

- Offshoring and outsourcing make it more **difficult for consumers** to know where and how commodities were made as supply chains are largely **invisible** to consumers. The effort to see through supply chains has led to a rise in **activism** to make consumers more aware, and a rise in **corporate social responsibility** such as supplier codes of conduct, certification programs and social and environmental accounting.

QUESTION BANK 2E

1. Define the term 'transnational corporation'.
2. Using relevant figures, describe the importance of transnational corporations in the world today.
3. On balance, do you think TNCs are a positive or a negative factor for the countries in which they operate? Provide specific examples to support your answer.
4. What is meant by the term 'sourcing efficiencies'?
5. What is the difference between FDI and outsourcing?
6. Describe the concept of supply chains.
7. Explain the difference between the five types of supply chains used by TNCs.
8. What are the implications of the shift by TNCs away from in-house supply chains to marketised supply chains?

CASE STUDY

Apple

In recent years, **mobile phones** have become an integral part of the lives of people in all parts of the world. Mobile phones are not only commonplace in high-income countries where fashion-conscious or tech-savvy consumers upgrade their phones annually or biennially, but in low-income countries where mobile phones offer cheap communications in areas where landlines are scarce and expensive. However, in the words of phonestory.org, "*When you buy a gadget, you aren't only buying the sleek image the company's advertising team worked so hard to create, you are also buying the whole line of production used to create it*".

Apple Inc, a US-based transnational technology corporation, is one of the world's largest manufacturers of mobile phones. Apple was founded by two young computer enthusiasts, Steve Jobs and Steve Wozniak, in 1976 to develop and sell personal computers that they had developed

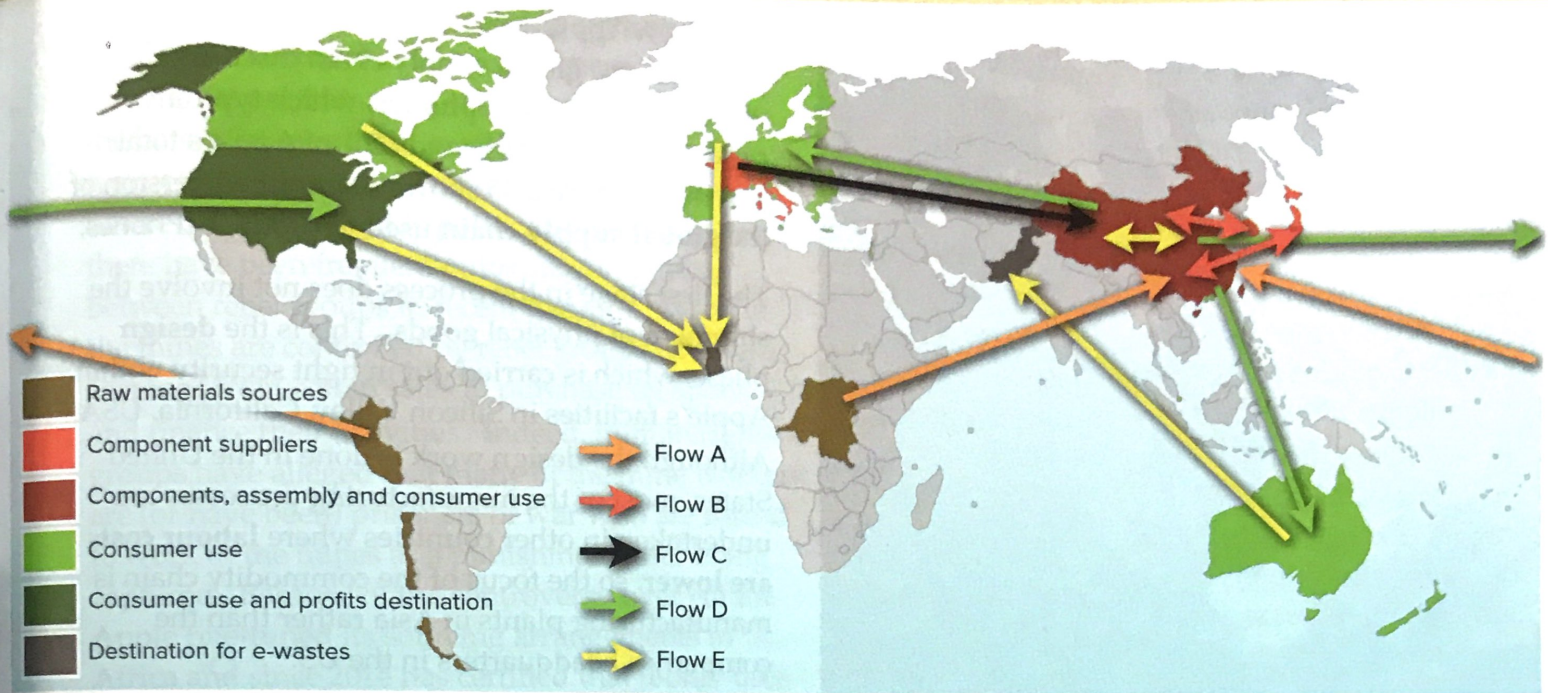
together, initially working in the spare bedroom and garage of Steve Jobs' parents' home in Los Altos, California, USA. The company is now one of the world's largest technology companies.

