

# Internet of Things

How it's being used

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# The Internet of Things

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## Introduction

The Internet of Things (IoT) is more of an architecture than a technology. One of the chief issues with utilising many a technology successfully is that whilst they individually and collectively represent new ways of doing things, many actors will simply attempt to overlay digital onto old processes and systems. This issue is perhaps even more pronounced when it comes to an architecture; without a reworking of processes, structures and even work cultures, the IoT cannot yield its potential. Go to market strategies, how suppliers are used, together with internal structures will all need to be re-thought if IoT deployment is to succeed.

Whilst IoT data is growing twice as fast as social and computer-generated data<sup>i</sup>, some 46 percent of companies report a shortage of staff with the analytics skills to support their IoT plans<sup>ii</sup>. If this is problematic now, the impending surge of IoT growth will create even large structural issues. By 2021, Gartner continues, one million IoT devices will be purchased around the world every hour of every day<sup>iii</sup>. In the middle of the next decade, up to 152,000 devices a minute could be connected to the network<sup>iv</sup>. By 2027 there could be 150 billion networked measuring sensors, which equates to roughly 20 times more than people on Earth<sup>v</sup>.

The very nature of this growth also presages the need for reorganisation. Data, and therefore data processing will happen at the edge (i.e. with individual consumers) with the IoT, requiring an ability to 'reach' this far and to this end, almost a quarter of companies working on IoT projects send data, or receive data from, a competitor's device<sup>vi</sup>. Collaboration, platforms, not to mention cybersecurity and data compliance with GDPR and similar standards all point to the encompassing architecture of the IoT. The ability to meet overcome some of these obstacles prevent many organisations from moving beyond piecemeal IoT deployments, and in some cases, eschewing it completely. Perhaps most importantly, 68 percent of businesses that aim to implement IoT, or that are already doing so, are struggling to find employees with the skills to address IoT-focused business models<sup>vii</sup>.

For those with the foresight and capacity to change, the IoT will prove a key catalyst of further enabling, or rather compelling, businesses to reinvent products and services, internal operations and business models<sup>viii</sup>.

## Retail

A host of retail trends, together with the IoT, is blurring the boundaries physical and digital shopping<sup>x</sup>. The value of the global connected retail market was \$16.3 bn in 2016 and \$19.4 bn in 2017, and further growth is expected, with the market expected to touch \$82.3 bn by the end of 2025<sup>x</sup>. Given that, by 2030 more than two-thirds of purchases are forecast to still occur in physical stores<sup>xi</sup> (and, perhaps surprisingly, an even greater percentage could be influenced by in-store experiences), the IoT is a central retail architecture.

This is emphasised by expected IoT investment over the next two years. Retailers alone are forecast to invest some \$2.5 billion on a range of tools (RFID, shelf sensors, mobile payments and so on) that, although individually useful, together promise to change the retail experience for consumers<sup>xii</sup>. The retail holy grail of delivering personalization is now within reach, with 79 percent of retailers expecting to be able to personalise in-store shopping experiences for customers by 2021<sup>xiii</sup>.

It is thus perhaps unsurprising that the retail and consumer goods sector, more than any other, sees the IoT as being central to its digital transformation strategies. 56 percent of the sector see it as thus, compared to 54 percent in IT and tech and 52 percent in financial services<sup>xiv</sup>.

### Uses in the sector

Combining blockchain with the IoT could revolutionise supply chains for many retail based industries. For example, 'modum.io is a start-up that combines the IoT with blockchain by including a sensor device on the package that can regulate temperature, humidity, and shock, along with a smart contract that automatically checks, accepts, or rejects acceptance criteria for a product. The sensor then pairs with a smart device to review time-stamped data and automatically make decisions at each transaction point, making the process faster, smoother, and more cost-effective<sup>xv</sup>.'

Clothing manufacturer and retailer, L.L. Bean, '...has announced it will embed data-gathering sensors in coats and boots to collect data, and send it to a blockchain system. This will allow the retailer to analyse temperature-related data, movement and how often customers wear and wash the clothing<sup>xvi</sup>.'

Intel believes retail is become more 'responsive' as a result of the IoT, noting that its tools are used by over 60 stores. JD, a large online retailer in China, is a 'flagship customer,' of its IoT solution that ultimately aims for '...some stores to be staff-free and meld online and physical retailing<sup>xvii</sup>.'

