

Relevant Knowledge

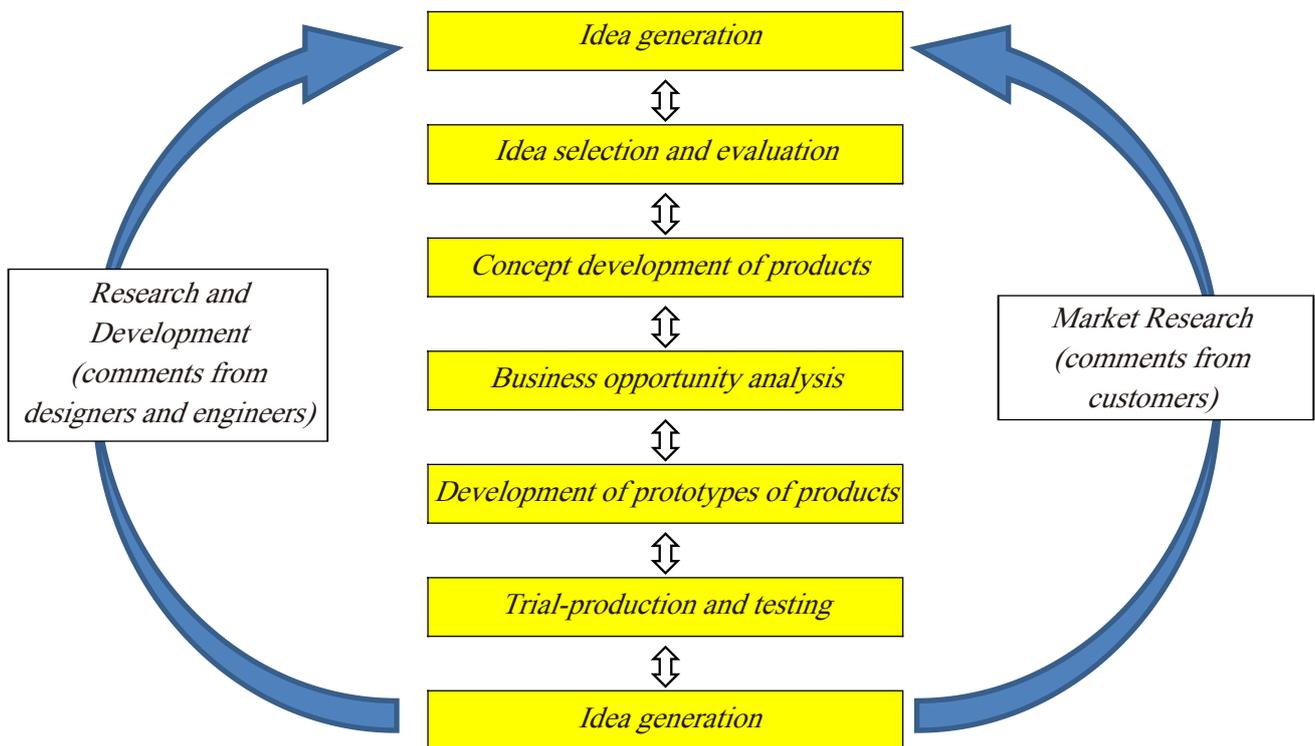
Relevant Knowledge

Project Management

1. Procedures for Developing New Projects

Every enterprise wants to develop an innovative product that can overwhelm all competitors. Facing the uncertainty of the market and technology, what procedures for new product development should the enterprises undertake and how should they manage the processes, so as to effectively reduce the risk of new product development while establishing superiority among competitors?

Concepts of a product usually originate from the creativity of the staff of an enterprise and demands of customers. They then take shape after integrating the benefits and demands of people related to the enterprise. The general procedures for new product development starting from idea generation and concept development to sale of the product are shown below:



Due to the differences in the business nature of enterprises, organisation culture, shapes of products, operational strategies and management styles, enterprises usually adopt appropriately amended procedures for new product development that suit their needs.