In the 1970s and 1980s, Apple manufactured its computers within the United States in **its own factories** in Silicon Valley, California, and in Carrollton, near Dallas, Texas. It used circuit boards that were manufactured in its own factories in Ireland and Singapore, following a tightly controlled **in-house model** of supply chain management that ensured **vertical integration** of the production process.



2.34 Apple's early computers, such as the Apple IIe shown here, were manufactured in Apple's own factories in the United States using components imported from their own factories in Ireland and Singapore. In the mid-1980s, assembly of Apple IIe computers was expanded to include the factories in Ireland and Singapore. Apple's global supply chain at that time followed the in-house model of vertically integrated production.

A major boost to Apple's growth was the release in 2007 of **the first iPhone** by Apple's co-founder and CEO, Steve Jobs. The iPhone was not the first mobile phone to become available to consumers. The first commercially available mobile phone was the Motorola DynaTAC 8000X, commonly known as 'The Brick', that was released in 1984 at a cost of US\$3,995. The iPhone differed from earlier mobile phones in being a **smartphone** with a touchscreen that included a virtual keyboard, which meant it could perform **additional functions** such as web browsing by connecting to the internet, texting, taking photos, shooting and viewing video, playing music, sending and receiving e-mail, implementing GPS navigation, performing mathematical calculations, playing video games, and so on. By early 2017, there were more than two million



2.35 Apple's supply chain for mobile phones. Note that only major indicative international flows are shown for the sake of simplicity. **Flow A** is the export of coltan, cobalt and other precious ores from small mines in Rwanda and the Democratic Republic of Congo to China for processing. Other significant raw materials flows are from Peru and Chile to China. **Flow B** is the two-way flow of processed materials such as coltan and cobalt, first from China to South Korea and Japan for use in making rechargeable batteries and other components, and then for re-export back to China (including Taiwan) for the assembly of the phones. There is also a flow of key components such as silicon chips and touch-sensitive glass panels from South Korea into China (including Taiwan). **Flow C** is the shipping of components from Europe to China (including Taiwan), such as microelectronics and gyroscopes from France, Switzerland and Italy. **Flow D** is the shipment, usually by air, of finished mobile phones to consumer markets around the world (only some of the largest markets are shown on the map for simplicity). As well as being an assembler nation, China (including Taiwan) is also a consumer user nation of mobile phones. **Flow E** is the flow of e-waste to dumping and recycling sites, the largest of which are in Ghana, Pakistan and within China.



2.36 Steve Jobs introduces the iPhone 4 at the Worldwide Developers Conference, 2010.

applications available for downloading and use on iPhones, and more than one billion iPhones had been sold.

Apple pursues a **global strategy** for every aspect of its supply chain except for the process of **design**, which is highly concentrated in its highly secretive headquarters in Cupertino, California, USA.

