



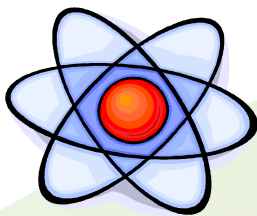
Technology Education Key Learning Area

Case Study: Students should be made aware of the relevance of the technology they are studying to the real world. Case studies on technology and design enable students to put their learning into an authentic context.

Authentic Context: Students could understand the success of an innovative product design through an example, namely Smartphone.

Level: S3

Knowledge Context Covered: Common topics – Design & Application (Product design)



The Success of an Innovation - Smartphones



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Background

Smartphone is the most popular modern communication device and considered highly successful product in the world; the features and functions provided by the phone are particularly attractive to the young generation and businessmen.

Smartphone is a product which embraces all the latest technologies such as multimedia, and internet-enabled mobile phone. Smartphones usually come with multi-touch screen including virtual keyboard and buttons. The functions provided by smartphones normally include camera phone, portable media player, text messaging and visual voicemail. It also offers Internet services including e-mail, web browsing, and local Wi-Fi connectivity, and is able to work faster than 3G cellular networks. Smartphone was named Time magazine's Invention of the Year in 2007

In a foreseeable future, smartphone will become peoples' essential tool just like clothes and shoes that we are using each day.

The Features of smartphones

Function	Special Features
Soft Keyboard	<ul style="list-style-type: none">• Makes call by a name or number in the address book, a list of favourites, or a call log.• Automatically syncs all contents from a PC, Mac, or Internet service• With SMS application, prevents and corrects incorrect entries making it easy and efficient to use
Visual Voicemail	<ul style="list-style-type: none">• Random and direct access to any messages, hence, enabling quick selection of the messages
Camera	<ul style="list-style-type: none">• Takes high resolution photos• Enables photo management• Display albums with a flick of a finger• Posts pictures directly to a Web Gallery
Music	<ul style="list-style-type: none">• Provides iTunes Wi-Fi Music Store• Enables to browse, review, buy, download and store music
Multi-touch display	<ul style="list-style-type: none">• Enables to browse web pages• Easy zoom in and out
HTML email client	<ul style="list-style-type: none">• Gets email from POP3 or IMAP mail services• Displays photos and graphics along side text
Maps application	<ul style="list-style-type: none">• Easy-to-use touch interface to view maps and satellite images, or get directions and traffic information
Wireless communications	<ul style="list-style-type: none">• GSM, Wi-Fi and Bluetooth for data connection



The Story (1) - How smartphones were born



Visionary and Seizing the Opportunities

In 2002, Steve Jobs, the founder of Apple Inc., started thinking about developing a phone which can provide all-in-one services to consumers embracing multiple features provided by separate phones, iPods, BlackBerrys, and MP3 players. In order to make the new product more successful, Jobs knew he would eventually need to venture into the wireless world, hence, he started to think about smartphone.

The First Hurdle – Identifying the Problems

In the fall of 2006, Steve Jobs had tasked to a group of engineers with the idea of creating a smartphone. At that time, the whole design was not ready and yet to prove the idea worked. The problems seemed endless such as the phone dropped calls constantly, the battery stopped charging before it was full, data and applications routinely became corrupted and unusable.

Marketing Strategy and Corporate Image

To fix all the problems seemed unlikely because the time leading to the launch of the product was imminent and short and the smartphone was supposed to be the centerpiece. Jobs had used the event as a showcase to launch his biggest products, and Apple-watchers were expecting another dramatic announcement. If the smartphone wasn't ready in time, the corporate image would be damaged.

Jobs changed his marketing strategy and had finally negotiated terms with the wireless division of Cingular, the telecom giant, to be the smartphone's carrier. In return for five years of exclusivity, Apple allowed roughly 10 percent of smartphone sales in AT&T stores, and a thin slice of Apple's iTunes revenue, AT&T had granted Jobs unprecedented power. He had also convinced AT&T into spending millions of dollars and thousands of man-hours to create a new feature, so-called visual voicemail, and to reinvent the time-consuming in-store sign-up process. He had also wrangled a unique revenue-sharing arrangement, garnering roughly HK\$80 a month from every smartphone customer's AT&T bill. On top of all that, Apple retained complete control over the design, manufacturing, and marketing of the smartphone. Jobs had done the unthinkable: squeezed a good deal out of one of the largest players in the entrenched wireless industry. Now, the least he could do was meet his deadlines.



Team Work and Meeting Deadlines

After getting all the needed deals, the engineers and designers were working tirelessly and frenetically in the next three months. The team work and need to meet deadlines were fully evidenced by seeing people screaming in the office and engineers frazzled from all-night coding sessions, quit, only to rejoin days later after catching up on their sleep.

Product Evaluation and the Values of Design

But by the end of the push, just weeks before the launch, Jobs had a prototype to show to the suits at AT&T. In mid-December 2006, he met wireless boss Stan Sigman and showed off the smartphone's brilliant screen, its powerful Web browser, and its engaging user interface. Sigman was uncharacteristically effusive, calling the smartphone "the best device I have ever seen."