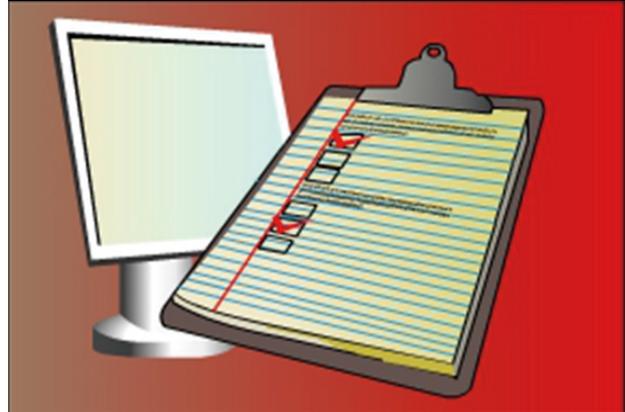
2. Setting Overall Objectives of the Project

Whatever procedures for new product development are adopted, the first step is always to set the target status of the product when the project reaches its

end. To facilitate the implementation of the project, the targets of ‘S.M.A.R.T’ can be formulated.

- a. Specific
- b. Measurable (or at least assessable) achievement
- c. Achievable (or ‘Acceptable’)
- d. Realistic
- e. Time bounded (with limit)

These five elements all include cost planning, time management and task analysis respectively.



Relevant Knowledge

i. Planning Execution

In the introduction of the design processes, we have already discussed the tasks to be executed. Since the design work and processes are very complicated, they have to be completed in sequence. The design team should have a clear picture on when, where and what to do. In planning a design project, the following must be considered and listed.

- (1) Steps and stages of the project
- (2) Outcome in each stage of the project
- (3) Time available for each stage



For any given tasks, it is impossible to have unlimited time for completion. Schedules of projects should be planned before development. Let's take a look

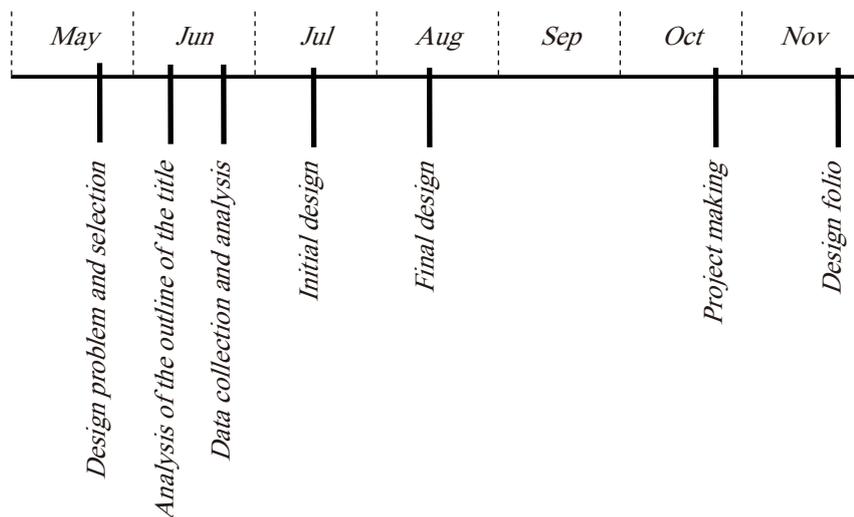
at an example of a design project activity that a student will complete in S6. Here are his expected completion dates of some of the key items:



Item	Content	Completion Date	Remark
Design problem and selection	Determine the title of the design	Late May	
Analysis of the outlines of the topic	List the design requirements of the selected title and analyse each item in detail	Mid-June	The more the items to be analysed, the more reliable are the answers.
Data collection and analysis	According to each item above, collect relevant information through the Internet, magazines, advertisements, textbooks, etc. and then carry out rational analysis.	Late June	The information can be obtained from the same source, but personal analysis must be conducted.
Initial design	Propose at least three feasible designs for each part and carry out a rough and initial evaluation for each design.	Early July	It is advised to sketch the feasible designs freehand. Drawings can be drawn by coloured pens in 3D shapes, with introduction in a few words.
Final design	Select a final blueprint from one of the initial designs and make appropriate amendments.	Mid-August	A model can be produced for testing. For each part, determine the outline, materials for production, assembly methods and sizes. (It would be better to use a computer to draw the parts.)
Project making	Make the relevant design project using various facilities at schools.	Late October	Try to stick to the final design closely during production and make amendments when necessary.
Design folio	1. Part drawings and assembly drawing of each part 2. Implementation records 3. Testing records and design evaluations	Late November	It would be better to use computer drawings so that the information can be handled easily.