Apple's global strategy is:

- to offer a mix of consumer products that appeal to a **global mass market**;
- to **standardise** its products in different international markets as much as possible;
- to target the **upper end** of the market that has low price sensitivity;
- to maintain **product differentiation** such as unique operating systems and distinctive design that enable higher margins to be included in the selling price of its products;
- to maintain a **high profit margin** on sales, and thus produce high earnings for **shareholders**;
- to reduce the costs of production where possible by **outsourcing** production to companies in low-cost locations, and then transporting finished products to their world-wide markets;
- to devote high expenditures to **research and development** in an effort to produce high quality products.



2.37 A labour-intensive mine in Kailo, DR Congo, where wolframite (a tungsten ore) and cassiterite (tin oxide) are mined for use in electronics. Although most pits are 4 to 10 metres deep, this one is larger at 25 metres.



2.38 Miners digging for wolframite in Kailo, DR Congo. Working conditions are hard as equipment is limited to shovels, and the tropical heat can be intense. The miners sell the minerals they obtain through a government office in the nearby town, and the government takes a share of the proceeds.

Although Apple produces a range of electronics products, the global supply chain discussed here will focus on **mobile phones**, which typically produce between 60% and 65% of Apple's total revenue. Figure 2.35 shows a simplified version of the **global supply chain** used to produce iPhones.

The first stage in the process does not involve the shipment of physical goods. This is the **design** phase, which is carried out in tight security within Apple's facilities in Silicon Valley, California, USA. Although the design work is done in the United States, most of the manufacturing processes are undertaken in other countries where **labour costs are lower**, so the focus of the commodity chain is manufacturing plants in Asia rather than the company's headquarters in the US.

Several of the **raw materials** needed to make mobile phone components are obtained from small-scale, labour intensive mines in Rwanda and the Democratic Republic of the Congo. One of the materials mined in Rwanda and the DR Congo for mobile phones is **coltan**, a highly conductive metallic ore whose full name is columbite-tantalite, which is required for making capacitors that are used in electronic devices such as mobile phones (and in missiles).

The border region between the DR Congo and Rwanda is one of the **main sources** for coltan, together with Brazil. Because the mining is largely **unregulated**, environmentalists are critical of the impacts of coltan mining on local ecological



2.39 Child labour is used in the DR Congo mines. This boy attends school in the morning, and then works in the mine each afternoon to help pay for his schooling. The children at this mine in Kailo help to pan for the ore, as well as carrying goods to the workers.

systems, as land eroded by mining **pollutes** the lakes and rivers of the region and surrounding forest areas are damaged. The mines are close to the habitat of **mountain gorillas**, which also worries environmentalists. Furthermore, the area where coltan is mined is **politically unstable**, and there have been frequent outbreaks of fighting between rebel groups in recent decades. Many of the mines are controlled by rebel groups, who use earnings from coltan sales to purchase weapons and finance their activities. Indeed, human rights groups have alleged that many of the mine workers are (or have been) prisoners of war who are forced to work in the mines as a punishment after being captured. Because of the controversy over coltan, Apple fine-tuned its sourcing arrangements in Africa and since 2014 has certified that it only uses 'conflict-free tantalum'.

Raw materials for iPhones are also obtained from many other parts of the world, including gold from Peru, copper from Chile, and rare earth minerals from Mongolia, China and the United States. Raw materials from many parts of the world are shipped to China (including Taiwan), which is where iPhones are **manufactured** and **assembled**. The materials are often shipped through **intermediary countries** such as Japan, Singapore, Malaysia, Mexico, the Philippines, Germany, Thailand, Switzerland, the United States and South Korea where components such as silicon chips, touch-sensitive glass panels and rechargeable batteries are manufactured.

This part of Apple's supply chain follows the **marketised model**, in which work is **outsourced** to whichever supplier can deliver the highest quality goods at the lowest price within the timeframe demanded. Interestingly, one of Apple's largest **component suppliers** is Samsung, the South Korean TNC that is also one of Apple's largest competitors in the mobile phone industry. Among other inputs, Samsung supplies Apple with such key components as silicon chips. Other **major suppliers** to Apple include Sony (cameras), Sharp (touchscreen displays), LG (another firm making touchscreen displays), TDK (inductor coils), Toshiba (flash memory), Greenpoint Singapore (iPhone cases), STMicroelectronics Switzerland (gyroscopes), Bosch Germany (accelerometers), Asahi Kasei Microdevices Japan (electromagnetic

compasses), Taiwan Semiconductor Manufacturing Company (fingerprint sensors), and Xintec Taiwan (also making fingerprint sensors). Industry analysts believe that Apple has about 200 vendor suppliers around the world.

