Project Breakthrough

Disruptive Technology Executive Briefs

INTERNET OF THINGS

Connecting the world

The Internet of Things (IoT) is set to transform our lives just as profoundly as mobile communications and the World Wide Web have done in recent years.

We are just beginning to see the benefits that IoT brings from having a better understanding of the world around us. The combination of connected sensors and cloud computing platforms means virtually any physical object can be connected to the internet. This will support our ability to make decisions, as 'things' around us respond and react to anticipate opportunities or hazards and take action - to be 'smarter'.

The technology

Advances in technology are providing us with smaller, cheaper and more accurate sensors that can measure any aspect of our environment. These sensors, embedded into everyday objects, are then connected by global communications systems to the cloud. This allows data to be stored in diverse and decentralised ways and provides a powerful means to process this information, draw insights and make things happen.

The potential

Today there are early examples of how IoT is transforming our environment, yet its full potential is still to be realised. In energy production, manufacturing, transportation and in our home lives, the benefits of sensing, communicating, and computing are being discovered. Domestic appliances that 'know' when they need servicing and can schedule a visit from the service engineer. Doctors who receive vital signs information from their patients 24/7 not just when they see the patient. Farmers that can receive up-to-date information about the best time to harvest using sensors in their fields.

And with simple IoT solutions being built by schoolchildren using systems that cost less than $10, the pace of adoption, and discovery of new applications, is only going to increase.

The barriers

Privacy is a key concern in the IoT. As we enable this global network of billions of sensors, so the potential to abuse the information gathered about the environment, individuals and organisations grows. We must have the confidence to understand the privacy boundaries within which these systems operate – and reassure users that they are empowered, not threatened, by them.

Today, however, the biggest hurdle to overcome is access. With over half the world's population still not connected to the internet, we have lots to do to make IoT deliver benefit to everyone.

United Nations Global Compact

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Some Example Applications...

Making cities smarter

IoT has the potential to transform entire cities by solving everyday problems. Widely deployed sensors, network connections and data processing capabilities provide a way to deal with traffic congestion and reduce noise, crime and pollution. For example, sensors have been deployed on lamp posts to detect gunshots and notify the police even faster than a person is able to. Traffic lights can adjust to the flow of traffic and relay this information to other areas, to provide alternative routes and smoother travel.

Cleanspace

Each year millions of deaths worldwide are attributed to air pollution. Drayson Technologies believes that people should have the tools to know what is in the air they breathe and, empowered with this information, be able to reduce their own exposure to air pollution. The company developed CleanSpace™, a portable personal air pollution sensor and app that gives real-time personal data on pollution exposure and motivates non-polluting transport choices in return for rewards.

Accessible healthcare

In a world where access to healthcare is not evenly distributed, the IoT has the potential to address this. Brighter have partnered with Telia and Ericsson to develop a connected blood glucose meter and insulin injection system to be used in patients' homes. Currently only available in the Swedish market, these kinds of connected medical devices have huge potential to transform healthcare globally, extending the reach and capacity of health practitioners in areas where they are limited – such as in the developing world.

Connected construction

JCB's Livelink telematics system connects construction equipment, such as excavators, to provide real time health monitoring. This helps maintain equipment at maximum availability and offers valuable insights into their use improving efficiency of operations.