TimeLine

The schedule above can be transformed into a timeline showing the distribution of time allocated for each item.



Gantt Chart

A Gantt chart shows the start and finish dates of each task so that the schedule can be monitored effectively. The Gantt chart of the tasks of the above-mentioned design project activity is shown below.

Stage	Task details	May	Jun	Jul	Aug	Sep	Oct	Nov		
Problem analysis and research	1. Setting of design overview	■	■	■						
	2. Decision on research areas	■	■	■						
	3. Collection of information		■	■	■					
	4. Field and marketing survey		■	■	■					
	5. Information analysis		■	■	■					
	6. Review on the design overview		■	■	■					
Idea generation	7. Initial idea		■	■	■					
	8. Sketch of initial idea		■	■	■					
	9. Selection of design proposal			■	■	■				
	10. Design development			■	■	■				
	11. Design of details				■	■	■			
	12. Model making				■	■	■			
	13. Scaled Design drawing				■	■	■	■		
	14. Production drawing				■	■	■	■		
Implementation	15. Purchase of materials				■	■	■	■		
	16. Preparation of tools and equipment				■	■	■	■		
	17. Prototype making					■	■	■	■	
	18. Assembly and decoration					■	■	■	■	
Evaluation	19. Testing and evaluating prototype						■	■	■	
	20. Improvement						■	■	■	
Presentation	21. Tidying up design records							■	■	■
	22. Tidying up design drawings							■	■	■
	23. Implementation plan								■	■
	Remark:									



(One interval in the figure represents a week)

3. Arrangement of Work

i. Teamwork

Teamwork is the concept of people working together cooperatively. Many large, ambitious projects require people to work together, so teamwork has become an important concept in project management. The

formation of an effective team is an intermediary goal towards getting good, sustainable results. Through training, people will work together more effectively to accomplish shared goals.

(1) Positions of a Team

Each member in a team has his / her own expertise. The best teamwork practice is to make use of the strengths of each member in fulfilling particular tasks throughout the whole process. For example,

(a) Co-ordinator

This person should have a clear view of the team objectives and be skilful in guiding team members to make contribution to the project.

(b) Idea contributor

This person may sometimes have abstract or unrealistic ideas but is very innovative and courageous in expressing his / her ideas.

(c) Executor

This person should be an individual who is well organised and can effectively turn big ideas into manageable tasks and achievable plans.

(d) Expert

This person provides expert skills and knowledge, and has a devoted and focused attitude.





(2) How Can I Know Which Position Is Suitable for Me?

When a team project activity starts, students, being members of a new team, do not know well about the abilities of other team members. Therefore, it will be useful to carry out the following items:

- (a) get familiar with the team members;
- (b) keep reviewing whether each member is suitable for his / her position;
- (c) try to understand the strengths and weaknesses of team members through cooperation; and
- (d) make changes of positions when necessary

after an agreement is reached by the whole team.

For small-scale teamwork, positions of individuals can be swapped, combined and redistributed. They may also take turns to play different roles. For the role of expert, in particular, each team member can take up the position if he / she possesses the relevant skill.

(3) Work Load Distribution

To achieve a balance among the work of all positions, team members should understand that the

work cannot be evenly distributed over the course of a project.

Design stages	Co-ordinator	Executor	Expert (skill)
Planning	*****		
Research	***	***	
Analysis	***	***	***** (Analytical ability)
Idea generation	***	***	***** (Creativity)
Idea development	***	***	***** (Modelling ability)
Design presentation	***	***	***** (Visual communication ability)

ii. Reviewing

As the design project comes to the final phase, a review process must be undertaken to summarise the outcome. Evaluation should cover the results and the processes.