Although Apple selects its suppliers using a marketised model of outsourcing, it also applies a version of the **captive-supplier** supply chain model. As a condition of signing a contract with a supplier, Apple usually insists that the supplier signs an **exclusivity agreement** with Apple, meaning that the firm cannot supply the same components to other phone manufacturers. In this way, Apple retains a **closed supply chain** that prevents competitors gaining access to components it has specified. Suppliers are usually happy to sign



2.40 The production line in one of Foxconn's factories in Shenzhen, China.



2.41 The CEO of Apple Inc., Tim Cook, visits a Foxconn factory that assembles iPhones in Zhengzhou, China. Shortly before his death in 2011, Apple's CEO, Steve Jobs, nominated Tim Cook as his successor because of his brilliant management of the company's global supply chain.

such agreements because of the huge scale of business that Apple offers them, and this huge scale also enables Apple to negotiate **large discounts** on parts, manufacturing capacity and air freight. From Apple's perspective, the exclusivity discounts enable the company to sell its products at **competitive prices** to consumers while also giving a **higher level of profits** to Apple.

The manufactured components from around the world are sent to China (including Taiwan) for their **final assembly**. Apple **does not manufacture** its own mobile phones, but **outsources** the assembly of the parts to other companies in various parts of China where skilled workers can be employed for wages that are relatively cheap by world standards.

All early models of the iPhone were assembled by **Foxconn**, a Taiwanese TNC electronics company. In addition to its Taiwanese operations, Foxconn has 12 factories in mainland China as well as factories in Brazil, Hungary, India, Japan, Malaysia, Mexico, Slovakia, South Korea, Turkey and the United States. It is estimated that about 40% of all the world's electronics products are assembled in Foxconn factories. Foxconn assembles electrical products for firms such as Acer, Amazon, BlackBerry, Cisco, Dell, Google, Hewlett-Packard,

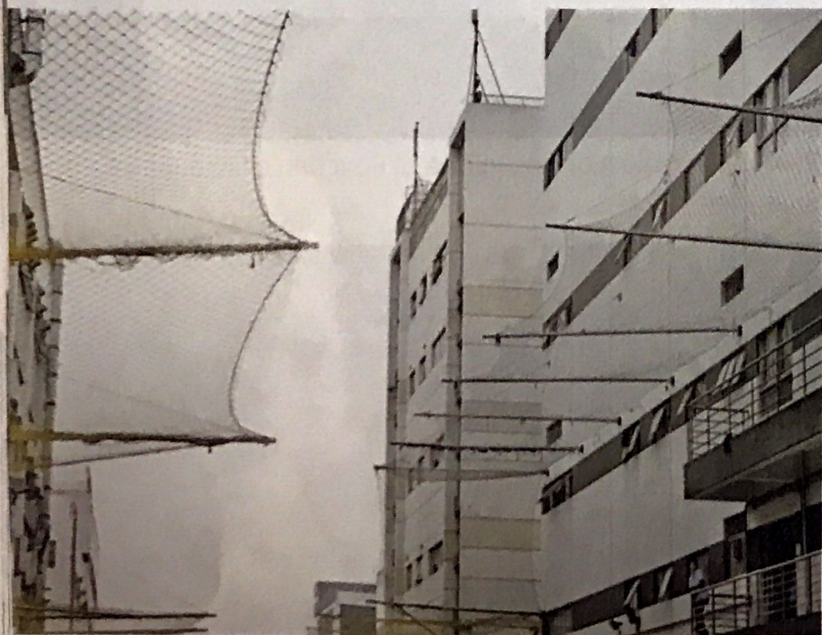
Huawei, Intel, Microsoft, Motorola, Nintendo, Sony, Toshiba and Xiaomi as well as Apple's products.

