Advanced 365 Thought Leadership Series

What's Hot in 2015

Technology Trends

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Whats Hot 2015 / Technology Trends:

The world is undergoing change at a rate that is unprecedented in the recent history of humanity. Rising wealth and greater global connectivity through technology are combining to redefine what it means to be in any consumer facing industry. The "what and how" of the way we work and live are in considerable flux, as it could be argued, is the way we think as consumers[1]. Mass customisation of products and services will increasingly be the expectation of consumers who are increasingly knowledgeable, demanding, networked and vocal[2].

As organisations adjust to the new norm ushered in by the aftermath of the global financial crisis, many are, or should be, in the process of developing strategies for the next decade. Scanning the emerging horizon, understanding key drivers – both internal and external – and the possible changes, challenges and opportunities will be critical in helping form such strategies. Eighty-six percent think doing business has become more complex since the Global Financial Crisis[3]. Technology, shifting business environments, changing regulatory requirements and shifting consumer behaviours are combining to increase complexity further.

In fact, seventy percent of the C-suite recognises the importance of shifting to new models of social and digital interaction to reach new customer demands and new markets. Forbes believes that today '...we'll see that the highest performing businesses are those that recognise that digital and social technologies have spawned a new kind of consumer behaviour and new ways to work that are highly intertwined[4].'

More than ever, businesses need to be aligned, flexible and adaptable; for example it is estimated that forty percent of the Fortune 500 won't exist in ten years[5]. Despite the social, technological, economic, environmental and political factors combining to create a more fluid and, in many ways, unstable business environment, only 15 percent of companies in 2013 reported adopting new business models[6].

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

David Smith
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Executive summary

There is more discovery and invention across more areas of science and technology than ever before. As our access to powerful computing for modelling and simulation increases, we will see an increase in technological breakthroughs. In some cases this will be in response to urgent global issues, and many technologies will have the potential to drive significant innovation within the global economy. Much of the forecasted economic growth through this century will, in some way, be technologically driven or aided. Some of these technologies are already emerging in mainstream business, such as the Internet of Things (IoT) and big data analytics, but many remain a few years behind in their maturity.

Technology is paradoxically creating and helping solve some of the biggest issues we face on the planet today:

- **Globalisation**
- **Access to information**
- **Connectedness**
- **Ageing, healthcare and wellness**
- **Energy, food and sustainability**
- **Resource scarcity**
- **Understanding the human brain**
- **Materials revolution**
- **Productivity improvements**
- **A new economy**

As business crafts (and sometimes struggles to craft) new models, revenue streams and organisational processes around established technologies such as social, mobile, wearables, the IoT and data analytics, it is apparent that a new operating paradigm is needed. Thirty-five percent of large companies don't believe their web infrastructures will be able to meet the demands of mobile for example[7]. As the utility of such technologies deepens, and is accompanied by a new wave of emerging digital options, organisational flexibility and business model agility will become key strategic drivers in the coming decade and beyond.

Hot Technologies to look out for in 2015

Automation

The impact of IT and automation on the world of work and warnings about the impact on labour are nothing new. However, with a number of technological trends coalescing, there is a growing consensus that things might be different this time.

What does it mean?

Forty seven percent of jobs in the US are now at risk from computerisation according to a 2013 prediction from Carl Benedikt Frey and Michael Osborne from Oxford University[8]. Deloitte, meanwhile, suggests that technology could automate a third of UK jobs over the next two decades[9]. McKinsey, meanwhile, has estimated that by 2025, productivity gains from automation in fields of "knowledge work", ranging from clerical to professional services, could account for forty percent of all the current jobs in those areas[10]. There is further concern at the lack of awareness among business leaders of this trend.

The use of humanless machines at sea, on land and in the air - 'Drones' - could replace many hundreds of thousands of jobs in the very near future, even in the next two or three years. Humanoid robots are increasingly being introduced into the 'workforce' for both manual and knowledge work.

CEOs are missing what could quickly develop to be the most significant technology shift of this decade[11]. Perhaps the most worrying aspect is not just that this shift is being 'missed', but that sixty percent of CEOs believe that the emergence of smart machines capable of absorbing millions of jobs within 15 years, is a 'futurist fantasy'. With the global economy developing further to resemble a complex supply chain, the disproportionate affects of automation could challenge the global economic order and redefine the notion of value, work and even employment.