### Possible future consequences

- With IoT derived efficiency on the back-end, experiences will be central to the shopping experience. Crafting these will often require an IoT infrastructure.
  - With the IoT, '...products will flow to the household like a utility, as electricity and water do. For many products, the shopper will be a bot, leaving customers with the sole task of consumption<sup>xviii</sup>.'
  - Individuals consumers' choice of tech will create personalised tech ecosystems, replete with virtual personal assistants, smart appliances and even cars. This could automate a lot of basic decision-making<sup>xix</sup>.
  - Engaging the consumer will become a problem when automated systems are employed by both consumers and businesses. Algorithms will increasingly be making the offers towards an individual's personalised tech ecosystem, and on the consumer side, deciding if they are beneficial for (or even seen by) individual users too.
- Indeed, Celent suggests that '...IoT takes contextual commerce to an entirely new level, as connected devices start facilitating customer orders, orchestrating commerce transactions, and ultimately acting as independent economic agents<sup>xx</sup>.'
  - Pop-up retail could flourish given enough data about incoming consumers on a given date or at a given event.

## Financial Services

Of all sectors, financial services ranks third in its belief that the IoT is central to its digital transformation<sup>xxi</sup>. However, this appears to hide a significant portion of financial service providers seemingly unmoved by the IoT. A significant minority of financial services firms located in the G7 doubt the influence the IoT could have. 25 percent little to no impact from IoT, against only 10 percent in the rest of the world<sup>xxii</sup>.

This lack of interest, or belief, in the IoT would seem to run contrary to current conditions, let alone future ones. Analysis by Deloitte suggests that perhaps as many as fifty percent of all sensors deployed by 2020 could be of use to the financial services sector, up from 33 percent in 2015 and 25 percent in 2013<sup>xxiii</sup>. Whether one takes a conservative estimate or else an optimistic one on just how many sensors will be deployed by 2020, there will be several billion sensors deployed within two years that could provide a range of useful data to FS organisations<sup>xxiv</sup>. This alone should prompt a look at where FS providers could operate within new ecosystems, what they could do with this data that benefits their customers and how to build new models around it.

The promise, of course, is that access to this data will enable banks and other financial providers will be able to both form and leverage a more complete

picture of the individual customer. This should allow more personalisation - whether in the form of offers, real-time lending decisions or through adding value by providing IoT gleaned insights back to the customers.

FS providers would be wise to prioritise consumer-centric offerings and solid cybersecurity practices with regards to IoT deployment, if they are to benefit from it, as opposed to suffer from it.

### Uses in the sector

In 2016, Citibank '...tested the use of Bluetooth-enabled beacon technology to give their customers the ability to access branch ATMs 24 hours a day via their smartphones and receive location-based personalised offers<sup>xxv</sup>.' Chase is testing beacon technologies to 'pre-announce' customers before they approach a human bank teller or ATM<sup>xxvi</sup>, if that is, the customer has opted in.

'Commonwealth Bank of Australia, Wells Fargo and trading firm Brighann Cotton claim to have completed the first global trade transaction between two banks using blockchain, smart contracts and the IoT. The transaction involved a shipment of cotton from Texas to China<sup>xxvii</sup>.'

### Possible future consequences

Many standalone FS organisations will undergo reinvention and become part

of ever-widening but integrated networks<sup>xxviii</sup>. IoT applications could enable banks to improve their underwriting processes and reach new markets. Information asymmetries lie at the heart of many FS models; that is to say that the institution has more knowledge than the individual user. The IoT could change this, requiring FS to provide new sources of value. 'The pattern of 'life data' could emerge as a new way to de-commoditize consumer financial products.

Consequently, new businesses may emerge to meet the market need for access to these data flows<sup>xxix</sup>. In the short-term the IoT may add to complexity as applications in FS migrate from common uses with tangible measures to new and experimental uses with intangible measures<sup>xxx</sup>. Idea Bank runs a fleet of cars, each customized with an integrated security deposit box and an ATM, which can visit their customers<sup>xxxi</sup>. If autonomous cars are the ultimate expression of the IoT, this could redefine banking provision significantly.

