sales associates³⁵. Aggregating data on customer sentiment and adapting offers in real time based on consumer emotion will become common around 2020, and 2016 may see some attempts along these lines. Likewise, Pizza Hut is testing 'the world's first subconscious menu,' using eye-tracking technology to predict guest choices.

What to do about it:

- Determine what the IoT would enable you to do differently, and map out what opportunities or issues may arise by sending the algorithm to the data.
- Examine how this could change organisational and business models in your industry and beyond.



In 2020, consumers won't be using apps on their devices. In fact, they will have forgotten about apps. They will rely on virtual assistants in the cloud, things they trust. The post-app era is coming

The Rise and Fall of Apps

Apps are hardly new, but the extent of their penetration and the likely direction they could take will present new issues for companies. Some issues relating to the growth in volume of apps are already present; 72% of I.T. leaders admit they don't know the number of shadow I.T. apps within their organisation³⁶.

What does it mean?

In the short term we are likely to see the rise of the concept of apps for everything. Home and remote control apps designed by Advanced 365 for Mitsubishi Electric and RS Components already exist and the value of the app dependent smart homes market is likely to reach \$58 billion by 2020³⁷. In addition to developing the Mitsubishi mobile application, Advanced 365 also designed the back-end data warehousing and reporting facilities. Performance data for the Wi-Fi enabled air-conditioning units is sent to the central data warehouse system every five minutes and stored permanently. In building an appropriate application architecture for RS Components, including an e-commerce site, revenue increased by 40% on a month-by-month basis.

Forrester expects the 2015 app download total to hit 226 billion, and predict growth at five-year compound annual growth rates of 14.2%³⁸. However the nature of some of these apps is shifting in exciting ways – in the years to 2020 some 12.9 billion mobile biometric apps are expected to be downloaded by some 2.2 billion users³⁹, whilst some 1.3 billion Augmented Reality (AR) apps are expected to be downloaded by 2019⁴⁰.

AR and Virtual Reality (VR) could also accelerate the autonomy of apps which is already hinted at by Amazon's Dash buttons which are essentially automated purchasing apps⁴¹.

Whilst apps currently act as the interface between us and the digital world, they will increasingly be passed over in favour of more open platforms. Many big tech companies are working on deep linking content inside standalone apps and wearables to make it possible to automatically find — and use — the information in other contexts. 'In 2020, consumers won't be using apps on their devices. In fact, they will have forgotten about apps. They will rely on virtual assistants in the cloud, things they trust. The post-app era is coming,' declares Peter Sondergaard, Senior Vice-President of Research at Gartner⁴².

What to do about it:

- Assess which products and services that you offer could benefit from an app.
- Look at your app ecosystem. Is it aligned in any way? Can you derive value across your processes and systems?
- Also assess what a post-app world could mean for your data architecture to stay one step ahead.

Virtual Reality

Over the next decade, all forms of displays and computer-human interaction devices could be replaced by Virtual Reality (VR) and its successor technologies⁴³. VR and adjacent technologies like mixed reality could rapidly reconfigure our interfaces with the world around us. Augmented Reality (AR) and VR could total a \$150 billion market by 2020, which could rapidly shift the meaning of mobile as we know it⁴⁴.

What does it mean?

Around 3 million virtual-reality units will be sold worldwide in 2016, predicts Jupiter Research. By 2020 consumers might buy 30 million, generating more than \$4 billion in retail sales of devices⁴⁵. In the short to medium term, uptake is likely to be dominated by industries that train through simulation – such as aviation or medicine, since they derive clear benefits from VR. The point of consumer mass adoption will likely occur when the technology can be used in more intuitive and less obtrusive ways.

Building on the Oculus Rift and other technologies that now let you feel as if you are in the room with other dispersed participants, the use of virtual reality could become commonplace by around 2025. Mark Zuckerberg suggests that ‘...VR is the future of how anyone will create, share and experience anything⁴⁶.’ Several maturing technologies, such as haptic interfaces and 3D touchable holographs are coalescing around VR and will redraw both consumer and work experiences significantly throughout the coming decade.

VR and adjacent technologies could generate revenue in one of three categories: Content (gaming, film and TV, health care, travel, education, and social); Hardware and distribution (headsets, input devices like handheld controllers, graphics cards, video capture technologies, and online marketplaces); and, Software platforms and delivery services (content creation tools, capture, production, and delivery software, video game engines, analytics, file hosting and compression tools, and B2B and enterprise uses)⁴⁷.

What to do about it:

- Assess whether any processes, including training, could benefit from Virtual Reality.
- Monitor developments in other industries as to how the technology is being used and/or prototyped.
- Examine your consumer touchpoints and discuss whether any would benefit from a more experiential type interaction.