What to do about it:

- Map out areas in the supply chain and internally that are vulnerable to automation and/or could take advantage from it.
- Engage with relevant studies and forecasts at the C-suite and Boardroom levels.
- Communicate any plans honestly and effectively with staff.
- Prepare for redesigned business processes and systems and think about the future, 'What happens if...?'.

Quantum computing

Instead of using data encoded into binary digits, quantum computers use properties like superposition and entanglement, to represent and perform operations on data at an incredibly fast rate. This means harnessing and exploiting the laws of quantum mechanics to process information.

What does it mean?

In spring of 2013, Google and NASA announced the launch of a Quantum Artificial Intelligence Lab, which, they said, will include a functioning quantum computer that will be used to evolve machine learning[12]. The enormous processing power of these computers could rapidly reconfigure political, business, economic and social norms within the next fifteen to twenty years.

What to do about it:

- Engage with the latest thought leaders and specialists in this area and build a long term plan for how it could be used within the organisation.
- Map out the opportunities and threats to the current operating system.

Cognitive computing

'Cognitive computing systems learn and interact naturally with people to extend what either humans or machines could do on their own. They help human experts make better informed decisions by penetrating the complexity of Big Data[13].'

What does it mean?

In early 2014 IBM, in what may come to be seen as the dawn of cognitive computing, launched IBM Watson as a new business unit focused on cognitive computing technology and solutions. It has already been implemented in call centres, for legal and investment advice, and medical diagnosis[14].
By 2025 we expect this form of computing to be widespread across most industries due to its ability to reduce the complexity brought about by enhanced data volumes.

What to do about it:

- Widespread adoption is some-way off, but investigation of how market leaders are adapting cognitive computing (and indeed their business structures to deal with it) is imperative.
- Ensure your big data strategy and analytics capability is aligned to your corporate strategy. Cognitive computing is not exclusively reliant on strong internal data sets but does benefit from them.
- Assess where cognitive computing could enhance internal processes, staff empowerment and consumer satisfaction.

It is estimated that forty percent of the Fortune 500 won't exist in ten years

Intercloud

The intercloud is a networked and interconnected global cloud of clouds – which allows workloads to migrate from private, to hybrid and public clouds[15]. Cisco has launched its 'Intercloud Fabric,' that further incorporates IaaS, PaaS and SaaS components[16].

What does it mean?

Some surveys have found an average of 759 cloud services per organisation[17]. No single cloud can possibly have enough flexibility, physical capacity and global network access to meet all current and future requirements. As a result, the complexity (both operational and security-wise) has increased. It is likely that an intercloud will become essential for managing multiple clouds[18].

An intercloud will also be a key enabler for the Internet of Everything (IoE). The near-infinite scalability and ingrained real-time analytics, together with distributed network and security architectures will form a platform from which the IoE can grow.

In 2014, three quarters of cloud implementations were expected to be hybrid and the burden of integrating disparate services with each other and with internal IT is time-consuming and damaging to business agility[19].

The ubiquitous rollout of the intercloud is probably some years away from us. Analysts suggest that by 2017 to 2020 we might begin to see some serious unification of this service.

What to do about it:

- The time to prepare is now, and mapping out current cloud deployments and their performance is an important first step.
- All technological change requires a deeper reworking of cultural and operational norms and these need to be aligned for any cloud and intercloud deployments to succeed.
- Cultural change is a pre-requisite and achieving operational agility is critical since interclouds will enable a more broad and business relevant range of services to stakeholders.
- Management structures should adapt to maximise the effectiveness of the intercloud. The ability to embed, extend and integrate collaboration more broadly into and across an organisation will increase.
- IT must be viewed as a business driver rather than cost centre since there is the potential for this technology to drive business value throughout the IT chain.

The ubiquitous rollout of the intercloud is probably some years away from us. Analysts suggest that by 2017 to 2020 we might begin to see some serious unification of this service

Software Defined Networks (SDNs)

Gartner denotes SDNs as a '...radical new approach to designing, building and operating networks that brings a degree of agility similar to what abstraction, virtualisation and orchestration have brought to server infrastructure[20].' This helps remove the physical limitations of networks, which are being pushed to their limits by social media, mobile devices, and cloud computing.