## Insurance

Insurance is ultimately a data-based effort to predict the future based on the past. One issue introduced by the emerging range of new technologies is that there is no past data to go on since blockchain, the IoT and cognitive technologies allow us not just to do things differently, but do different things. Central to this is a shift in the role of the insurer (in many cases) from being transferring and ultimately indemnifying risk to orchestrating a network of prevention and performance, or behaviour, optimisation<sup>xxxii</sup>.

Many insurers are cognizant of this. 75 percent of insurers believe that industry boundaries will dramatically blur due to the IoT and other platforms<sup>xxxiii</sup>. This blurring will also shift sources of competition and potential collaboration too, as coverage evolves into a broader value chain containing new services, products and risk pools<sup>xxxiv</sup>.

The potential gain in building and participating in this new insurance architecture is significant. Insurers that fail to embrace a digital mindset, says Cognizant, '...risk missing out on the \$1.6 trillion of value that the new generation of digital is set to create in the next three years<sup>xxxv</sup>.' Predictions of the value created by the Industrial IoT (IIoT) range as high as a \$15 trillion boost to global GDP by 2030, with the industries potentially capturing the most value from this being insurance (26 percent), ahead of

manufacturing (20 percent), and banking and securities (14 percent)<sup>xxxvi</sup>. That insurance could profit more from the IIoT than industry itself may seem surprising, yet the reward for building successful cyber-risk solutions to meet the spread of new liability concerns at organisational and personal levels will be immense<sup>xxxvii</sup>. The reverse is true too; those that move into IoT based cyber risk without the expertise, partnerships or appropriate strategy could well find it a hundred-billion dollar liability.

The need to develop the talent, external partnerships and sense of collaboration within the insurer's cultures is pressing. 80 percent of cybersecurity and IT experts predict '...unsecured IoT devices will cause a potentially "catastrophic" data breach at their organisations within the next three years<sup>xxxviii</sup>.' Those wishing to truly exploit the IoT insurance boom need to develop strategies and test them soon.

### Uses in the sector

Connected wearables are already being used by many. For example, the John Hancock Vitality Program allows someone with diabetes (who would normally pay more for healthcare) to use an Apple Watch to track activity. If they then meet certain goals, they receive a discount on the following year's premium<sup>xxxix</sup>.

'In a pilot program with Church Mutual Insurance Company, an IoT capability provided by Hartford Steam Boiler saved policyholders more than



\$500,000 by avoiding property losses from frozen pipe leaks<sup>xl</sup>.

Meteo Protect, an insurance and reinsurance broker dedicated to weather risk management, '...has created an app that lets customers select their policy specs, including geolocation, coverage period, and weather parameters. The company then uses an in-memory computing platform to aggregate weather-related data, analyze risks, and price and underwrite the policy – all in real time<sup>xli</sup>.

Telematics auto coverage is now being offered by most major insurers, and many insurers are investing in the connected home.

#### Possible future consequences

IoT applications could enable insurers to improve their underwriting processes and reach new markets and craft new 'offers.'

New connected insurance models will continue to emerge, driven by both the needs and wants of industrial sector players and insurers aiming to expand their reach into outcome-driven models<sup>xlii</sup>.

Traditional customers could become partners, not just relating to data but in areas such as distribution. For example, Accenture suggests that '...the industrial organisation may conveniently deliver insurance through its service platform<sup>xliii</sup>.

Insurers have the chance to become close business intelligence partners with customers; IoT data may not only be used to reduce the risk of fire or water damage but potentially generate insights into employee habits.

- There is a risk of disintermediation of data set ownership as other players access data that enables them to understand risk dynamics and pricing. For example, BMW is now fitting telematics as standard in certain car models to offer drivers insurance premiums based on their usage<sup>xliv</sup>. This is, for now, in conjunction with an insurer, but questions remain as to future need.
- Skill sets will need to change at many levels of the organisation. Insurers will need to establish partnerships in the value chain and work closely with them to combine business processes and exchange data.

## Legal Services

The base technologies of the fourth industrial revolution – artificial intelligence, blockchain and the IoT will combine in ways that shifts the current legal services standard ‘...of chaos and complexity towards process and predictability<sup>xlv</sup>.’

A wide range of companies, including legal services, are already experiencing the benefits of certain IoT based initiatives. 58 percent, for example, believe they have seen increased collaboration within their business. It is likely that within a couple of years, ‘...video conferencing that previously required use of a fixed device such as a computer or smartphone will be possible from any part of an enterprise base<sup>xlvi</sup>.’

