PEOPLE & ECONOMIC ACTIVITY

PART 1: BIG DATA – Products & services

Dr Susan Bliss Educational consultant Author, Macmillan Australia

Image source: https://media.licdn.com/mpr/mpr/p/4/005/09e/055/267fd22.png

'History has taught us that nothing is constant but change'

Geography Syllabus Links

Part 1

• HSC Geography: People and Economic Activity and Economic Enterprises.

Part 2

• HSC Geography: People and Economic Activity and Economic Enterprises.

Over the past 20 years, Exxon Mobile, General Electric and Walmart shared the top-five ranking places as the world's largest global companies. However by 2017, the five most valuable listed companies were technology giants – Alphabet (Google's parent company), Amazon, Apple, Facebook and Microsoft. In the first quarter of 2017 these five giants collectively generated over \$25 billion in net profit. Few people can survive without Google's search engine, Facebook's newsfeed and Amazon's one-day delivery.

The dominance of technology companies in the global market, has prompted requests for these large companies to be broken up, as experienced by Standard Oil in the early 20th century.

Tech titans race for supremacy

Today, the fastest growing resource is data, provided by the Information and Communications Technology (ICT) industry not oil. Globally, money spent on ICT is estimated at US\$3.5 trillion and is growing at 5% per year. The escalating growth rate is linked to over 3 billion people possessing access to the internet and 80% of internet users owning a smartphone with access to data. Technology companies are anticipated to impact on future innovations, employment, wealth and lifestyles.

Changes to largest global companies

A new world is emerging. Today's superstar companies differ in what is considered 'big'. In the early 21st century companies with large revenues and global footprints, such as oil companies (Exxon, Shell), had substantial assets. However today, large technology companies (Apple, Alphabet), boast enormous market valuations and market shares, but possess few assets.



Largest global companies by market capitalisation (cap) 2006 –2016

Source: http://www. visualcapitalist.com/wpcontent/uploads/2016/08/ largest-companies-bymarket-cap-share.jpg

Largest ICT companies by revenue

In 2016, 51 ICT companies were ranked on the top Fortune 500 list, with Apple ranked at number three. Apple was also ranked as the number one tech company in the world, with largest revenue, profits, assets and market cap. Other top ICT companies include Samsung, HP, Microsoft, IBM and Alphabet.

The largest ICT companies by revenue are associated with computer hardware and software, electronics, internet, e-commerce and computer services.

Apple Headquarters, Cupertino, California



https://commons.wikimedia.org/wiki/File:Apple_Headquarters_in_ Cupertino.jpg

Rank	Country	Company	Industries
1		Apple Inc.	Mobile Devices, Personal Computing, Software
2	:•:	Samsung	Mobile Devices, Semiconductor, Electronic Devices
3		Foxconn	OEM Component Manufacturing
4		Amazon.com	Internet Retailer, Cloud Computing
5		HP Inc.	PC, Printers, Enterprise solutions
6		Alphabet Inc.	Internet, Software
7		Microsoft	Software, Hardware, Cloud Computing
8		IBM	Cloud Computing, Software, Consulting, Hardware
9		Dell	Personal Computers, Enterprise solutions
10	•	Sony	Electronic Devices, Personal Computing, Mobile

Largest ICT companies by revenue

Rise of tech unicorns

A unicorn is a startup company valued by investors at over \$1 billion. Startups take advantage of the social media combined with technological innovations such as mobile smartphones and cloud computing.

Unicorn companies are no longer rare. In 2017 there were 223 unicorns, the largest included Uber, Xiaomi and Airbnb. In the same year, 22 companies became unicorns-of which the majority (7) were involved in internet software and services. Most of the world's unicorns are based in North America-US (54%), China (23%), India (4%), UK (4%), Germany (2%) and South Korea (2%). However, the Asian number of unicorns are increasing at incredible speed. About 25% of unicorns are in the E-Commerce/Marketplace industry, 20% in Internet Software and Services and 10% is Financial Technology (FinTech). At present the fastest growing sectors are Cybersecurity at 50%, Real Estate 36% and Big Data 27%.