What does it mean?

HP is one company that believes the move into SDNs represents a metamorphosis in network technology. 'When you use an application, you use a certain bandwidth and you have to allocate that beforehand,' said HP's marketing VP for networks, Nick Watson. 'Now, that bandwidth can be totally dynamic, which we believe is absolutely revolutionary[21].'

The SDN market is expected to reach $2 billion by 2016, up from $200 million today[22]. Indeed, twenty percent of enterprises are using SDN now, and fifty five percent are evaluating whether to do so. However forty percent of network pros say SDNs are an indefinable term, even as they're considering implementing it. End-customers stand to benefit from simplicity, cost reduction opportunities, and the possibility for consolidation[23], whilst SDNs are said to better support cloud deployments[24].

What to do about it:

- Educate yourself as to what SDNs are, and engage with experienced SDN partners to rapidly understand its importance to you.
- CIOs will need to invest in technology where networks can be configured or reconfigured remotely using software.
- Determine your goals for an SDN and in particular, know whether you want centralised or distributed control.
- Consider the security implications of having a centralised network.
- If SDNs are deemed both viable and of benefit to your organisation, as a starting point, develop a pilot on a limited part of the network.

The SDN market is expected to reach $2 billion by 2016, up from $200 million today

Atomic GPS

Information and data is the digital fuel of the global economy. The costs to maintain GPS remain a barrier for more involved utility. A modern GPS satellite can run into the range of $223 million. DARPA*-funded initiatives are exploring the use of atomic physics for much better sensing without the need for satellites. Measuring how the Earth's magnetic field acceleration and position is effecting individual atoms can enable geo-location awareness that could be 1,000 times more accurate than any GPS system currently in existence.

What does it mean?

Without a satellite infrastructure, geo-location aware devices become more economical and capable. Real-time, location-based searches, self-driving cars and delivery via drone could all be optimised by such technology – the effect on development in economic hinterlands could be marked. However, perhaps the most fundamental impact could be on privacy and the relationship between consumers, governments and businesses.

Atomic GPS could boost privacy and redefine location based marketing as there are no signals to be intercepted[25]. Current prototype devices are too bulky to be of commercial interest and may only be shrunk to suitcase size by 2016[26]. Given a decade of refinement however, we can expect this size to change considerably.

What to do about it:

- Invest in developing a horizon scanning capability; of new white papers, possible legislation and the latest technical and academic papers.
- Watch for so called 'break' technologies – ones that break supply chains and value networks in at least one industry.
- Engage in scenario planning to map out business model adjustments, areas of opportunity and possible challenges presented by this technology.

* Defense Advanced Research Projects Agency (USA)

Internet of Things (The Internet of Everything)

The Internet of Things (IoT) – links people, processes, data and buildings but could also problematise the nature and volume of data gathering. Cisco estimates that 99.4 percent of physical objects in the world are still unconnected[27], with only about 10 billion of the 1.5 trillion items currently connected globally.

What does it mean?

Given the potential value of the IoT - $14.4 trillion to 2022 by some counts[28], there is clearly a business rationale for developing a strategic approach to what, how and where the IoT can be used to unlock new value streams and create new business. Many companies will start 2015 by looking closely at wearables – a significant contributor to the IoT- from both a consumer and enterprise perspective.

What to do about it:

- Weight the ramifications for your business and map out possible changes in the supply chain
- Scenario planning is a must.
- Cisco CEO John Chambers has repeatedly emphasised that, for an organisation to fully realise the benefits of the Internet of Every thing, there will be a demand for cooperation across business units and require CMOs and CTOs to work closer than ever.
- The Internet of Everything will also demand that traditionally non-technical industries begin to acquire IT expertise[29].

Prescriptive analytics

The IoT delivers significant quantities of machine-to-machine data. As we learn to apply predictive analytics to this data, often in near real-time, we will need help in deciding what to do about the predictions. Prescriptive analytics not only predicts a possible future, it predicts multiple futures based on the decision maker's actions.

What does it mean?