The underlying promise for legal services providers is that the raft of digital technologies – including the IoT – are inducing change in established industries, could create new ones (especially relating to data) and ‘...generating concepts that require new legal thinking, such as self-owning assets<sup>xlvii</sup>.’ The Commonwealth Bank of Australia, for example, is already preparing for a ‘...future in which machines will have their own bank accounts and pay for replacement parts and engineers to service them<sup>xlviii</sup>.’

However, the emergence of the IoT also creates potential legal risk for companies that fail to adequately define data usage, boundaries and

consent. From 1 zettabyte in 2016 to 500 within the next three years, what to do about data in terms of volume, handling, authenticity and beyond, is central to future prospects for many sectors. Data could be as damaging as it is beneficial for most companies. The current model of data use often lacks explicit consumer consent, is far from legally fool-proof (has no equivalent of the ‘key facts,’ featured in financial service products) and is open to huge disruption when, not if, it is challenged in court.

### Uses in the sector

Data is allowing many law firms to identify potential clients much more strategically and at a lower cost<sup>xlix</sup>. 40 percent of law firms experienced a data breach in 2016 and did not know about it<sup>l</sup>. Consumer grade tech is often inadequate for the level of risks law firms face, and given the escalating costs of cybersecurity, industry-wide collaboration would appear to be of high immediate import.

The IoT encourages BYOD policies. Seattle-based law firm Perkins Coie, ‘...has a 100 percent BYOD policy, (but uses software that ) only lets employees access data through trusted devices, apps, and cloud services, with the access levels selected by the firm's IT administrators.

### Possible future consequences

Within legal service work, ‘...people used to know what problem they were trying to solve before they started

collecting data to analyse. With the IoT, that model of discovery is being flipped on its head<sup>lii</sup>. IoT data could theoretically find cases that people are unaware of.

Legal services, like insurers have the opportunity to expand their value offerings by becoming an additional information vendor. This could form either a futurist type approach to emerging technologies or else flow from accessing existing IoT information flows and offering advice. Either way, business models will shift<sup>lii</sup>.

IoT could deliver real transformation through the concept of 'embedded law.' Since IoT have technology embedded in them, there is no reason not to be able to embed legal information.

Devices themselves '...could form contracts (e.g., for repair services), signal potential problems, or perform different functions depending on whether the IoT owner is in good standing or default<sup>liii</sup>.'

IoT law could easily form its own new area of practice. Rohit Talwar and Alexandra Whittington suggest that '...opportunities might emerge from pre-emptive legal insurance and retainers to protect against future accusations<sup>liv</sup>.'

## Health and Pharma

By 2025, the IoT could generate an economic impact of \$11.1Tn, of which healthcare may contribute up to \$3.3Tn<sup>lv</sup>, up from a forecast \$163bn by 2020<sup>lvi</sup>. Despite this, almost one in three healthcare execs doesn't see disruption from the IoT in the next couple of years; only 73 percent of healthcare executives say the IoT is poised to create disruptive change within three years. Perhaps more concerning is that only 49 percent think their organisation's leadership understands what the IoT could mean to and for them<sup>lvii</sup>.

According to Goldman Sachs, the most immediate area of impact is to lower costs. Their forecast is of the IoT inducing global savings of around \$300bn their projection is a \$300 billion saving in global healthcare spending in the 2017-2022 period. First and foremost, this applies to chronic disease management which can then result in fewer check-ups or hospital admissions<sup>lviii</sup>. For example, it is estimated that remote monitoring for Type 2 Diabetes alone has the potential to shift more than \$100 billion in value from traditional to emerging business models<sup>lix</sup>.

Personalised medicine is a key tenet of IoT healthcare, with consumer smart pills a leading example. Proteus Digital Health' Proteus Pill contains a small ingestible sensor that can communicate to a wearable patch on a patient's skin and is able to send status updates to a mobile device<sup>lx</sup>.

Benefits can, and should, also be passed onto consumers. 54 percent of consumers like the concept of linking their wearable activity tracker to their pharmacy in order from pharmacists (or bots) to suggest products to meet specific conditions<sup>lxi</sup>.

### Uses in the sector

The IoT helps empower patients. Glooko, for example, helps track and manage blood glucose levels in diabetics by syncing readings from insulin pumps, blood glucose meters, and/or continuous glucose monitors with a smartphone app<sup>lxii</sup>.