(1) Outcome evaluation

This reflects how good the final design is at the end. It can be done with views from different perspectives:

- Management view (management in enterprises or teachers in schools)

- Design team member view (or classmates / members of other teams in the class)
- Target user view, if possible

(2) Process evaluation

This reflects the effectiveness and efficiency of the whole process. As time resource has already been taking into account, a performance indicator can reflect how good the team has done.

iii. Cost-effectiveness Evaluation

A cost-effectiveness evaluation is a means to assess the way to make the project more cost effective. Effectiveness here refers to the reduction of production and delivery costs.

(a) Production costs

Production costs refer to the cost for producing the design. It generally includes the making of parts, assembly and packaging of the design.

(b) Storage costs

As the design is produced, the final product may not be delivered to clients immediately. A certain amount of the products will be stored

until they are delivered via different kinds of transportation. These products must be stored in an appropriate condition which should not cause any damages. The rental expenses on the storage space (usually inside factories) will become part of the cost.

(c) Transport costs

Products are delivered to clients through a certain transportation method. The speedier it is the higher is the cost. The cost of air freight is more expensive than ocean freight.

Case Study of New Product Development 1 – Design Processes of a Hearing Device

The HiSonic Head Gear provides the wear ability of a bone conduction hearing device for the profoundly deaf.



When the design team was first approached, the clients already had a basic prototype of head gear for the profoundly deaf. However, the original

design had a problem in terms of comfort and lacked ergonomic consideration.

(1) The teamwork

The design team in the Designology design studio divided the project into different stages, and personnel into different roles. The team started with a design manager who was the co-ordinator of the whole design project. Other designers were executors. All design activities were executed by

them. As the project required a large amount of technical expertise, experts from different fields were invited in different stages. They provided valuable ideas and assistance throughout the whole design progress.

Stage	Co-ordinator	Executor	Expert
Research	Design manager	Designers	Medical specialist, ergonomist, engineer on ultrasonic technology
Conceptual design	Design manager	Designers	Medical specialist, ergonomist, engineer
Product development and finalisation	Design manager	Designers	Model / Prototype maker, CAD operator, CAE engineer, production engineer.

The technology applied in the HiSonic hearing device converts speech and sound into ultrasonic vibrations. These vibrations, when transmitted by

a transducer to the mastoid bone behind the ear, are perceived by the brain as sound.

(2) Management of the Project

As a co-ordinator, the design manager worked closely with the team following the project schedule. The objective was clear and direct. It served as the main content of the design brief.

- (a) Design brief – to design a comfortable hearing device for the profoundly deaf of different ages, ranging from children to adults.

(3) Research

Experts including ultrasonic technology engineers and ergonomists provided information and working models from their professions. This information

(4) Concept Design – Idea Generation

Brainstorming sessions and mind mapping activities were held to generate as many ideas as possible. Experts with different backgrounds were usually

(5) Design – Development

Meetings with ergonomists were held to study human dimensions for the head set. A lot of tests

(6) Product Development and Finalising Design

Up to this stage, the design was initially shaped, but it needed further development so that it became a product.

- (a) With the help of CAD operators, engineers were invited to provide technical details and assist in the selection of materials at this stage.
- (b) Designers developed structural details of the design with CAD.

- (b) The design manager drafted a schedule with a timeline, which specified all the stages and key days.
- (c) At different stages, the design manager formed various focus groups and organised various meetings for discussing different subjects.

allowed designers (executors) to acquire more understanding in medical and technological aspects.

invited to attend these sessions to provide their expert views. More design concepts were thus able to be visualised through sketches.

were conducted to determine the most suitable dimensions.

- (c) CAE engineers conducted structural strength simulation tests.
- (d) Physical testing models were built for ergonomic and material testing.
- (e) Production engineers were invited to fine tune the selection of materials and production processes so as to maximise the cost-effectiveness.

Case Study of New Product Development 2 – Production Cost of a Potato Peeler

The following is an example of the production costs of a potato peeler for the production of 500 units.