As a consequence of technological unicorns, such as e-commerce and the online marketplace (e.g. eBay), the physical locations of store brands has caused a decline of shopping malls.



https://commons.wikimedia.org/wiki/File:LakeTerraceCenterSept2008.jpg

Global unicorn club over \$1 billion dominated by tech companies

E-commerce, internet software and services, Big Data, cybersecurity and others.



Table:https://cbi-blog.s3.amazonaws.com/blog/wp-content/uploads/2017/05/Unicorn-Market-Map-Update-25.17.png

Unicorn 2017 top companies and rise of super unicorns



Rise of Asian unicorns, E-commerce, Internet software/services, FinTech and Big Data



Graphs: http://economictimes.indiatimes.com/small-biz/startups/ us-leads-the-chart-for-unicorns-india-behind-china-at-third- position/ articleshow/53936720.cms

Network orchestrators

Successful tech unicorns maintain 'network orchestrators' where peers create value through interaction and sharing. They provide products or services, build relationships, collaborate and share advice. Examples of network orchestrators include:

- sharing economy-economic and social activity involves online transactions (e.g. Uber)
- sharing information-enables the attainment of comparisons (e.g. TripAdvisor)
- transactions-peer-to-peer (e.g. AirBnB) and businessto-person (e.g. Amazon, Alibaba). The network orchestrator business model many advantages such as larger growth rates, and has profits and valuations 2–3 times higher than companies with other business models.

China's tech unicorn boom

The global tech's centre of gravity appears to be shifting from USA to China. Chinese companies, once scoffed as copycats, are now viewed as potential global conquerors. In May 2017 China boasted 10 unicorn companies valued at US\$435 billion-about the size of the gross domestic product (GDP) of Belgium. China's unicorns account for 53% of the global total and 66% in terms of valuation.

China's gigantic decacorns include, Baidu, Alibaba and Tencent, commonly referred to as BAT:

- Baidu-called the Google of China
- Alibaba Ant Financial-worlds' largest E-commerce company
- Tencent-referred to as the Facebook of China

FinTech, mobile Internet, E-commerce and artificial intelligence are giving birth to most unicorns in China.

Tech giants concentrated in Beijing, Shenzhen and Shanghai-Hangzhou



Source: https://www.dealstreetasia.com/wp-content/uploads/2016/12/dbs2.png

Financial technology (FinTech) revolution

Financial technology (FinTech) uses new technology to compete with traditional financial institutions to deliver financial services. Today, the \$US1.7 trillion financial services industry, referred to as a tsunami of technology, disrupts the way we save, invest, spend and borrow. Globally \$18.9 billion poured into FinTech startups during the first 9 months of 2016.

China is leading the world in FinTech with currently 27 FinTech unicorns worth over \$US1 billion

Data

Reliable data is essential if people, industries and governments aspire to progress from exploiting fossil fuels to employing renewable energy, reducing impacts of natural disasters such as the tsunami in Japan, improving poor peoples' access to clean water in West Asia, and eradicating diseases such as Ebola in Africa.

Data is collected by a range of organisations such as businesses (revenue), governments (literacy rates) and non-governmental organisations (number of people living below the poverty line). Data once collected, measured and analysed, can be visualised using graphs, tables and images such as Meteorological satellite images and Census data.

Traditionally data consisted of information, with rows and columns of numbers in spreadsheets, or structured tables. This model is becoming outdated as data is moving towards systems that use artificial intelligence to extract answers. By teaching computers to think, information can be analysed in an abstract way. This task requires vast, limitless collections of data from a variety of sources

More data than grains of sand on Earth

Governments, companies, researchers and community groups are adapting to the new world in which data is bigger, faster and more detailed. This is referred to as the Big Data Revolution that will transform how we live, work and think

Imagine all the grains of sand around the world-include deserts and beaches. According to Google it is seven quintillion, five hundred quadrillion!