In recent years, Apple has expanded its iPhone assembly to a second company, **Pegatron**, which is another Taiwanese electronics company. Although not as large as Foxconn, Pegatron has factories in Taiwan, mainland China, Czechia, and Mexico.

As high-profile companies, both Pegatron and Foxconn have been accused of exposing their employees to **harsh working conditions** and **mistreatment**. These criticisms have included long working hours with no time off, forced overtime, discrimination against mainland Chinese workers by Taiwanese supervisors, employment of young teenage workers, and cramped dormitory accommodation for workers. The criticisms came to a head between 2010 and 2012 when it was alleged that several workers in Foxconn factories had committed **suicide** because of their harsh treatment, and western media observed what appeared to be **nets** around the factories to catch workers who were trying to jump to their deaths. To balance these accusations, Foxconn and Pegatron have **no shortage of applicants** for jobs in their factories, which are highly sought after by local Chinese workers who see the **salaries** paid as being higher than for most other Chinese factory jobs.

When the phones have been assembled and packaged, they are **air freighted** to **distribution centres** in several parts of the world, including Australia, China, Czechia, Japan, Singapore, the United Kingdom and the United States. Apple operates on a '**just-in-time**' system for distributing phones, using constantly updated information on purchases to adjust the production of different models of phones in its subcontractors' factories, and keeping as little stock as possible in its warehouses.

The small size and light weight of iPhones makes transport by air feasible, and it gives Apple an advantage over competitors, many of which transport their output by ship because it is cheaper. For Apple, air freight means **faster deliveries** and lower quantities of **stock** in warehouses. The cost of transporting a mobile phone from China to the United States by ship, assuming a full container of phones, is about US\$0.07 per phone. The cost for the same transport by air is US\$0.30 to US\$0.65 per



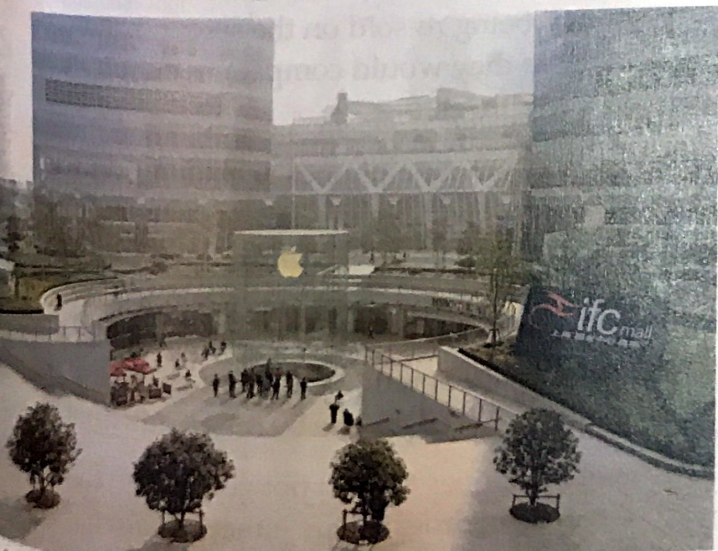
2.42 Nets were erected at one of Foxconn's factories in Shenzhen, China to prevent deaths by suicide after several employees had jumped to their deaths at the factory. Workers rights activists claimed that the suicides were a response to harsh working conditions in the factory and the repetitive, mundane work done by the employees. However, Foxconn's wages and working conditions are better than most factories in China, and are subject to more external scrutiny and foreign publicity than typical Chinese factories. Foxconn argues that erection of the nets was for the employees' welfare as an expression of the company's corporate social responsibility.

phone, depending on the freight rates at different times of the year. This amounts to about 0.008% of the purchase price of a new iPhone. In September each year, there is an increase in the cost of air freight world-wide because this is when new models are released on Apple's annual cycle, and a significant portion of the global air freight industry focusses on transporting new iPhones.

Apple allocates the **distribution** to a number of air freight companies such as Cargolux, Cathay Pacific, AirBridgeCargo, China Airlines Cargo, Air China Cargo, China Southern Cargo and UPS on the basis of competitive quotes. This fits in with Apple's **marketised approach** to most aspects of its global supply chain. The vast majority of Apple's air freight flights begin from **Shenzhen** and **Zhengzhou**, which are the locations of Foxconn's largest Chinese factories. From these airports,



2.43 Apple's retail stores typically have understated, discreet branding. This view shows Apple's flagship store in Regent Street, London, United Kingdom.