Traditional potato peeler

	Item	Process	Unit Cost (HK\$)	Total (HK\$)
Production	Material –stainless steel	Purchase from market	0.5	3.6
		Handle	Cutting	
	Bending		0.3	
	Finishing		0.3	
	Cutter	Cutting	0.3	
		Stamping	0.3	
		Forming	0.3	
Finishing		0.3		
Assembly	Assembly		1.0	
Package	Blister pack	Material	0.5	1.0
		Production	0.5	
Storage		Rent	0.5	0.5
Transport		By ocean freight in containers	2.0	2.0
			Total cost per unit (HK\$)	7.1

(a) Production Rate and Cost

When the design is mass produced, the unit cost of production will be lowered. For example:

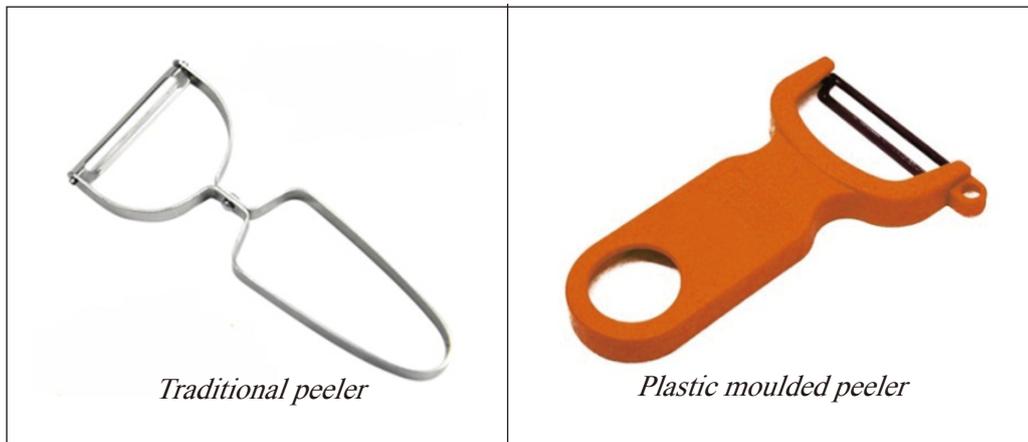
Quantity produced	Production	Cost of packaging	Storage	Transport	Total
500	3.6	1.0	0.5	2.0	7.1
2000	1.8	0.5	0.5	1.5	4.3

In the selection of a suitable production process, we have to first decide the quantity to be produced. The costs of different production methods vary. For

mass production, the plastic moulding method is a cheaper solution.

(b) Cutting the Design Cost

Here are some examples of the costs that need to be considered during the design process.

Production Cost:**(i) Moulding Cost and Assembly Cost:**

For a plastic peeler, a set of relatively more expensive mould has to be made before production, but the cost will be shared in mass production. Thus, when the production volume goes up to more than 1,000, the potato peeler on the right is a cheaper alternative when compared to the peeler on the left. That is,

the plastic design is a cheaper solution in mass production. The production materials, time and assembly require less investment, whereas the metal peeler requires more complex procedure such as metal cutting, bending, welding, finishing and parts assembling.

(ii) Packaging, Storage and Transport Cost

*Blister pack package**Box package*

The simpler the package, the less it costs. With a simpler packaging method and design, the production cost can be lower as fewer materials are used and production process can be faster. With a smart design, the volume of the packaged products can be reduced, thus freeing up more storage space. Also, with the same storage space, a good packaging design can store twice of the amount of a poorly designed packages. In other words, transport cost can be lowered too.

In terms of materials and space, the package design on the left above is smaller than the box package on the right. That means the costs of packaging, storage and transport will be lowered.

(1) Assessment

With the costs for different designs listed, a comparison table can be drawn to assess how the designs benefit cost control. In the example below, we must first determine the quantity of production

and selling method.

Quantity: 1000 pieces

Selling channel: supermarket



	Design A 		Design B 	
	Unit cost (HK\$)	Total:(HK\$)	Unit cost (HK\$)	Total:(HK\$)
Production	2.6	3.6	0.2	0.3
Assembly	1.0		0.1	
Package	1.0	1.0	1.0	1.0
Storage	0.5 (box pack)	0.5	0.2 (blister pack)	0.2
Transport	2.0	2.0	1.0 (lighter & smaller pack)	1.0
	Total cost per unit	7.1	Total cost per unit	2.5

In conclusion, design B has a lower cost, implying a larger profit.