By 2020:

- amount of data will be four times larger than grains of sand on Earth
- 15% of data will be stored in the cloud
- 33% of data will contain information that might be valuable if analysed. Referred to as MapReduce technology – extraction of value from large untapped pools of data

Big Data

Big Data involves data sets that contain large or complex data that is inadequate for traditional data processing software. Instead, Big Data can be analysed to reveal patterns, trends and associations relating to human and environmental behaviour and their interactions. It employs predictive analytics to find new correlations that prevent diseases and combat crime. Big data includes the ability to identify the relationship between crime and socio-economic variables such as education, income and unemployment. It identifies concentrations of crime in small geographical areas (crime hotspots) that allows the application of appropriate welfare projects.

Commercial, industrial, governmental and welfare organisations benefit from the use of Big Data.

Big Data Companies and their influences

EXAMPLES	INFLUENCES
SMS Marketing Services	Company works with top brands, brokers, agencies and Fortune 500 firms to provide data
Tableau	Company offers visualisation of data from a variety of sources and works on everything from an iPhone to a PC
Kognitio	Analytical applications of the company on large and complex data for organisations such as Data Science
New Relic	Company monitors mobile and web applications in real-time that run on- premises, in the cloud, or as a mix. Daily, the company makes sense of 250 billion data points from millions of applications.

The Five Vs of Big Data

Velocity, Variety, Veracity, Volume and Value required to understand Big Data





Image: https://cdn.datafloq.com/blog_images/where-does-the-internet-of-things-come-from.jpg

Internet of Things (IoT)

a. Internet

Over the past few decades, the Internet has democratised the creation, access, and analysis of Big Data. The Internet of Things (IoT) and the Big Data Revolution (IoT/Big Data revolution) connects billions of internet-connected 'things' to generate massive amounts of data. The huge growth is due to available and affordable (largely cloud-based) storage and compute power, low-cost internet use, lowpower sensor technology and widespread wireless connectivity. In the future the Internet appears likely to maintain its dominance, when every thermostat, doorknob, and household white good is linked to the Internet.

60 Seconds Online



Diagram: https://media.licdn.com/mpr/mpr/shrinknp_800_800/AAEAA QAAAAAAAAQGAAAAJDNhN2Y4M2RmLTc3ODUtNDlhNC1iN2VhLTdkZ GFhOWEyNjgwYg.jpg

b. Things

'Things,' refers to a wide variety of devices such as cars with built-in sensors, heart monitoring implants, biochips on animals, DNA devices for food monitoring, field devices that assist firefighters and home automation that control of air conditioning, and refrigerators. However, in 2017, more than 99% of 'things' in the physical world are still not connected to the Internet.

The Internet of Things (IoT) refers to the interconnections of computing devices embedded in everyday objects or things (e.g. smart phones) that enables data to be received and transmitted via the internet. It has propagated smart watches (Apple Watch), smart wristbands (Nike), smart TVs (Google), and the development of smart homes, cities and energy systems. By 2020, IoT will consist of about 50 billion devices enabling humans to become increasingly connected, interactive and capable of communicating with each other independently of humans.

IoT is driven by connectivity, Big Data, analytics and the cloud, and is said to be powering the fourth industrial revolution. In the smart connected world, these networked connections aim to create unprecedented economic opportunities for countries, businesses and individuals and 'disconnected' devices are anticipated to no longer exist.



http://arduinoarts. com/wp-content/ uploads/2011/09/ iot2.jpg



http://blog.orbitahealth.com/bebaio/8-iot-cartoons-that-will-add-somehumor-to-your-day

Network Intelligence



Diagram: https://blogs.cisco.com/digital/how-the-internet-of-everything-willchange-the-worldfor-the-better-infographic

Internet of Everything (IoE)

Internet of Everything (IoE) developed by Cisco is the intelligent connection of people, process, data and things. IoE builds onto IoT by adding network intelligence that allows convergence and visibility across systems.