A prescriptive model can be viewed as a combination of multiple predictive models running in parallel, one for each possible input action. Since a prescriptive model is able to predict the possible consequences based on different choices of action, it can also recommend the best course of action for any pre-specified outcome[30].

Data will enable ever greater micro segmentation of customers, increased personalisation for customers and a more effective search for new customers. Data will also have a transformational role to play within HR, assuming its broad use is seen to benefit employees in their efforts to reach their goals, both professional and personal.

What to do about it:

- Embed data analytics at the heart of your organisation. This is a critical prerequisite for the use of any analytical technique.
- Develop a capacity amongst employees and develop the infrastructures that enables data to be analysed and to be used in business insights, but also in crafting a digital platform that enables the right person to review the right data at the right time.
- Look at the recruitment and retention of data fluent personnel as this will become a critical success factor.
- Invest in the capacity of the board, staff and systems to deal effectively with data.

The rise of mobile and location sharing is fundamentally changing the social paradigm

Social

Social networks are evolving into platforms for content creation, idea sharing, and self-service. These networks not only lower business costs, but also make users feel more engaged and empowered[31].

What does it mean?

Whilst many business executives still conjure up Facebook and Twitter as examples, the rise of mobile and location sharing is fundamentally changing the social paradigm[32]. Early adopters have realised the business benefits of a platform that enables creativity, collaboration and online community formation. Given the interactive nature of a social platform and the concurrent realisation that gamification also features elements of what makes social an appealing business proposition, forthcoming social platforms could well be game-based[33].

Whilst social networks have primarily been seen to-date as a tool for engaging people outside the organisation, next generational thinking and use of social networks will be to increasingly replace e-mail as the preferred electronic communication platform within the corporation.

What to do about it:

- A business must ensure its social processes connect people with information, enable greater collaboration and encourage knowl edge sharing.
- As McKinsey suggests '...strategic choices, such as whether to extend collaboration networks to customers and suppliers, will be important[34].' Such advances are possible technologically, but still have to clear cultural, legal and organisational hurdles.
- The need to embark on a transformation program that enables new ways of working and is fully supported by senior management is needed if the benefits of social are to be realised.
- Exploring game based collaboration could be a logical starting point for various work teams – whether as part of formal training or as a communication platform. Determining where social and games could interface would be a logical starting point.
- How would you migrate to social networks for information sharing and collaboration around problem solving in your management teams?

Avatars

Avatars are evolving into a highly sophisticated computer generated set of images with a variety of purposes – from customer service to advertising[35]. Ultimately avatars are enabling companies and organisations to leverage human-like images to communicate their messages.

What does it mean?

The social aspect of using avatars in virtual worlds is also significant. The University of Florida's Digital Worlds Institute is developing the Virtual Distance Learning Classroom, a digital system that will allow students to congregate online in virtual reality classrooms with 3-D avatars using the infrared depth sensor in Microsoft's Kinect[36].

Electronic avatars, either in holographic form or via a TV (A University of Kent project) could monitor heart rate and blood pressure as well as provide medication reminders. Such avatars could potentially analyse a person's speech, movement and facial expression to detect mood and formulate an appropriate response[37].

What to do about it:

- Discuss how you might use avatar advisers to engage with your distribution channels and end consumers. Examples of avatar use reveal a spectrum of approaches. For example, it has been found that college students who were introduced to avatars of themselves morphed to look like senior citizens were motivated to put aside twice as much money for retirement.
- Look at how the use of avatars can modify staff behaviour.
- Actively map out your HR policies with various scenarios. How does it stand up to future changes? Research suggests that by 2025 '... holographic teleconferencing and virtual 'dry runs' of projects will consign old office templates to the dustbin[38]. In their place, multiple surfaces in the home, or shared work hub, will be coated with digitally enabled smart paint that will project 3D avatars of colleagues at a single touch.'
- Is your IT system ready for such changes? Are your employees?

Haptic interfaces

Commentary in several industries, from retail to professional services centres on the marriage of the physical and online in an effort to provide more efficient and satisfying service propositions. The technology that may drive this is haptic interfaces. Japanese researchers have made haptic interfaces that create the sensation of being pushed or pulled by an invisible force. Vincent Hayward, who researches haptics at the Pierre and Marie Curie University in Paris, says that technology today '...is reaching a critical mass[39].'