4 Glossary of terms

New product development(NPD)	新產品開發	Expert	專家
Gantt chart	甘特圖	Project management	項目管理
Co-ordinator	統籌員	Packaging	包裝
Idea contributor	創意提供者	Storage	貯存
Executor	執行者	Transport	運送

Lesson Activity

(1) Brief

Students form groups of two and bring a toy or a household product from their homes. The product selected should have a good design. It should also be formed by at least four parts.

(2) Each team should point out the following with one of the team members focusing on the design process and the other focusing on the production process.

i. Focusing on the design process, list the following about the toy or the household product.

(a) Ergonomic concerns	
(b) How to use the product?	
(c) How the design aspects of the product affect its use?	
(d) Comfortability	
(e) Effectiveness	
(f) Efficiency	
(g) Does the product meet the expected use?	
(h) How is the product stored?	
(i) Is it easy to store the product?	
(j) Cultural needs	
(k) Is the appearance of the product attractive?	
(l) What kind of users do you think the product is designed for?	
(m) Which part of the product is the most attractive – shape, colour or materials?	
(n) Do you think the design of the product evokes any emotional response from you, e.g. it looks like something familiar?	

ii. Focusing on the production process, list the following about the toy or the household product.

(a) User friendliness	
(b) Is the product working well functionally?	
(c) Production feasibility	
(d) How is the product produced?	
(e) Technical safety	
(f) Is the product safe? Why?	
(g) Reliability	
(h) Is the product reliable during operation?	
(i) Production cost	
(j) Is the price of the product reasonable?	



Case Study Guidelines



Technology
Education
Key Learning Area

Case Study – The Success of an Innovation

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)

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Background

A smartphone is the most popular modern communication device and is considered a highly successful product. The features and functions provided by the phones are particularly attractive to the younger generation and businessmen.

A smartphone is a product which embraces all the latest technologies such as multimedia, and is an Internet-enabled mobile phone. Smartphones usually come with multi-touch screen including a virtual keyboard and buttons. The functions provided by

smartphones normally include camera, 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. Smartphones were named Time magazine's Invention of the Year in 2007.

In a foreseeable future, smartphones will become one of our essential tools just like clothes and shoes that we are using every day.

Functions and features of smartphones

Function	Feature
Soft keyboard	<ul style="list-style-type: none"> ● Make call by a name or number in the address book, a list of favourites or a call log ● Automatically synchronise all contents from a PC, Mac or Internet service ● With SMS application, prevent and amend 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"> ● Take high resolution photos ● Enable photo management ● Display album with a flick of a finger ● Post photos directly to a web gallery
Music	<ul style="list-style-type: none"> ● Provide iTunes Wi-Fi music store ● Enable to browse, review, buy, download and store music
Multi-touch display	<ul style="list-style-type: none"> ● Enable to browse web pages ● Easy zooming in and out
HTML email client	<ul style="list-style-type: none"> ● Get emails from POP3 or IMAP mail services ● Display photos and graphics alongside mail text
Maps application	<ul style="list-style-type: none"> ● Easy-to-use touch interface to view maps and satellite images, or get driving routes and traffic information
Wireless communications	<ul style="list-style-type: none"> ● GSM, Wi-Fi and Bluetooth for data connection

Story (1) - How Smartphones Were Born



Visionary and Seizing 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 functions

provided by phones, iPods, BlackBerrys and MP3 players separately. 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 a smartphone.

The First hurdle – Identifying 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 of the phone was not ready and was yet to prove the idea workable. 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 the smartphone was supposed to be the centrepiece. Jobs had used the event as a showcase to launch his biggest products and many Apple-watchers were expecting another dramatic announcement. If the smartphone was not ready in time, the corporate image would be affected.

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% 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 function, 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.

Teamwork 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 worked hard to meet the deadlines. People were screaming in the

office and engineers were frazzling from all-night coding sessions, quitting, only re-joining 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 senior officers 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 was also arguably Apple's most profitable device. The company netted an estimated HK\$600 for every HK\$3,000 smartphone it sold, and that was not counting the HK\$1,870

it made from every two-year AT&T contract a smartphone customer signed. Meanwhile, about 40 percent of smartphone buyers were 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.