Key Numbers

$11tn

Impact on global economy by 2025

Source: PA Consulting

4.5mn

Employment in the sector by 2020

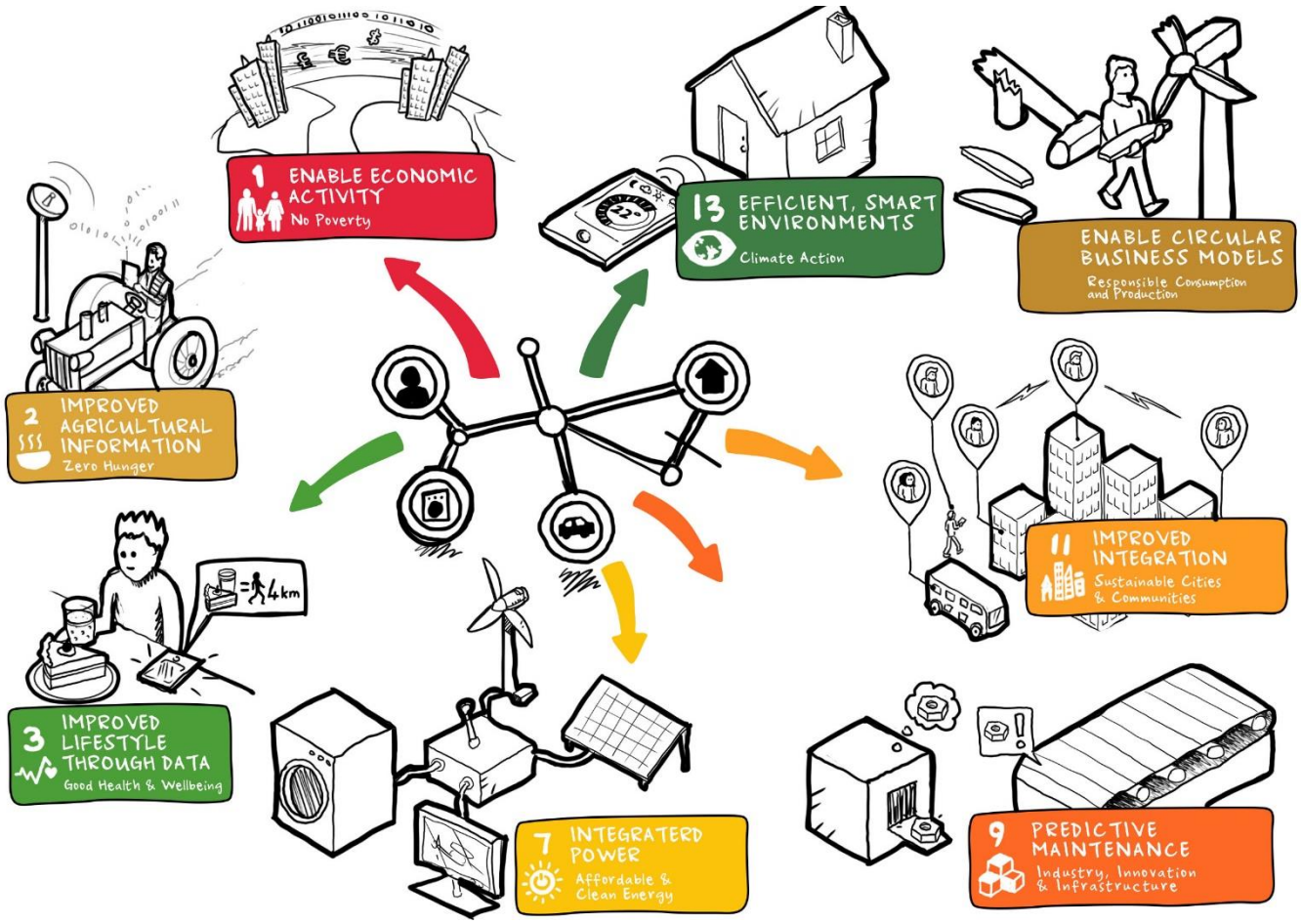
Source: Cisco

38.5bn

Connected devices by 2020

Source: Statista

Advancing the Sustainable Development Goals (SDGs)



IoT has the potential to advance many of the SDGs. Below are some examples of areas of applications across a wide variety of sectors.

SDG 1 No poverty

- Tackle fuel poverty through better awareness of consumption and helping people make smarter decisions.
- Improve social housing through monitoring conditions in smart buildings.

SDG 2 Zero hunger

- Increase yield and improve food security by using IoT to monitor soil and weather conditions, crop health, pest activity and crop treatment.
- Decrease food wastage through using insights gained from connecting different parts of the supply chain.