Software Robotics and A.I go Mainstream

Nouriel Roubini has noted that '...in the years ahead, technological improvements in robotics and automation will boost productivity and efficiency, implying significant economic gains for companies⁴⁸. Over the next five years the impact of cognitive technologies on organisations will grow substantially.

What does it mean?

Cognitive technologies extend the power of information technology to tasks traditionally performed by humans and can enable organisations to break prevailing trade-offs between speed, cost, and quality. Not only can cognitive technologies be used to enhance products and services, they can also bring about entirely new classes of them.

Google Chairman Eric Schmidt believes that the rise of automation will be nothing short of a second Industrial Revolution⁴⁹. According to EIU research, 58% of businesses think automation actually improves the creative thinking of their employees⁵⁰ by freeing them from more routine tasks. Indeed, Gartner believes that by 2017, autonomics-based managed services and cognitive platforms like Amelia will fuel a 60% reduction in the cost of I.T. solutions by automating repetitive tasks currently tackled by humans⁵¹. Amelia is an artificial intelligence platform (virtual agent avatar) that leverages cognitive technology to interface with consumers and colleagues. Instead of simply recognising individual words, IBM's Watson, meanwhile, is delivering a 40% reduction in search time for information⁵².

Machine learning – a subset of cognitive technologies – could develop into more strategic directions. Machine learning and other amplified intelligence approaches can generate new growth ideas for their organisations⁵³. By 2017, a significant disruptive digital business will be launched that was conceived by a computer algorithm (Gartner).

What to do about it:

- Invest in board and executive level education and learning. Leaders in all sectors need to understand whether, how, and where to invest in applying cognitive technologies⁵⁴.
- Craft a structure in which human abilities are augmented by technology. Pushing automation in a human focused direction doesn't require any technical breakthroughs, but rather a shift in priorities and a renewed focus on human strengths and weaknesses.
- Develop an understanding of the technologies that are most likely to become important in the industry. For highly quantitative fields, machine learning is a strong candidate; for more textually oriented fields, Watson-like cognitive computing is more likely to be the automating technology⁵⁵.



Gartner suggests that by 2020,
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A New Era of Cybercrime

In the words of Scott Vernick, partner at Fox Rothschild '...there are only two types of companies, those that have been hacked and those that don't know they've been hacked⁵⁶.' This inconvenient truth is leading to the realisation that many cyber defences are preparing for yesterday's threat, not tomorrow's. Despite this, security is still seen in some quarters as a short-term function and of little strategic value.

What does it mean?

Cybercrime is estimated to cost the global economy upwards of \$400 billion a year⁵⁷, and could cost businesses over \$2 trillion by 2019⁵⁸. Gartner suggests that by 2020, 30% of global 2000 companies will have been directly compromised by an independent group of cyber activists or cyber criminals⁵⁹ - and others have suggested that the average cost of a data breach will exceed \$150 million by 2020, as more business infrastructure gets connected.

Worryingly, a 2015 survey of I.T. professionals working in the financial sector found that '...only 16% felt very prepared to fend off intrusions aimed at financial accounts⁶⁰.' New vectors will also open up at an alarming rate. Intel predicts that we'll go from 15 billion internet-connected devices now to 200 billion in 2020⁶¹. Since we cannot at present keep our smartphones, servers or networks secure, the number of hackable devices emerging on the IoT presents a significant issue and one that must be confronted starting in 2016. At present, Juniper Research⁶² notes that '...we aren't seeing much dangerous IoT malware because it's not profitable.' As IoT interest grows, so will the payout from hacks and the motive to develop specific IoT malware.

Hitherto, security and convenience have been somewhat inversely related - the greater the security provided, the less convenient it is for individuals (customers and employees). However, this could begin to change thanks to both technologies and a shifting organisational perspective of cyber risk, which has now moved beyond being an operational issue to one of the top issues corporate boards must face⁶³. This will necessitate organisational change; by 2018, IDC estimates, 75% of Chief Security Officers (CSO) and Chief Information Security Officers (CISOs) will report directly to the CEO, not the CIO⁶⁴.

What to do about it:

- Create a culture of cyber awareness, starting with the board.
- Look for opportunities for developing stronger ecosystem cyber cooperation. FireEye also believes that '...fewer organisations will run their own security operations centre.'
- It also adds that businesses should '...shift from a peacetime to a wartime mindset⁶⁵.' For this, strategic use of technology is critical as is an understanding of the limits and challenges of such technologies.
- Develop relationships with trusted partners and third parties who can provide security assessments or additional forms of due diligence. Advanced 365 provides a Secure I.T. Health Check which supports customers in addressing and managing their I.T. security challenges.