Today, smart beds have been linked to improved outcomes in pressure ulcers, and in-home medical devices can be monitored remotely by patient caregivers<sup>lxiii</sup>.

88 percent of providers and 81 percent of payers that have applied IoT services for remote patient monitoring reported at least moderate improvement in consumer attraction/retention<sup>lxiv</sup>.

42 percent of providers and 45 percent of payers that have applied IoT services reported achieving extensive medical cost savings from their wellness and prevention IoT programs<sup>lxv</sup>.

### Possible future consequences

- Healthcare IoT must prepare for imminent GDPR regulations.
- Combined, AI and IoT could help be used to drive full integration of data suppliers and

data consumers into a data-driven business model for both health and pharma organisations.

- Could predictive maintenance for machines also apply to our bodies<sup>lxvi</sup>?
- Powered by IoT, personalized medicine is creating new business opportunities for pharmaceutical drugs, medical

devices, and patient services that will dramatically improve therapeutic outcomes. Digital disruption has the potential to unlock \$100 billion in commercial value, reports Accenture<sup>lxvii</sup>.

A range of future preventative healthcare such as heart attack detection warning to transcranial direct current stimulation, will place the IoT – in the form of the implantable or ingestible device<sup>lxviii</sup> - at the centre of healthcare and pharma models.

## Marketing

Research from the Economist Intelligence Unit (EIU) shows that 86 percent of marketers believe they will own the end-to-end customer experience by 2020<sup>lxxix</sup>. To this end, marketers will need to become data chiefs, and more.

This elevation of marketing to that of a strategic lever is supported by other statistics. 87 percent of marketers believe '...their departments will exercise significant influence over business strategy by 2020,' with 78 percent also expecting to have the same influence over company technology decisions<sup>lxxx</sup>. The latter is perhaps especially unsurprising given that more than 68 percent of corporate investment in IT is now made outside the IT department (from 47 percent in 2014)<sup>lxxxi</sup>. Without IoT expertise and strategy input, this will remain a pipedream for marketers.

Initially, B2B opportunities may outstrip direct B2C. IoT applications for B2B companies will be worth twice as much (around \$300bn) as consumer applications by 2020<sup>lxxii</sup> yet this value risks remaining untapped since 42 percent of B2B marketing professionals state that a lack of quality data is their biggest barrier to lead generation<sup>lxxiii</sup>. This speaks to significant organisational challenge for marketers – one that is accentuated by cyber issues.

Some 30 percent suggest their organisation is prepared for the

security risks associated with the IoT<sup>lxxiv</sup>, leaving a significant amount on the wrong side of this issue. In fact, despite significant IoT cybersecurity concerns, KPMG reports that 44 percent of IoT users admit to not having thought about third party risk<sup>lxxv</sup>. This would not appear to be a strong position from which to launch customer experience leadership and confirms the need to partner closely with the CIO and other stakeholders in strategic technological security.

### Uses in the sector

- Using smart thermostats, '...marketers will be able to determine household patterns and even integrate their data with air filtration systems. This will unlock new opportunities for marketers to customize their message based on allergens and other factors in a customer's home<sup>lxxvi</sup>.'
- Philips' Hue is a smart light that can be used therapeutically in your home and hospital surroundings. 'Marketers will be able to customize their message about indoor lighting needs based on the use and preferences of their customers. Some clients might need brighter lights based on their geographic locations, while hospitals and other civic centres will need different lights to meet their safety codes<sup>lxxvii</sup>.'

The European Union's imminent data privacy legislation GDPR (May 25th 2018) is going to drastically shift how companies around the world collect,

process and manage EU user data. This will create concerns for marketers already using the IoT to communicate or provide services<sup>lxxviii</sup>.

Possible future consequences  
IoT technology will give provide marketers a new perspective into the needs and desires of customers, but striking the balance between privacy and convenience could be tricky. IoT could help better collaboration within and between companies. By identifying design and performance issues, marketers could provide feedback that enables continual improvement even in already launched products or services<sup>lxxix</sup>.  
Marketers and their c-suite colleagues could use IoT data to craft more

customer-centric products and services<sup>lxxx</sup>.

New design skills will be required. In the short term, 30 percent of search could be voice-conducted by 2020<sup>lxxxi</sup>.  
Longer term, zero UI will need to be considered.