Six months later, on June 29, 2007, the smartphone went on sale. At press time, analysts were speculating that customers would snap up about 3 million units by the end of 2007, making it the fastest-selling smartphone of all time. It is also arguably Apple's most profitable device. The company nets an estimated HK\$600 for every HK\$3,000 smartphone it sells, and that's not counting the HK\$1,870 it makes from every two-year AT&T contract an smartphone customer signs. Meanwhile, about 40 percent of smartphone buyers are new to AT&T's rolls, and the smartphone has tripled the carrier's volume of data traffic in cities like New York and San Francisco.

Smartphone is considered a successful product by the virtue of the leader's foresight of future market, integration of technologies, customers' satisfaction and innovative outlook design. The down side of smartphone is the relative higher cost as compared to the competitors' products, lack of video recording function, frequent charging of the battery, replacement of battery by Apple dealers, and proprietary Bluetooth device such as the ear voice reception device.

The Role of a Leader

But as important as the smartphone has been to the fortunes of Apple and AT&T, its real impact is on the structure of the HK\$88 billion-a-year US mobile phone industry. Now, in the pursuit of the contract, every manufacturer is racing to create a phone that consumers will love (user-centred), instead of one that the carriers approve of (monopolized market). "The smartphone is already changing the way carriers and manufacturers behave," says Michael Olson, a securities analyst at Piper Jaffray.



The Story (2) - The technologies incorporated in smartphones



Smartphone is really a piece of creative product of today; it embraces many innovations and applications of new technologies. The design has made due considerations on various aspects such as customer, energy and materials. It will change the way you think about a mobile device.

Smartphone is not just a piece of ordinary mobile phone because it provides the advanced features which are much more than a mobile phone can perform. The advanced features are enabled by the integration of multiple technologies which include wireless, embedded systems, software, computer network, touch screen, and materials.

Smartphone can be seen as a widescreen iPod with touch controls on just everything including music, audiobooks, videos, TV shows, and movies and you can enjoy them on a beautiful display. It also allows you to sync the content from the iTunes library on your PC or Mac and access it all with the touch of a finger.





With its large multi-touch display and innovative new software, smartphone lets you control everything using only your fingers. You can type using the predictive keyboard, glide through albums with Cover Flow, scroll through photos with a flick, or zoom in and out on a section of a web page — all with the smartphone multi-touch display. The ease of control has given smartphone a leading edge in phone service.



Smartphone uses OS X, as the operating system which allows you to access the software on a handheld device, including rich HTML email, full-featured web browsing, and favourite applications including Address Book and Calendar. Smartphone is also fully multi-tasking allowing you to read a web page while downloading your email in the background. This feature satisfies the customers' need and save their time in performing multiple tasks at the same time.

Smartphone uses quad-band GSM, the global standard for wireless communications. It also supports AT&T's EDGE network, 802.11b/g Wi-Fi, and Bluetooth 2.0 with EDR, which links to Apple's compact Bluetooth headset. When you move around, smartphone automatically switches between EDGE and Wi-Fi to provide the fastest data connection possible. This feature satisfies the customers' need to access data while they are moving around.

The accelerometer detects when you rotate smartphone from portrait to landscape, then automatically changes the contents of the display, so you immediately see the entire width of a web page or a photo in its proper landscape aspect ratio. This feature is designed for user friendliness.

The proximity sensor immediately turns off the display to save power when the display is not required and prevent inadvertent touches. Another power-saving feature is the ambient light sensor. This intelligent sensor automatically adjusts the display's brightness to the appropriate level for the current ambient light. This design is meant for environmental



protection and energy saving.

With a 2-megapixel camera and an advanced photo management application, smartphone goes beyond anything on a phone today. It automatically syncs photos with your PC or Mac when you dock.

With smartphone's Maps application and easy-to-use touch interface, you can view maps and satellite images, or get directions and traffic information.



The Story (3) - Smartphone technical specifications

Size and weight

- Height: 4.5 inches (115 mm)
- Width: 2.4 inches (61 mm)
- Depth: 0.46 inch (11.6 mm)
- Weight: 4.8 ounces (135 grams)



In the box

- smartphone
- Stereo Headset
- Dock
- Dock Connector to USB Cable
- USB Power Adapter
- Documentation
- Cleaning/polishing cloth



Capacity

- 8GB flash drive

Display

- 3.5-inch (diagonal) widescreen multi-touch display
- 480-by-320-pixel resolution at 163 ppi
- Support for display of multiple languages and characters simultaneously

Operating system

- OS X



GSM

- Quad-band (850, 900, 1800, 1900 MHz)

Wireless data

- Wi-Fi (802.11b/g)
- EDGE
- Bluetooth 2.0+EDR

Camera

- 2.0 megapixels

Audio

- Frequency response: 20Hz to 20,000Hz
- Audio formats supported: AAC, Protected AAC, MP3, MP3 VBR, Audible (formats 1, 2, and 3), Apple Lossless, AIFF, and WAV