What does it mean?

Prosaic current examples appear on smartphone keyboards and within computer games yet future applications will include physical interaction with holograms and a widening use of the technology in training and educational environment (i.e. medical student training in virtual surgery). As it evolves in complexity, it is probable we will see this technology in retail circles, whether for checking the firmness of fruit bought with the online groceries or the feel of items of clothing.

What to do about it:

- Assess the areas of potential benefit to your company. Is it internally focussed as a staff tool, could it be used to enhance your offerings, or could it become a key part of your ecommerce platform?
- Develop the capability of IT personnel to enable strategic views and a greater sense of how, where, when and why certain technologies can be used and to what effect.

Research suggests that by 2025 '...holographic teleconferencing and virtual 'dry runs' of projects will consign old office templates to the dustbin'

Instant language translation

In 2013 Japanese telecom giant NTT Docomo's unveiled its new Augmented Reality glasses that they hope will be able to accurately translate text in near real-time by 2020. Meanwhile, Google and Microsoft are engaged in the challenge of real-time speech translation.

What does it mean?

Successful real-time speech translation hinges on artificial intelligence of the highest quality: speech and text recognition is one thing but interpretation quite another. To reach the level of accuracy a human interpreter achieves, these machines have to not only convert each word into the target language, but analyse entire phrases and infer their meaning before offering up a translation. Franz Och, Google's head of translation services, estimates it could only be a 'few years' before speech to speech translation would work reasonably well[40].

What to do about it:

- Within the next decade the talent shortage faced in many countries may moderate as globally dispersed teams can collaborate, regardless of language, on an array of different topics. For those willing to invest the required resources, creating a global talent pipeline via partners or through a local physical presence could yield benefits.
- Possibilities for collaboration and new ideas are unlocked; hiring and retaining culturally dextrous people to take advantage of them will be key.
- Global experience becomes critical in business even as this technology shrinks the world a little. Developing corporate plans for foreign work experience may become an increasingly key differentiator for talented individuals seeking global exposure.
- IT systems must be upgraded to allow for collaboration – internally but also externally for third party players. It must also provide relevant security features and updates.

Virtual Retinal Display

Examples such as The Glyph, from Avegant, dispense with screens and uses '...a combination of optics to reflect an image directly onto your retina, effectively using the back of your eyeball as a screen[41].'

What does it mean?

Available in 2015, such devices could reduce eye strain and therefore enhance reading time for business folk, as well as provide an additional Augmented Reality (AR) interface. Virtual retinal displays and other wearables more generally represent a new paradigm – of fusing digital and physical worlds together.

What to do about it:

- An aligned IT strategy and streamlined operations is a must. Bain acknowledges that many organisations possess '...an IT environment that is a patchwork of legacy systems and ill-suited technologies[42].'
- It continues by noting that '...in most companies, the pressure to create new IT-enabled functionality usually takes precedence over fixing what's broken or underperforming.' A strategic review of the state of internal technology efficacy must inform decisions over the need for new technologies.
- 'With the array of technology available that can be used for achieving a given task or goal, synergies are vital. There must be a board level appreciation of how technologies impact and complement each other, as well as a broad understanding of which technologies can allow an organisation to meet its goals.
- The ability of the CIO to relate technical knowledge in terms of bottom-line business value will be important, not just for virtual retinal displays but all technologies.

Imaging the mind's eye

Mary Lou Jepsen, the founder of Pixel Qi Corporation, gave a TED talk[43] in which she discussed displaying images from the mind on to a screen. We already use scanning technology like MRIs to 'visualise' what you are seeing in your mind's eye and it is perhaps only a matter of time before the method shifts sufficiently to become commercially viable.

What does it mean?

Jepsen says that ultimately, 'we're going to be able to dump our ideas directly to digital media. Could you imagine if we could leapfrog language and communicate directly with human thought? What would we be capable of then? And how will we learn to deal with the truths of unfiltered human thought[44]?' As a tool used to amplify our cognitive and communication skills, Jepsen believes it could help lead to a cure for Alzheimer's and similar diseases.