- IoT has the potential to make much of the physical world a viable marketing platform<sup>lxxxii</sup>
- Boundary silos between marketing and other functions will need to lower to an extent that is practical. Since all IoT deployments link a multitude of functions, CMO's will need to develop soft-skills and appreciation of other business units strategies and needs.

## Education

The last fifty years has fundamentally changed the face of the organisation and the business environment in which they operate, yet education and learning remains relatively traditional. The friction between a dynamic business environment (and wider society) and an education system that still mirrors the industrial economy is one of the key issues facing people, business and wider society today.

Research suggests there will be a thirty-fold increase in Internet-connected physical devices by 2020 and this will have a significant impact on how schools and colleges operate<sup>lxxxiii</sup>, as well as how learning occurs. Indeed, IoT will help propel the global edtech market which is forecast to reach \$252 billion by 2020<sup>lxxxiv</sup>.

Stephen Trachtenberg of George Washington University believes digitisation will allow learners to choose courses more compatible with their learning style. He suggests that '...earning a degree will lose importance as the range of credentials widens. Certificates from schools, workplaces and industry, alongside something akin to the merit badges earned by Scouts, will gain in respectability – especially once a new system of accreditation for them is developed<sup>lxxxv</sup>.' AI and the IoT could be used to them play a key role in identifying where gaps exist in an individuals' education or learning and suggesting optimal – and not

necessarily standard - ways to fill them.

Indeed, as the pressure for continuous learning grows, both as a result of automation and companies' demand for ever more adaptive workforces, the need for on-demand learning experiences will grow. IoT data, say from a volcano being studied in class, could greatly add to a student's perception of 'being there,' especially when allied with virtual reality and other tools.

The idea of the quantified worker is also emerging thanks to the spread of the IoT; 81 percent of CIOs believe wearables will perform in the workplace<sup>lxxxvi</sup>. Combined with machine learning, the IoT could revolutionise workplace learning and ultimately help craft a new approach to organisational learning. Figuring out who works best with whom or which hours are best for different team members could well prove key drivers of productivity, as could pinpointing specific areas of hard and soft-skill weakness and offering plans for remediation

Uses in the sector

Sensors can already '...detect and determine changes, such as when students are distracted during learning, and (allied to machine learning) generate alternate learning scenarios<sup>lxxxvii</sup>.'

Since learning an overwhelmingly physically located activity, significant benefits can be accrued through smart



building technologies aimed at reducing operating costs. For example, '...New Richmond schools in Tipp City, Ohio are saving approximately \$128,000 each year by using a web-based system that controls all mechanical equipment inside the buildings<sup>lxxxviii</sup>.'

Likewise, the University of Washington reports \$5 in future energy savings for every dollar invested. Smart building protocols in one building alone save the university \$33,000 annually, which given the 15 year life expectancy of the system, leads to plausible savings of \$500,000<sup>lxxxix</sup>.

#### Possible future consequences

- In the future, we will likely live and learn in a world deeply networked by wearables and eventually implantables<sup>xc</sup>
- Wearables, albeit with a less clunky interface than we have hitherto seen, could directly stream content to us, driven by context and attention. With the IoT and machine learning, this

could increasingly be anticipatory<sup>xcii</sup>.

- By analysing more metrics than is possible in contemporary education, a combined IoT/Machine learning set-up could allow for ever more personalised and context specific education, perhaps through our virtual personal assistants.
- As we develop the ability to measure the impact of micro-learning and quantify its benefits, education could become more accurately assessed.<sup>xcii</sup>
- The IoT may ultimately help us develop new classroom pedagogies<sup>xciii</sup>.
- Thomas Frey of the DaVinci Institute even suggests that '...by 2030 the largest company on the internet is going to be an education-based company that we haven't heard of yet<sup>xciv</sup>.' The chances of achieving such growth without blending digital technologies – including the IoT – would appear low.

## Automotive

The IoT is the ultimate platform, and one of the key underpinnings of the emerging autonomous vehicle ecosystem. The business models enabled by autonomous vehicles coupled with the evolution in the concept of personal transport and the increasing digitisation of cars mean the traditional industry boundaries are collapsing. This inevitably alters the skillsets, strategies and culture needed to compete. Indeed, 73 percent of automotive executives say that collaboration with other industries will become the centre-piece to their growth strategies<sup>xcv</sup>.