2.44 Many of Apple's newer retail stores feature glass facades, such as this example in the Pudong district of Shanghai, China.



2.45 An unauthorised Apple retail outlet in Shenzhen, China, selling iPhones together with other mobile phones assembled in nearby factories.

flights connect through a series of hub airports to Apple's **distribution centres** around the world. When Apple ships its finished phones, it includes tracking chips in the cargo that enable constant monitoring of the stock. This also acts as a safeguard against theft.

Although Apple does not manufacture its iPhones, it does retain control of their **sales and marketing**. Apple's phones are typically sold through **four main channels**:

- **Online orders** through its own website. By early 2017, Apple enabled online orders through its own online stores in 38 countries, an example of the **in-house model** of supply chain organisation.
- **Retail sales** through its own stores. By early 2017, Apple had 500 fully owned and operated retail stores in 20 countries around the world, following the **in-house model** of supply chain organisation.
- **Contracts** with mobile phone network providers (telcos) such as AT&T, Sprint, T-Mobile and Verizon in the United States; China Mobile, China Telecom and China Unicom in China; Optus, Telstra, Virgin Mobile and Vodafone in Australia; and BT, O2 and Orange in the United Kingdom. Apple's arrangements with telcos are negotiated using the **marketised model** of supply chain organisation.
- **Unauthorised sales** through retail outlets, usually in China and some developing countries, selling phones that have been smuggled out of assembly plants by employees or obtained



2.46 An iPhone 5S. The disposal of mobile phones when they reach the end of their useful life is the final stage in the global supply chain.



2.47 A worker in the Sims Recycling Solutions facility near Sacramento, California, USA, uses a forklift to move a large cardboard box filled with iPhone parts for recycling by shredding.



2.48 A group of men sort and break apart e-waste from disused mobile phones in the Agbogbloshie district of Accra, Ghana.

through unofficial channels. Understandably, Apple does not endorse this retail channel and does all it can to eliminate it.

The last stage of the supply chain, as shown in figure 2.32, is production of the **outputs** from the system. In the case of Apple's supply chain, the **profits** of the supply chain flow to Apple's **shareholders**. All of Apple's large shareholders are based in the **United States**.

Insiders hold a significant component of Apple's shares, including Tim Cook (the CEO) who owned about 1.04 million shares in early 2017, Arthur Levinson (an Apple board member) with 1.13 million shares, Craig Federighi (Senior Vice President of Software Engineering) with 466,000 shares, and Al Gore (former US Vice-President and Apple board member) with 443,000 shares. The largest **institutional shareholders** are the Vanguard Group with 338 million shares, which is 6.5% of Apple's shareholdings (worth about US\$32 billion in early 2017) and Berkshire Hathaway Inc., one of Warren Buffet's companies, with 133 million shares.

The **disposal** of used iPhones is the final stage of the supply chain. Mobile phones are designed to have a life of just a few years. They contain a number of **hazardous materials** such as lead, nickel, mercury and cadmium, which makes environmentally responsible disposal of phones difficult. Therefore, Apple encourages consumers who have finished with their iPhones to return them to Apple for **recycling**. As well as enabling the **re-use** of valuable materials, this program also raises Apple's **sales and profits** because it prevents used phones being re-sold on the **second-hand** market where they would compete with Apple's sales of new phones.

Although early mobile phones were designed to be disassembled, newer phones are made by gluing components together, which means they must be **shredded** if they are to be recycled, and this is an energy-consuming process. It is estimated that 85% of the materials in shredded iPhones can be retrieved and re-sold for use by other industries.

Most mobile phones that do not go through the official recycling program are either **re-sold** for second-hand use, or they are sent to **e-waste sites** in China, Pakistan or Ghana where recycling is done by hand in a highly labour-intensive manner.

Between 50% and 80% of electronic waste is exported to developing countries where the recycling is done in dangerous ways that emit pollutants that are dangerous to both human health and the environment.