What to do about it:

- Develop a radar for scanning the wider external environment – including analyst reports, whitepapers and thought leadership pieces.
- Watch for so called 'break' neuro-technologies – ones that break supply chains and value networks in at least one industry.

NextGen Virtual Reality

Oculus VR is a company that is on the verge of releasing the Rift, an affordable virtual-reality headset for playing ultra-immersive video games. Facebook bought the company for $2 billion in the spring of 2014 - a sign of faith that virtual reality is now sharp enough and cheap enough to have huge potential for more than just video games.

What does it mean?

The idea of merging immersive virtual reality with social communications is intriguing. It could also be a compelling tool for teleconferencing, online shopping, or more passive forms of entertainment. Separately, Sony is also working with NASA to create a virtual-reality simulation of Mars using images pulled from the Mars Rover. A more mundane but potentially useful application that Sony is exploring would let travellers visit virtual hotel rooms before booking the real thing[45].

What to do about it:

- Scanning the wider environment for strategic use of the technology – regardless of the industry – may empower organisations to think about business model reorganisation.
- The ubiquity and scope of emerging technologies such as NextGen VR will demand a greater attention to the strategic use of technologies in their implementation for employees, customers and ultimately in how they align to the goals and visions of an organisation.

Programmable matter

Programmable matter is a broad field subject area in which atoms or molecules can rearrange themselves to a desired state. We are starting to see smart substances which can self-heal like the G-Flex phone from LG, but the aspirations of programmable matter go much further.

What does it mean?

Programmable matter might, in the future, be able to self-replicate which has huge implications for everything from medicine to manufacturing[46]. 'Such a capability could change society even more profoundly than the Internet has. If this magical morphable matter were cheap and effective, it would allow us to send and download copies of objects as easily as we do digital documents. We could duplicate an object and then reshape it to our whims[47].'

What to do about it:

- Prepare for change on a cultural level.
- Scenario planning can enable the mental agility needed to change course given a disruptive event or technology.

Smart dust/Micro motes

Thousands of tiny computers that scavenge power from their surroundings could one day be used to monitor your world. Micro Motes could be used to monitor every tiny movement of large structures like bridges or skyscrapers. Motes in a smart house could report back on lighting, temperature, carbon monoxide levels and occupancy.

What does it mean?

With motes embedded in all of your belongings it might be possible to run a Google search in the physical world. For example, asking Google 'where are my keys?' would give you the right answer if they have been fitted with a mote. Smart dust computers could make efficient medical implants too. The idea is that motes placed inside the body would monitor a patient's vital signs. For example, in as-yet-unpublished research, a University of Michigan team has implanted a micro mote inside a mouse with a tumour so that it can report back on its growth[48].

What to do about it:

- As with several other technologies, assess your level of innovation potential and adapt ability to change.
- What is the state of your current technological infrastructure, or ecosystem? Is it aligned and does it deliver results for your customers and employees?
- Have you identified technological trends that may soon present challenges for your organisation? Conversely, have you explored how you could turn these challenges into opportunities?

With motes embedded in all of your belongings it might be possible to run a Google search in the physical world

3D Printing

3D printing, or additive manufacturing, is an object creation technology where the shape of the objects are formed through a process of building up layers of material until all of the details are in place. Despite the recent hype surrounding it, additive manufacturing has been around since the 1980s[49]. However, progression in types of materials used, significant and ongoing cost reductions and the emergence of an industry ecosystem have all combined to give the impetus for its recent, and future growth.

What does it mean?

Within the next two or three years, some analysts suggest that entry-level machines could fall below the psychologically crucial $100 level[50]. Indeed, we noted in 2014 that twenty percent of 3D outcomes formed final products rather than prototypes and this could reach fifty percent by 2020[51] if the price drops appropriately. This could mean the start of a process of radical change in the retail, supply chain and manufacturing sectors as consumer products effectively become digital content[52].

The market for complex, low-volume, highly customisable parts, such as medical implants and engine components, could be $770 billion annually by 2025. It is possible that between thirty and fifty percent of these products could be 3D-printed, costing roughly half of the traditional cost[53]. Planning for the impacts, opportunities and challenges must start in 2015 if companies are to avoid significant disruption in the coming decade.