Compare IoT with IoE focussing on the rail system



Image source: https://iot-convention.eu/_library/_files/iot_pub_trans_2015-8-27_version2-2_large.png



Internet of Things and Everything



Image source: http://zdnet2.cbsistatic.com/hub/i/r/2016/07/20/82ce1fd8-6817-4a64-b065-ae245ad00e8e/resize/770xauto/7b385d49ef7c1e11677fa a947a03638a/istock-internet-of-things.jpg



Enablers of IoT and IoE



Image source: http://zdnet2.cbsistatic.com/hub/i/r/2016/07/20/82ce1fd8-6817-4a64-b065-ae245ad00e8e/resize/770xauto/7b385d49ef7c1e11677faa947 a03638a/istock-internet-of-things.jpg

Use of Big Data and the Internet of Things







Diagram: https://datafloq.com/read/internet-of-things-more-than-smart-things/1060

Smartphones and wearable computing

Smartphones can be used to do everything beside phone calls, such as sending text messages, reading emails and visiting websites. They can also be converted into a medical device. For example, the microphone can pick up heartbeats, camera can look at the back of throats and accelerometers are able to track a person's exercises. All of these activities are linked to a cloud of doctors who pass the information onto someone who specialises in your affliction.

By adding extra sensors and smarter use of the microphone, camera and accelerometer, all lives are anticipated to change in the future

Reinventing the interface – power in your hand

Turn your hand and fingers into a touchscreen display, 3D mouse and controller







Source: http://eyehand.com/

From head to toe wearable IoT

By 2017, there is anticipated to be 70 million wearable computing gadgets. For example:

- shirt and trousers: conductive thread takes the energy generated by body movements and uses it to power other gadgets
- wristband: measures steps walked during the day
- shoes: with embedded GPS chips left shoe indicates direction and right shoe shows distance
- hand: with embedded chip contains medical records, passport data and credit records
- wristwatch: vibrates when message arrives
- eyes: glass overlays navigate direction and provide information about points of interest

Augmented reality (AR)

Augmented reality (AR) or wearable technology, is combining with IoT to create a new

reality that will change the way we experience the world. Technology will overlay daily activities to create a personalised, digitally enhanced experience. Visit a shop and have your body scanned, and soon a customised wardrobe will be presented to you.

The integration of virtual and augmented reality will require larger sets of data to be analysed.

Example of Augmented reality



https://boygeniusreport.files.wordpress.com/2017/02/augmented-realityiphone.jpg?quality=98&strip=all&w=782

Augmented Reality in Medical World

Augmented Reality (AR) technology plays an important role in the future of medicine such as

Telemedicine, Real-Time Imagenology, and Telesurgery (robotic surgery and AR from afar). Google Glass has been successfully used for surgical purposes. For example in 2013 shoulder replacement surgery was performed using Google Glass and virtual AR technology VIPAAR. Apps are also used, such as Doctor Mole-Skin Cancer app that enables users to assess moles with real time computer vision technology. It scans a mole and the patient receives real time feedback.

Google Glass in the medical world



Source: http://bloggie-360.blogspot.com.au/2014/11/the-specs-on-specsof-google-glass.html

Apps for Healthcare Professionals



Source: https://www.imedicalapps.com/wp-content/uploads/2013/02/ Screen-Shot-2013-02-14-at-12.46.19.png



Image Source: http://www.agilone.com/wp-content/uploads/2015/06/retailtech.jpg

Big Data a game changer for retail

Eventually, every aspect of our lives will be affected by Big Data. Interestingly, the retail sector is where big data has made a huge impact. Large retails stores understand consumers' behaviour by collecting data from every store and every item.