New Security Models

New security models are sorely needed; if our current models are insufficient for today, they will be woefully unable to deal with tomorrow's threats. McKinsey suggests that by 2025, the IoT could have an \$11 trillion impact⁶⁶. Relying on perimeter defense and rule-based security is inadequate notes Gartner, especially as organisations exploit more cloud-based services and open APIs for customers and partners to integrate with their systems⁶⁷.

What does it mean?


Northrop Grumman notes that we will require '...new frameworks for security as a science with the rigour of physics and mathematics. Newton's Laws for cyberspace have not yet been developed⁶⁸.' In short, new, as-yet-untested models of security are needed that can deal with new and evolving threats such as deeply embedded advanced persistent threats.

Whilst technologies represent new vectors of attack, they also represent a range of tools that could improve security. Blockchain – the technology behind BitCoin could for example, dramatically reduce the cost of governing regulatory compliance in the future. New encryption methods and interfaces – such as MasterCard's scanning of your face to authorise payments will increase in the coming years. Biometrics are evolving in new areas; 'brainprints' represent a new system allowing accounts to be unlocked using brainwaves⁶⁹. The acceptance that preventative services cannot be solely relied on will be a cornerstone of data security in the future, even as the array of preventative services evolves.

Adaptive security architectures are likely to prevail. I.T. leaders must focus on detecting and responding to threats, in addition to the more traditional blocking. Application self-protection, as well as user and entity behaviour analytics, will help fulfill the adaptive security architecture.

What to do about it:

- Create security architectures that balance security with ease of access for staff. The concept of cloaking and containing is gaining traction as another key step, which can also be described as the concept of least privileges, or providing the least amount of information that someone needs to do their job.
- Build security inside services, by design. The days of implementing services first and security as an afterthought is not only a key vulnerability in information systems⁷⁰ but part of a business model that is increasingly unattractive to customers.
- Beyond enforcing compliance, make cyber risk management a strategic organisational pillar and a shared cultural concern embedded across solution life cycles and operational processes⁷¹.



The share of CIOs owning business analytics doubled from 15% to 30% in just one year to 2015. As the importance of analytics deepens, this will likely increase further

The Evolving CIO Role

The role of the CIO is in the midst of significant change. Their business understanding is evolving from I.T. operations to I.T. strategy, CIOs' primary focus is shifting to monetisation and the scope of accountability is moving from I.T. organisation to ecosystems. This is shifting the planning approach from routine to dynamic, all of which are broadening CIO typologies. Choosing which typology of CIO – as entrepreneur, as leader or as manager will be critical in determining how an organisation reacts to these driving changes.

What does it mean?

Increasingly, CIOs need to harness emerging disruptive technologies for the business while balancing future needs with today's operational realities. This will result in CIOs being given additional responsibilities. The share of CIOs owning business analytics doubled from 15% to 30% in just one year to 2015⁷². As the importance of analytics deepens, this will likely increase further. CIOs may also be asked to develop company procurement as well as develop multi-functional shared services.

Whilst the use of technology has become difficult to separate from other business activities, CIOs need to make the case for linking technological solutions strategically to their organisations' most pressing issues. This may include facilitating the boards' own education and expertise as only 7% of companies report being very effective in aligning their business and I.T. goals⁷³. It should also include linking marketing, customer service and other stakeholders – the CIO as Chief Integration Officer⁷⁴.

Deloitte suggests that 'CIOs acting as Chief Integration Officers can serve as the glue linking the various initiatives together—advocating platforms instead of point solutions, services instead of brittle point-to-point interfaces, and I.T. services for design, architecture, and integration.'

What to do about it:

- Creating strategic alignment between CIO typology, the organisation's strategic goals, as well as its ability to meet those goals, will feature prominently in deciding the effectiveness of CIOs. One CIO legacy pattern is not better than the others but aligning the typology to the business need is critical. ([Read our CIO as Manager, Leader or Entrepreneur report](#)).
- A shift in board education, competencies and even composition may be necessary if a clear, cohesive and strategic view of technology is to be achieved. ([Read our I.T. Governance and the Board report - The Board and the CIO](#)).
- Improve communication channels; 42% say poor communication between I.T. and business is a roadblock⁷⁵. It is through collaboration that CIOs can elevate and broaden their roles. This means working with business leaders and helping them figure out what they really need.

Positioning I.T. as the Engine of Change for the Company

As the world moves at digital speed, all businesses will become technology businesses if they have not already⁷⁶. With nearly 40% of CIOs reporting that they are the leaders of digital transformation in their enterprise, and 34% stating they are innovation leaders, CIOs are clearly being given the opportunity to lead a digital transformation.

What does it mean?