What to do about it:

- Assess your value chain, and attempt to map it out, look for 3D printing opportunities.
- Harvard Business Review suggests that you '... outline, in detail, how you create and deliver the products and services your customers value. Know each step up the value chain distinctly and understand that the chain will have to evolve over time[54].'

Terehertz Frequency Electronics and Meta-materials

The area of the electromagnetic spectrum between microwave, which we use for cell phones, and infrared, is the Terehertz range. If scientists can figure out how to harness it, we could open up a vast frontier of devices that don't compete against others for spectrum access.

What does it mean?

On the civilian side, because THz radiation, unlike X-ray radiation, is non-invasive, meta-material smart clothes made with small THz sensors would allow for far faster and more precise detection of chemical changes in the body, which could indicate changes in health states[55].

What to do about it:

- In practical terms, for many businesses this is a wearables and big data issue. Ensuring adequate analysis capacity is a given.
- Monitor how first users of such technologies – such as healthcare providers- use these technologies and assess what business opportunities could result.

Wireless electricity

Wireless electricity is in development from WiTricity. Inc notes that '...the technology is complex and still years from perfection, but magnetic resonance - created by coils of conductive materials like copper - could eventually replace wires as the main power source for everything in our lives[56].'

What does it mean?

Indeed, it's already available in limited ways, Starbucks is rolling out wireless charging at its stores, and certain brands of smartphones have already incorporated one kind of technology[57]. Inductive power transfer has already been developed at a range of 5 metres[58]. So whilst 2015 will see smartphones charging remotely, the groundwork may also be prepared for Wi-Power zones at places such as restaurants and streets that offer electric power wirelessly to electronic devices[59] and perhaps even for electric cars to be able to recharge while sitting in a car-park[60].

What to do about it:

- This technology will not be appearing ubiquitously in 2015, but this time should be used to plan out how wireless electricity could impact operations.
- Assess how the technology could benefit your environmental standing and map out where it could be used.

So whilst 2015 will see smartphones charging remotely, the groundwork may also be prepared for Wi-Power zones at places such as restaurants and streets

Rapid Threat Assessment

The globalised nature of the economy also raises the possibility of pandemics spreading in geographical reach at an enhanced rate. The *Rapid Threat Assessment (*RTA) project of the *Defense Advanced Research Projects Agency (*DARPA) seeks to enable researchers to '...within 30 days of exposure to a human cell, map the complete molecular mechanism through which a threat agent alters cellular processes.' It took years and a lot of money to figure out that H5N1 bird flu became much more contagious with the presence of an amino acid in a specific position. That's what enabled it to live in mammalian lungs and, thus, potentially be spread by humans via coughing and sneezing. Knowing this earlier would have prevented many human deaths.

What does it mean?

Better understanding of the interplay between disease vectors and human physiology could enable better planning, response and care for the ill during pandemics. In the decades ahead, the biggest contribution of the program may be fundamental changes in future drug discovery[61]. It may also be of importance for global operators who see people move from region to region on a regular basis as multinational companies seek to mitigate the risk to personnel from global travel.

What to do about it:

- Prepare risk mitigation contingencies for possible pandemics – how does it impact supply chains and key personnel.
- Monitor government programs closely for new developments and areas of potential collaboration.
- What does the emerging ecosystem look like and would there be a role for you to play in it?

Technological changes demand an organisational response

As disruptive and transformative as technology can be, change does not happen in a vacuum. Across all industries '...the change will be more about how technology is used to change an organisation and its interaction with customers[62],' says Jack Bergstrand, the former CIO of Coca-Cola. It is also worth noting that it is the unintended consequences of technology, or else misuse or re-appropriation of it that can define its impact. 'With each new technology, first we do things differently; then we do different things*.'

How will your organisation respond to these technologies?

How could they alter your supply and value chain?

Have you mapped scenarios out?

Have you identified technological trends that may soon present challenges for your organisation? Conversely, have you explored how you could turn these challenges into opportunities?

Do you have an agile organisational culture that can handle rapid change?

Is your leadership oriented towards stability or change?

*David Smith 2012

With each new technology, first we do things differently; then we do different things

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