Video

- Video formats supported: H.264 video, up to 1.5 Mbps, 640 by 480 pixels, 30 frames per second, Low-Complexity version of the H.264 Baseline Profile with AAC-LC audio up to 160 Kbps, 48kHz, stereo audio in .m4v, .mp4, and .mov file formats; H.264 video, up to 768 Kbps, 320 by 240 pixels, 30 frames per second, Baseline Profile up to Level 1.3 with AAC-LC audio up to 160 Kbps, 48kHz, stereo audio in .m4v, .mp4, and .mov file formats; MPEG-4 video, up to 2.5 Mbps, 640 by 480 pixels, 30 frames per second, Simple Profile with AAC-LC audio up to 160 Kbps, 48kHz, stereo audio in .m4v, .mp4, and .mov file formats
- TV out: Component and composite video out through dock connector (with AV cables sold separately). Supports NTSC (up to 480i) and PAL (up to 576i).

Headphones

- Stereo earphones with built-in microphone
- Frequency response: 20Hz to 20,000Hz
- Impedance: 32 ohms





Mac system requirements

- Mac computer with USB 2.0 port
- Mac OS X v10.4.10 or later
- iTunes 7.5 or later

Windows system requirements

- PC with USB 2.0 port
- Windows Vista Home Premium, Business, Enterprise, or Ultimate Edition; or Windows XP Home or Professional with Service Pack 2 or later
- iTunes 7.5 or later

Environmental requirements

- Operating temperature: 32° to 95° F (0° to 35° C)
- Nonoperating temperature: -4° to 113° F (-20° to 45° C)
- Relative humidity: 5% to 95% noncondensing
- Maximum operating altitude: 10,000 feet (3000 m)

Input and output

- Smartphone
 - 30-pin dock connector
 - 3.5-mm stereo headphone minijack
- Smartphone Dock
 - Dock connector

Power and battery

- Built-in rechargeable lithium ion battery
- Talk time: Up to 8 hours
- Standby time: Up to 250 hours
- Internet use: Up to 6 hours
- Video playback: Up to 7 hours
- Audio playback: Up to 24 hours



[<http://www.apple.com/iphone/specs.html>]



The Story (4) - Attributes leading to smartphones being successful

- User Centred Design – friendly interface such as touch screen and scrolling feature and multi-tasking
- Customers' wants – smartphone include all the functions from mobile phone to all different kinds of communications
- Entrepreneurship and enterprise – leadership, vision, collaborations with worthy partners and teamwork
- Green design – sensors incorporated for energy saving
- Data retrieval – at finger tip and downloading is possible under moving situation
- Applications of modern technologies – web browser, 3G, WiFi, GPS, Camera/Photo, multi-touch screen, Accelerometer, sensors, Internet search engine, wireless network, LCD display and adaptable keyboard
- Marketing strategy – first launch world wide attracting 270,000 buyers within the first 30 hours, and all-in-one design strategy
- Product evaluation – well acceptance by customers reflected the sale volume of 1.39 million in 2007
- Aesthetic Design
- IP – with over 300 patents
- Good use of resources – partnering with different worthy partners such as AT&T, YouTube and Google etc to provide a wide range of services

Room for improvement

Undisputedly, smartphone is a piece of state-of-the-art product, however, there are still rooms for improving the shortcomings, such as the batteries can be replaceable, and the accessories of the smartphone be more compatible with non-proprietary products. With the advent of new technology, smartphone should become more client-oriented and friendly to use.



Activities



Group Discussion and Brainstorming

- You should read the materials contained in the story and search from relevant websites to compile a table showing the features, functions and attributes of a smartphone.
- You should then use the table to discuss on what makes the product so successful.

Questions:

1. What are the attributes leading to smartphone being so successful?
2. Discuss and understand each of the attributes.
3. Compare the functions and prices between an smartphone and a Personal Data Assistant (PDA) device
4. Think of an innovative product designed with the use of appropriate technology and considerations of the product attributes.
5. What should designers and engineers be considering during the design and manufacturing stage of a new product?

Assignments

- *Group Presentation: PowerPoint*
- *Individual Report: 300 words of your own writing plus references from other sources*





Assessment

Assessment Rubrics

Group Presentation

Assessing Target	Component	% (out of 100)
Group Assessment	(1) Effort by the group	15
	(2) Organization of the presentation	15
	(3) Contents	20
	(4) Flow of the presentation	15
	(5) Time keeping	5
	(6) Peer's score	5
Individual Assessment	(7) Command of language	10
	(8) Confidence and attractiveness	10
	(9) Peer's score	5

Report Assessment

Assessing Target	Component	% (out of 100)
Individual Assessment	(1) Effort	25
	(2) Organization of the report	20
	(3) Contents	25
	(4) Presentation skills	20
	(5) Time keeping	5
	(6) Peer's score	5



References

1. http://en.wikipedia.org/wiki/Personal_data_assistant
2. <http://en.wikipedia.org/wiki/Smartphone>

