BRAINY IAS

Internet of Things (IoT)

Relevancy
- ✓ G.S. Paper 3
- ✓ About internet of things

What is the internet of things (and why does it matter)?

- The internet of things (or as it's also known, IoT) isn't new: tech companies and pundits have been discussing the idea for decades, and the first internet-connected toaster was unveiled at a conference in 1989.
- At its core, IoT is simple: it's about connecting devices over the internet, letting them talk to us, applications, and each other.
- The popular, if silly, example is the smart fridge: what if your fridge could tell you it was out of milk, texting you if its internal cameras saw there was none left, or that the carton was past its use-by date?
- Where it's most common, in Britain at least, is home heating and energy use – partially because the government is pushing energy companies to roll out smart meters (although it has been questioned whether it can be delivered on schedule).
- They have clever functions that let you turn on heating remotely, set it to turn down the temperature if it's a sunny day, or even turn off when there's no-one home.
- Some can tell the latter with motion-sensing cameras, or simply by seeing that your smartphone (and therefore you) has left the premises.
- IoT is more than smart homes and connected appliances, however. It scales up to include smart cities – think of connected traffic signals that monitor utility use, or smart bins that signal when they need to be emptied – and industry, with connected sensors for everything from tracking parts to monitoring crops.

Why does it matter?

- There's a reason the government is encouraging energy companies to hand you a smart meter: all that data and automated use is more efficient, meaning we use less energy.
- Many areas of IoT show such benefits, though some smart gadgets are more about whizz-bang effects than efficiency, which may well be why we're seeing more smart heating than smart fridges in European countries.

Internet Of Energy (IoE)

Relevancy

- ✓ G.S. Paper 3
- ✓ About internet of energy and its mechanism
- ✓ Problems related to it and their solutions
- ✓ Some examples of IoE

What is the Internet of Energy?

- The Internet of Energy (IoE for short) is the implementation of Internet of Things (IoT) technology into distributed energy systems to optimise the efficiency of energy infrastructure and reduce wastage.

How does it work?

- It is achieved by creating a network of sensors that have various applications, such as power monitoring and demand-side energy management.
- Consumer appliances with IoT functionality would be able to help balance energy demand.
- For example a washing machine could be connected to the internet and only power on when there is sufficient energy from solar power in the grid. For the consumer, using energy at off-peak times could save them money as well.

What problems does it solve?

- Wastage is currently a big problem, especially in the renewable energy industry. For example, in 2016 **China** wasted enough to power Beijing for a whole year.
- The IoE also helps countries manage demand and could ensure that countries don't suffer from blackouts in the future.
- Nicola Shaw, UK based National Grid plc executive director, said that between **30% - 50%** of fluctuations in the grid could be solved by both households and businesses adjusting their demand at peak time.

IoE examples

- Various companies have started implementing IoT technology into the way they either produce, transmit, or consume energy.
- **General Electric** are combining big data, machine learning and IoT technology to build an Internet of Energy. Sensors are being used to collect data, which is then sent to special software to be analysed. This allows real-time monitoring of their equipment, and has brought various benefits including a 5% reduction in downtime and a 25% reduction in maintenance and operations costs.
- **Marriott Hotels** attached a switching unit to the air-con chillers on the roof. When demand is about to peak, the system sends Marriott a message asking if it is willing to suffer a power drop. If the hotel agrees the chillers are switched off remotely. The cost savings if the system was implemented across the whole hotel chain would be £700,000 a year, and the customers don't even notice the slight rise in temperature due to the switch-off.

Is the IoE just a buzzword?

- The terminology 'IoE' may be on-trend at the moment, but this is a growing market.

- The **World Energy Council** describes advances in energy software along with solar power as the biggest changes in 21st century energy and the market for digital services in the renewable energy sector alone will be worth c. **$89bn** by 2030.
- IoT technology looks set to continue to develop an era of IoE, which will help improve efficiencies and help the growth of renewable energy, both of which are important priorities for a lot countries across the world.
- Although many might argue that simply building more power stations would be more beneficial in areas where demand management is a problem, it is clear to see that the way power is managed and consumed is in need of modernising.
- Consumers especially are increasingly getting used to internet of things technology in other aspects of their daily lives, so the old method of reading a meter and then receiving an estimated bill won't cut it for very long.

Relevancy

- ✓ G.S. Paper 3
- ✓ Difference between 3G, 4G and 5G technologies

Introduction

- There have been innumerable technological shifts over the centuries, and they've all impacted humanity greatly.
- The invention of the telephone in the 1800s made it possible to talk to people remotely and, 100 or so years later, the first portable handsets appeared.
- Motorola was the first company to pioneer mobile technology, launching a revolutionary portable phone in 1973.
- For the first several decades of their existence, mobile phones' functionality was limited to sending and receiving calls and SMS text messages.
- Fast forward into the 2000s, and handsets have evolved, with today's phones combining the power of computers, communications devices and media players in a single form.
- While mobile hardware has changed dramatically, the networks on which they rely have also undergone huge change.
- The first dramatic change was when 3G networks rolled out in the early 2000s - arriving in the UK 2003 – which allowed mobile phone users to access the internet.

Potential uses of 3G

- 3G was a huge step in bridging the transition between the common mobile phone and smartphone.
- Fourth generation mobile connectivity started to make waves in the late 2000s, and EE launched Britain's first 4G service in 2012.
- It made mobile internet speeds up to 500 times faster than 3G and issued support for HD mobile TV, high-quality video calls and 3D television.
- 4G is now common throughout the world, but there's now talk about its successor, 5G. Whenever a new type of mobile network comes out, it ushers in a new era of technology.
- The example of 4G is the rise of smartphones in the mid-2000s. All of a sudden, phones could do everything, so the telecoms industry needed a standard to support the evolutionary gap from feature phones.

Uses of 5G technology

- Many expect the first 5G networks and technologies to come out in about three years time, but they may not be commercialised until the mid 2020s.
- Technologists, companies and organisations often debate the exact definition of 5G, too. To look at 5G in a more simple way, it's widely believed that it'll be be smarter, faster and more efficient than 4G.
- As we enter an era where more people and devices are connected to the internet, it'll be crucial to have a mobile network standard that can support huge demand.
- 5G networks will also enable more effective device-to-device communication, provide more bandwidth and lower latency thanks to built-in computing intelligence.
- For instance, in 2015, 5G researchers working at the University of Surrey were able to reach speeds of 1Tbit/sec.

- Just to compare, 4G can hit speeds of 300mbps. A high-speed mobile network will be crucial if communication between ever-increasing amounts of connected devices is to be effective.