The smartphone was 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 the smartphone was its 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

As important as the smartphone was to the fortunes of Apple and AT&T, its real impact was on the structure of the HK\$88 billion-a-year US mobile phone industry. In the pursuit of the contract, every manufacturer was racing to create a phone that consumers would love (user-centred), instead of one that the carriers approved of (monopolised market).

'The smartphone is already changing the way carriers and manufacturers behave,' said Michael Olson, a securities analyst at Piper Jaffray.

Story (2) - Technologies Incorporated in Smartphones



The smartphone is indeed a product of creativity of today. It embraces many innovations and applications of new technologies. The design has made due considerations on various aspects such as customers, energy and materials. It will change the way you think about a mobile device.

The smartphone is not just a piece of ordinary mobile phone because it provides advanced functions which are much more than a mobile phone can do. The advanced functions are enabled by the integration

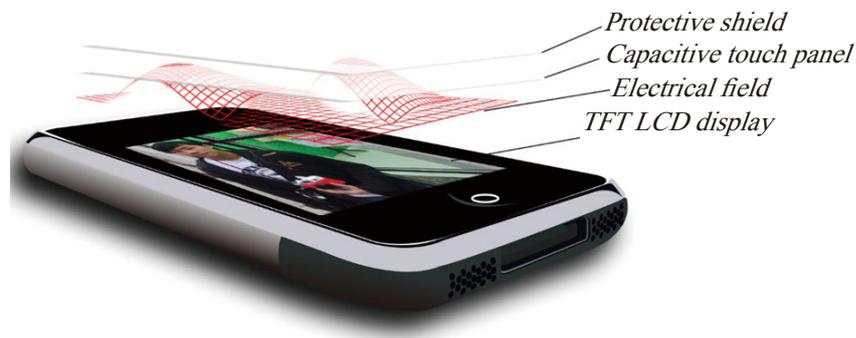
of multiple technologies which include wireless communications, embedded systems, software, computer network, touch screen and materials.

The 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 synchronise the contents 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 software, the 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 enabled by the smartphone's multi-touch display. The ease of control has given the smartphone a leading edge in phone service.



The 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. It is also fully multi-tasking, allowing you to read a web page while downloading your email in the background. This feature satisfies customers' needs and saves their time by letting them perform multiple tasks at the same time.

The 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, it automatically switches between EDGE and Wi-Fi to provide the fastest possible data connection. This feature satisfies customers' needs to access data while they are moving around.

The accelerometer detects the rotation of the smartphone when its orientation changes from portrait to landscape. It will automatically change the display of the contents, so that you can immediately

see the entire width of a web page or a photo in its proper landscape aspect ratio. This feature is designed for better 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 its ambient light sensor. This intelligent sensor automatically adjusts the display's brightness to an 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, the smartphone goes beyond anything on a phone today. It automatically synchronises photos with your PC or Mac when you dock it.

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

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° F to 95° F (0° C to 35° C)
- Nonoperating temperature: -4° F to 113° F (-20° C 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>]



Story (4) - Attributes Leading to the Success of Smartphones

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

Room for Improvement

Undisputedly, the smartphone is a state-of-the-art product, however, there are still rooms for improving the shortcomings, such as its batteries becoming replaceable and its accessories being more

compatible with non-proprietary products. With the advent of new technology, the smartphone should become more client-oriented and friendly for 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 the factors that make the product so successful.

Questions:

1. What are the attributes leading to the success of the smartphone?
2. Discuss and understand each of the attributes.
3. Compare the functions and prices between a smartphone and a personal digital assistant (PDA) device.
4. Come up with an innovative product designed with appropriate technology and considerations of the product attributes.
5. What should designers and engineers be considering during the design and manufacturing stages 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) Organisation of the presentation	15
	(3) Contents	20
	(4) Flow of the presentation	15
	(5) Time keeping	5
	(6) Peers' score	5
Individual assessment	(7) Command of language	10
	(8) Confidence and attractiveness	10
	(9) Peers' score	5

Report Assessment

Assessing target	Component	% (out of 100)
Individual assessment	(1) Effort	25
	(2) Organisation of the report	20
	(3) Contents	25
	(4) Presentation skills	20
	(5) Time keeping	5
	(6) Peers' score	5



References

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