Responsive retail has peaked, and 'predictive analytics' is used to exploit customer data. Predictive analytics uses past data for predicting future events. Its focus is on the micro rather than the macro, looking at individual interactions with customers, suppliers and employees rather than at average behaviour.

Retailers are gathering demographic data and economic indicators to build a picture of the spending habits across targeted markets. They also follow trend forecasting algorithms, and comb social media sites and peoples' web browsing habits, to determine what is triggering the latest retail buzz, and then analyse data to forecast future retail trends

Changing retail

It can be spooky to contemplate living in a world where Google and Facebook and even Target knows more about you than your parents do! Today, there has been

vast progress since Target's Big Data retail experiment attempted to work out who was pregnant.

Article source: http:// seanlahman.com/blog/wpcontent/uploads/2013/08/ target.jpg; http://www.slate. com/blogs/how_not_to_ be_wrong/2014/06/09/ big_data_what_s_even_ creepier_than_target_ guessing_that_you_re_ pregnant. html



Predictive retail



Cartoon: https://s-media-cache-ak0.pinimg.com/736x/d2/ff/8b/d2ff8bab820 4bcb85d134b94f431ff35.jpg; http://timoelliott.com/blog/wp-



Cartoon: content/uploads/2014/01/predictive-maintenance-health.jpg



Walmart-predictive shopping



Source: https://image.slidesharecdn.com/eventtechfinal-notes-131110220819-phpapp02/95/big-data-and-predictive-analyticsmarketings-holy-grail-9-638.jpg?cb=1384247776

Imagine you're about to leave the house to pick up your kids. As you grab your keys, you hear a voice from the device on your coffee table: "It looks like you'll use the last of your milk tomorrow, and yogurt is on sale for \$1.19. Would you like to pick up an order from Trader Joe's, for a total of \$5.35?" You say yes, and Alexa confirms. The order will be ready for curb side pickup, on the way home from your kids' school, in 15 minutes. This future scenario isn't so far off. Amazon, Facebook, Google, and Apple are accelerating consumer expectations and what's technologically possible, from same-day delivery to machine-powered image recognition. You can call an Uber with Siri and book a flight entirely through a Facebook Messenger bot.

It's time for retailers to help people find products in their precise moment of need – and perhaps before they even perceive that need – whether or not they're logged in or ready to click a "buy" button on a screen. This shift willrequire designing experiences that merge an understanding of human behaviour with large-scale automation and data integration.

> Source: https://hbr.org/2016/11/how-predictive-ai-will-changeshopping

Big Data a winning formula in sports

Big Data spans the entire sports cycle from pre-match analysis, training, player profile, team performance to fan engagement. It triggers broadcast content, advertising, ticket sales, a sports person's performance, and predict the outcome of a game. However, it is easier to analysis real time data for an individual such as a tennis player than a team sports such as football.



'Teams and the analytics providers have sophisticated ways of monitoring and capturing growing volumes of data. Cameras, sensors and wearables record every aspect of player performance. Managers, coaches and athletes use data to dictate calorie intake, training levels and even fan interaction in the chase for better performance on the field.'

'In American football or rugby for example, injury levels have been reduced in the professional game due to wearable sensors that monitor the intensity of activity and impact of collisions, and compare this to historical data to determine when a player might be in danger of overexerting or injuring themselves.

https://www.forbes.com/sites/bernardmarr/2015/03/25/big-data-thewinning-formula-in-sports/#66875ed34dea

Baseball – A snapshot of metadata and graphics illustrating Sportvision's Field f/x

The Field f/x program captures over one million points of data for every baseball game. That is 2.4 billion data points per baseball season. This task is measured by a computer and not constrained by human limits-errors and labour intensive job to view videos make billions of measurements.

Baseball game



Screen grab:http://seanlahman.com/blog/wp-content/uploads/2013/08/ field-fx1.jpg