The extent to which this is both enabled and required by the IoT is startling; the wider economic landscape created by autonomous cars is forecast to be worth some \$800bn in 2035, before growing to \$7Tn by 2050<sup>xcvi</sup>. Automotive data itself could be worth \$33bn by 2025<sup>xcvii</sup>. These sums represent huge opportunities, but carving out a slice should be considered an imperative for current OEMs. PwC suggests that '...by 2030, OEMs, suppliers & dealers will see their share of industry profits cut to just half, from a current 85 percent share, thanks to the digital automotive revolution<sup>xcviii</sup>'.

If, as is anticipated, more than 1 in 3 kilometres driven will be under one of the many forms of 'sharing,' by 2030<sup>xcix</sup>, it is plausible that the number of cars in Europe at that date could have declined from 280 million to 200

million, with figures in North America decreasing to 212 million from the current 270 million<sup>c</sup>.

### Uses in the sector

An unnamed '...Japanese automobile manufacturer utilises IoT to model the behaviour of their welding process. The manufacturer wanted to identify causal factors of failures and faults, identify top predictors of equipment failure, and improve production line availability and reliability. The new system delivers 90 percent prediction of faults with no false positives; 50 percent of the faults are predicted over 2 hours in advance. The company saved 1.5 hours per fault thanks to advanced prediction<sup>ci</sup>'.

Schaeffler AG uses the IoT to improve their manufacturing operational performance. They're also using IoT data to re-position themselves in the automotive ecosystem by creating new value and services<sup>cii</sup> related to wind turbines, planes, trains and even bio-hybrid vehicles.

The IoT is a key enabler of the autonomous vehicle ecosystem. In 2017, 343 driverless trucks and buses were sold. By 2021, these driverless vehicles are predicted to be part of an industry worth \$35bn<sup>ciii</sup>.

### Possible future consequences

Companies like Intel, Nvidia & Qualcomm see connected cars as essentially 'the' computing device of the next decade<sup>civ</sup>

- New business models and revenue streams will evolve

- from this. Idea Bank, cited earlier in this paper is one example. Zilvinas Bareisis of Celent concurs that cars will become partially independent actors, citing the future possibility of an IoT-AI bidding war between rival self-driving cars, each of which carry an impatient passenger<sup>cv</sup>.

Vehicle issues that can be fixed through software will be able to be resolved while IoT-enabled autos are parked in the owners (or communal) garage overnight<sup>cvi</sup>.

An A.I and IoT prompted reduction in the number of cars needed will free-up significant amounts of urban space currently dedicated to car parking<sup>cvii</sup>. Connected transportation promises large-scale efficiencies and safety improvements thanks to predictive maintenance, autonomous vehicles and vehicle to vehicle comms<sup>cviii</sup>.

## ICT

In response to the challenge posed by digitally enabled upstarts, established companies are adopting Gartner's maxim that every company is a technology company. Organisations across a vast swathe of sectors have already actively disrupted their own business models, before competitors and consumer demand do. Tech suppliers, whether established or start-up, and whether with a 'tech' background or not, are being presented '...with the opportunity to develop new and valuable systems and create new sources of revenue and lines of business<sup>cxix</sup>.'

Those with a history outside the tech sector now find themselves with the opportunity to become a leading part of it. Witness, General Electric's commitment to becoming a top 10 software company by 2020. More could be done by all players without even considering further tech developments; nearly 90 percent of the 6,000 exabytes of data being generated at the edges of networks, as of 2016, was not being exploited or used. Indeed, in IBM's words it was '...being wasted<sup>cx</sup>.'

There are hundreds of IoT platforms to choose from. Indeed, of the four hundred plus companies offering IoT platforms in 2017, Boston Consulting Group believes that less than 15 percent have what it takes<sup>cxii</sup>. Establishing connectivity standards may go some way to helping distinguish these, but as we have seen

with other technologies, this can take time and ultimately frustrate the potential of a given technology or architecture.

McKinsey notes that presently, both '...Ericsson and Huawei are introducing different versions of NB-IoT, but it is unclear which one will become more popular. Therefore, platform vendors that want to enable out-of-the-box device connectivity for IoT offerings may want to make their products compatible with both versions. While this strategy ensures that devices can communicate, it also creates additional complexity and could potentially increase product costs<sup>cxiii</sup>.'