Despite the seemingly clear remit for CIOs to enact digital transformation, there would appear to be a limited time frame in which this can occur. Executives suggest there will be a drop-off in CIOs leading digital transformation in three years' time (to 35%). At the same time, executives say they expect the CIO will ramp up the internal focus on I.T. and innovation from 32% today to 36% in three years⁷⁷. Recent Accenture research found that only 34% of companies expect the I.T. organisation to be the main generator of innovation, less than half of the 71% of two years ago⁷⁸.

There is a need to focus on speed and flexibility, not just in I.T. implementation but within the CIO role itself. 40% say the CIO should identify opportunities for competitive differentiation; only 13% say they do⁷⁹. Inaction could result in such tasks being given to CDO's or other emerging C-Suite typologies, yet there can be little doubt that the CIO is in prime position to help establish technological literacy and help identify which technologies will compliment overall strategy and add to corporate speed and flexibility.

Some have already started this journey. Nearly 40% of CIOs are on the bimodal journey of implementing two speed I.T., with the majority of the remainder planning to follow in the next three years. The evidence shows that building a mature bimodal platform results in significantly better digital performance⁸⁰.

What to do about it:

- CIOs should aim to understand the company's strategies and challenges and make innovative connections between the needs of the business and what's possible technologically.
- CIOs should demonstrate value for various business units.
- By enhancing internal coordination, reducing technical complexities and crafting effective compliance for data privacy and protection, a CIO can help launch their business into the digital era successfully.

Collaborating to Solve Tough Business Problems

It is through collaboration that CIOs can elevate and broaden their roles. That means working with business leaders to not just give them what they ask for but helping them figure out what they really need. This will include helping ensure '...critical domains such as digital, analytics, and cloud aren't spurring redundant, conflicting, or compromised investments within departmental or functional silos⁸¹.'

What does it mean?

Collaborating to solve the toughest business problems will require building relationships and tapping into new ecosystems for ideas, talent, and potential solutions. Opportunities to collaborate with non-traditional players such as start-ups, incubators, academia, and venture capital firms should also be explored⁸². The evolution of the ecosystem is a necessity for almost all businesses, and it is likely that cultural fit with regards to risk will become an increasingly important consideration in choosing with whom to partner.

As such, organisational boundaries will blur somewhat and as they do, some form of standardised security will become increasingly built in to third party products, services or enabled capabilities. This will be a key area for CIOs to collaborate in, both internally and externally. Such partnerships may also enable competitive advantage regarding implementing new technologies.

What to do about it:

- Companies should leverage their existing set of partners, vendors, and alliances in order to get the pulse of their direct and closest collaborators.
- The mechanisms of collaboration, curation and crowd creation will become critical skills and processes for businesses – and how to organise technologically for this will be critical.
- The CIO needs to articulate and demonstrate how I.T. can work across silos to help units meet their goals, and ultimately to align business strategy cohesively.
- Set explicit expectations with technology vendors and services partners to bring, shape, and potentially share risk in new ideas and offerings⁸³.

Building New Organisational Models

The future of many industries is inextricably linked to harnessing emerging technologies and disrupting portions of their existing business and operating models.

What does it mean?

Google's Director of Engineering, Ray Kurzweil, suggests that '...if you don't model where the future will be, your plans will be wrong in a year, let alone two years⁸⁴.' Harvard Business Review notes that '...it's the rare CIO who applies scenario planning to the business of I.T... Yet, in a function driven by innovation and the uncertainties surrounding the application and implication of future technologies, not using scenarios is tantamount to management malpractice⁸⁵.'

As much as a digital and technological focus is required to elevate organisations to a new business paradigm, CIOs need to go beyond that and develop new capabilities. This will include reimagining their own roles to focus less on technology management and more on business strategy. In most cases, building these capabilities will not be easy. In fact, the effort will likely require making fundamental changes to current organisational structures, perspectives, and capabilities.

The successful I.T. department of the near-future will focus more on enabling and orchestrating rather than operating⁸⁶. In order to manage the channels of change at the sources – which is increasingly proving to be individual employees, CIOs will require a broad business understanding if they are to enact appropriate structures in which they can thrive.

What to do about it:

- Developing partnerships with other key stakeholders, understanding customers and placing themselves at the heart of business critical issues will be key for CIOs.
- The CIO needs to develop a clear knowledge of how various technologies work in synergy but more pertinently, of how such ecosystem wide collaborations could be monetised.
- Innovation in management is perhaps even more critical to the CIO than technological innovation as the benefits of the latter cannot be fully realised without the former. In many ways the CIO is well positioned to be the resident futurist at many organisations. At the very least the CIO as an entrepreneur should be able to contribute, and act, decisively on core issues.

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