SDG 3 Good health and wellbeing

- Use wearable devices and smart clothing to provide individuals with immediate access to information that highlights the impact of their behaviour and lifestyle choices, and motivates them to adopt and sustain positive lifestyles.

SDG 7 Affordable and clean energy

- Improve monitoring, control and integration of power sources. For example, increasing efficiency in renewable energy sources through improved management of their variable output.

SDG 9 Industry, innovation and infrastructure

- Create opportunities for new and innovative products and service models.
- Track and manage assets remotely and in real-time, allowing a more efficient use of people.
- Predict when parts will fail using sensors so they can be replaced before this happens, reducing down time.
- Help employees make better decisions about the tasks they are doing by providing relevant real-time information.
- Automate repetitive and predictable processes through smart IoT systems.

SDG 11 Sustainable cities and communities

- Transform city infrastructure through intelligent buildings and transport infrastructure, air quality monitoring, smart energy and water networks.
- Share information between widely dispersed groups of individuals through technologies such as shared activity trackers, which help people to stay connected and feel part of a broader community.

SDG 12 Responsible consumption and production

- Reduce waste from manufacturing, and from shorter and more responsive supply chains.
- Track the provenance of products and their constituent components across the supply chain and their lifetime, so that products are more easily reused and recycled, supporting circular economy models.

SDG 13 Climate action

- Monitor ecosystems and the natural environment using webs of connected sensors.
- Improve energy efficiency through smart devices that can provide a low cost way for people to conserve energy by monitoring home temperatures, varying temperature by room and controlling temperature when out of the house.

Potential Negative Impacts and Barriers

Access to the internet in developing countries will be the key factor limiting the global potential of IoT.

Sharing the benefits

Less than half of the world's population (3.5bn people – source Statista) have access to the internet. There is enormous potential to use IoT to improve sustainability and growth in the developing world but this will be limited by the rate of people becoming connected. Until internet connectivity is pervasive worldwide, IoT will largely be a first world phenomenon.

Security

Managing a diverse network of connected devices and sensors creates significant security challenges and it is critical that devices are designed with security in mind and IoT connections are secured end-to-end. The risks were made abundantly clear in October 2016 when a Distributed Denial of Service attack infected a large number of poorly secured connected consumer devices with a virus.

In another interesting example, British Prime Minister Theresa May was reported to have banned government ministers from wearing smart watches to meetings amid fears that they could be hacked and turned into listening devices.

Increased electronics demand

As smart, connected devices become more pervasive the demand for electronic components and their raw materials will rise. Aside from the need to ensure this ever increasing demand is sourced in a responsible way, this will have an impact on waste. Although largely covered by existing legislation in the developed world it will be important to ensure that more hazardous products are not heading to landfill sites in developing countries. The advent of biodegradable electronics will have a big mitigating impact on this.

Technical Considerations

The IoT will create new and diverse challenges for both manufacturers and consumers, and these will need to be overcome as they adapt to that change.

Interoperability

Integrating different solutions from a range of manufacturers is a challenge. Today we have many networks of things but a lack of standards is limiting the potential for greater interoperability. This means that a level of commonality that makes the technologies interchangeable will be key to mass consumer adoption.

Manufacturer responsibility

Traditional business models work on an assumption that the manufacturers' responsibility stops when customers take ownership of the product. Issues relating to guarantees, warranty and replacement parts are the only reason for subsequent contact. With IoT however, manufacturers need to maintain ongoing connections and services, provide support and advice, and manage upgrades, all of which creates new business activities around collecting and aggregating data. This requires more engagement with customers and, while creating potential new sources of revenue, it can also increase costs for organisations and take them into unfamiliar areas.

Data overload

A dramatic increase in connected objects will generate huge amounts of data that needs to be processed to generate insight – collection alone will not lead to improvements in services. It is what we do with the data that will make a real difference and there will be a need to ensure that users have the capability to process and analyse these new volumes of data.