### Uses in the sector

- General Electric is in the process of transforming from a manufacturing company to a tech service that happens to also manufacture goods. As such some 70 percent of revenue now comes from selling as a service what used to be sold as products<sup>cxiii</sup>, with predictive maintenance based on the IoT as a key driver of this new strategy.
- IoT led servicization continues to blur industry boundaries.
- Rolls Royce, '...uses a model under its TotalCare program where they charge a fixed rate per flying hour. With the IoT they can track how many hours their engines are being used in

- real time, and monitor their performance<sup>cxiv</sup>. Value add to the customer is in the form of accurate forecasting of ownership costs and ease of use.

#### Possible future consequences

- Business models could shift from B2B to B2B2C and perhaps even B2B2S (society).

The IoT will lessen the reliance on the screen as the primary way of displaying information sets. The non-linear design problems of zero UI will require vastly different tools, and skill sets<sup>cxv</sup> in design.

Human computer interfaces will likely include voice and gesture enabled UIs.

- Data could increasingly become a key sustainability issue for companies. While 98 percent of business leaders acknowledge the great potential in data and

connectivity contributing to a sustainable future for their organisation and the wider environment, only half currently use data and connectivity to support such efforts<sup>cxvi</sup>, and many of these efforts are likely prosaic.

- The IoT, allied to other key technologies of the digital revolution – machine learning and cognitive systems being chief among them, could reshape current business ecosystems into vast interconnected business networks. Acting like automated B2B marketplaces, SAP foresees these new entities as ‘...facilitating information-sharing among partners, empowering workers with greater contextual knowledge, and augmenting business processes with enhanced information<sup>cxvii</sup>’.

## Conclusion

Many industries currently lack an IoT-based killer app but their likely emergence over the next few years could further boost the scope and scale of the IoT market<sup>cxviii</sup>.

It is of high import that, when waiting or searching for such killer apps, that businesses pre-emptively prepare their systems, processes and people in order to truly take advantage of it. Capabilities and culture will need renewing whilst partnerships to enact scale and perhaps even others' data are required. The right information must flow, securely, to the right person at the right time. In addition to security and appropriate data usage (i.e. with consent), training will likely need to be given to workers to address the skills deficit and culture of siloed information that pervades many organisations. Ultimately '...all of the implications of big data and analytics apply to IoT data<sup>cxix</sup>.'

Given that software is already a commodity, data could become so too, if in some cases it isn't already. The likelihood of build long-term advantages around a commonly held good is low. Nor does sheer volume help in this regard. Data gathered by a given organisation should ideally be tied to a specific domain, in which data is used to solve problems or address wants of customers<sup>cxx</sup>. This focus should lead initiatives and could then signal a subtle shift into systems architecture and other disciplines that take an enterprise-wide view of software systems. This consumer-centrism must lie at the heart of IoT models, no matter whether they are based on new pricing models, service-based business models or the monetisation of IoT data<sup>cxxi</sup>..

Very few technologies are plug and play, as most have wider implications whether in terms of talent, organisational structure or even business model. More so than many other technologies, IoT is an architecture that demands a series of questions before embarking on its use<sup>cxxii</sup>.

What is our goal with the IoT? How are we aiming to improve customer satisfaction?

Where will we play within the ecosystem? Are we the orchestrator?

How will we guarantee data safety and/or privacy, especially in a GDPR world?

How do we cope, organisationally, with a huge increase in data?

Which ecosystem partners do we need to achieve our goals and strategies? Is this enough for us to win in our chosen market?

What capabilities do we need to fill the gaps? 'Evolving and innovative companies hire employees for the culture they want, which is not always the culture that they have,' notes McKinsey<sup>cxxiii</sup>.

How can we attract ecosystems participants to build scale?

## About David Smith

David is a leading strategic futurist who combines the experience gained from a 40 year IT, marketing 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, Ogilvy 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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## About Marcela Lopez, Artist

Front cover by Marcela.



Marcela Lopez, Colombian artist with European influences based in UK. Commissions and artwork for sale. My subject matter is landscape. Using my hands I choose plaster to capture the movement of water and trees on wooden boards. Through my artwork I intend to invite viewers to a peaceful moment of reflection. I see my artworks gently brightening up any space and being a source point of serenity and comfort.

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