Enabling New Business Models

The IoT is going to going to challenge many current business models as well as opening up a number of new ones.

As a broad enabling technology, IoT can have an impact across many sectors. The increasing availability of sensors, connectivity, and cloud-based computing makes it possible to gather a wide variety of data. This can then be used to generate actionable, real-time information and intelligence in a way that is significantly more cost effective than previous methods.

Established businesses may typically start connecting their existing products, manufacturing lines and assets. IoT provides an opportunity to measure and automate what is going on in a business. This provides greater degrees of control than traditional information gathering techniques which rely on manual input. When combined with big data analytics and data visualisation this can provide valuable new insights into efficiency and productivity.

Machine learning can go further and help detect anomalies, predict usage patterns, and optimise maintenance scheduling and other improvement opportunities. This means manufacturers will be better able to monitor, control, improve and automate their operations in ways that were previously unimaginable.

IoT will help organisations gain a better understanding of customers, their needs and behaviour, from data about how they use products. This will allow product performance to be improved, and additional valuable services to be provided. It will also deepen their relationships with those customers by engaging them through their products after they have bought them, creating new business opportunities.

An even greater potential for IoT comes from monitoring the environment through the use of widely deployed networks or sensors that gather data such as indicators of climate change, levels of pollution, population movement and soil health.

In many industries, IoT is disrupting traditional business models causing companies to ask the fundamental question "what business am I in?" This is creating opportunities for start-ups, and for technology companies with expertise in capturing, managing and exploiting information to enter new sectors.

It also means competition can now come from unforeseen directions, examples include Google entering the domestic heating market through NEST and Apple entering the automotive market. As a result, businesses need to look more broadly when considering their options for the future, and form partnerships more extensively.

IoT will enable a number of the disruptive business model levers identified on the Project Breakthrough Website, specifically:

A more personalised product or service

IoT can capture information and insights on individual customers and their preferences, and tailor services and their delivery to individuals.

A closed-loop process

IoT will allow products and components to be tracked across the supply chain and their lifetime, enabling reuse and recycling.

Asset sharing

IoT will allow the monitoring and tracking of usage of assets, which is essential to asset sharing business models.

Usage based pricing

By monitoring asset status and health, IoT can provide the information needed for usage-based pricing.

More Examples...

Connected off grid energy supply in Africa

http://www.vodafone.com/business/why-africa-is-feeling-the-power-of-iot-2016-03-07

Tesla's over the air software updates

https://www.wired.com/insights/2014/02/teslas-air-fix-best-example-yet-internet-things/

Changing a business model through IoT

http://www.paconsulting.com/our-experience/rentokil-launching-an-internet-of-things-cloud-platform-to-handle-24-million-messages-a-day/

United Nations Global Compact

The United Nations Global Compact is a call to companies everywhere to align their operations and strategies with ten universally accepted principles in the areas of human rights, labour, environment and anti-corruption, and to take action in support of UN goals and issues embodied in the Sustainable Development Goals.

The UN Global Compact is a leadership platform for the development, implementation and disclosure of responsible corporate practices. It is the largest corporate sustainability initiative in the world, with more than 9,000 companies and 3,000 non-business signatories globally.

Project Breakthrough

Project Breakthrough is a collaboration between UN Global Compact, Volans and partners that spotlights the best thinking in sustainable innovation. It showcases innovators across mainstream companies and next generation entrepreneurs who are developing solutions with the potential to achieve exponential impact. It features analysis and resources designed to help leaders understand the new business models and technologies that will be crucial in achieving the SDGs, catalysing action amongst today's businesses to meet the needs of tomorrow's world.

The Disruptive Technology Executive Briefs are produced in collaboration with PA Consulting Group, combining cross sector technology, innovation and business design expertise. The briefs are intended as an easy to digest introduction to disruptive technologies, to help organisations understand how they could advance the Sustainable Development Goals and business performance. These overviews explore key features, examples of applications, potential positive and negative impacts, and how they may enable the new business models.

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