IBO

IB DIPLOMA PROGRAMME
PROGRAMME DU DIPLÔME DU BI
PROGRAMA DEL DIPLOMA DEL BI

INFORMATION TECHNOLOGY IN A GLOBAL SOCIETY
CASE STUDY

For use in November 2007 examination only

INSTRUCTIONS TO CANDIDATES

- Case study booklet required for higher level paper 3 information technology in a global society examinations.

Foreword

The ITGS case study, *Cell Phones in a Global Society,* provides a basis for further investigation and is the stimulus material for the questions on November 2007 Higher Level paper 3.

Students are expected to research, analyze, evaluate, synthesize and reflect on ideas from their investigation. Work done on the case study should reflect the integrated approach explained on page 8 of the *ITGS guide*.

Through their investigation of cell phones, students should investigate:
• relevant IT systems in a social context
• both local and global areas of impact
• social and ethical impacts of cell phones on individuals and societies
• current challenges and solutions
• future developments.

Students are expected to research local and global real–life situations where cell phones are used. The perspectives of the various stakeholders need to be considered. Information should be collected through primary and secondary research, field trips, guest speakers, personal interviews and e-mail correspondence.

Responses to examination questions should reflect the synthesis of knowledge and experiences that students have gained from their investigations. In some instances, additional information may be provided in examination questions to allow students to generate new ideas.

Cell Phones in a Global Society

The number of cell phones (mobile phones) is rapidly increasing in both developed and developing countries. For example, in China the number of cell phone users was estimated to be over 400 million in 2006. Likewise, Africa has one of the fastest growth rates in the world in mobile phone use. Cell phone operators never anticipated that Africa would be a potential market.

Overview

Modern cell phones utilize a wide selection of technologies that provide immediate access to communication, services and entertainment. Cell phones contain computer technologies that enable the use of a wide range of digital technologies (*e.g.,* SMS [Short Message Service], digital camera, radio, television, Internet, MP3 player, personal organizer, calculator, alarm clock, games, infrared and bluetooth connectivity, voice recorder, and video access). Even as you are reading this case study, new technologies and uses for cell phones are being developed for the global consumer market.

People of all ages and with differing economic status use cell phones. Cell phones have changed the way people work, play, communicate and keep in contact with one another. Cell phones have had both positive and negative social and ethical impacts on today's societies.

In developing countries, cell phones have changed the way people work and pay for services and goods. In Kenya, for example, cell phones have created a new kind of "cyber–cash". Money can easily be transferred from cell phone to cell phone forming a new type of "cashless" society. Parking vouchers and other services can be purchased in some major European cities by sending an SMS to a designated telephone number.

IT Systems: How Cell Phone Technology Works
Cell phone technology is based upon geographic areas being divided into a network of cells. A cell contains a radio transceiver and a base station controller, which manages, sends, and receives traffic from the cell phones in its geographical area to a cellular telephone switch. Cell phones communicate through electromagnetic radio waves with the base station and rely on several numbers: a System Identification Code (SIC), a Mobile Identification Number (MIN), and an Electronic Serial Number (ESN). Each cell has a set of voice channels and a control channel.

The base station is a tower with antennas and is customarily located on the top of a hill or high building. It provides a link to the distant cellular switch called a Mobile Telecommunications Switching Office (MTSO). Amongst other functions, the MTSO switches calls from land–lines to cell phones, switches calls between cells as cell phones move across cell boundaries, and authenticates wireless customers before they make calls.

As a cell phone moves near the edge of a cell, the cell base station detects that the signal strength is weakening. In the meantime, the base station in the cell being approached detects that the cell phone's signal strength is increasing. The MTSO monitors the relative signal strength of a cell phone as reported by each cell base station and switches the connection to the cell base station which will give the best possible reception. The MTSO sends the cell phone a signal on a control channel telling it to change frequencies. This "hand off" switches the cell phone to the new cell without interruption to the telephone call.

Areas of Impact
The use of cell phones and related technologies can be found in all areas of impact, and raises both social and ethical issues in relation to individuals and society. The following descriptions provide examples of in-depth investigations that may be undertaken. It is not intended to be an exhaustive list.

- **Business and employment**
  Cell phone technologies include the capability to communicate by voice and text messaging from almost any place and at any time. This has liberated business people from using land–lines and enabled them to conduct business and be available anytime and anywhere. Unfortunately, this has led business people to try to limit their accessibility by having two phones – one for private use and another for business purposes.

  Because cell phones are constantly turned on, people have to be reminded, for both etiquette and safety reasons, when they should not be in use (*e.g.,* in school classes, restaurants, cinemas, theatres, on airlines, driving cars). A number of social and ethical issues have emerged as a result of the use of cell phones (*e.g.,* eavesdropping, access to personal information, viruses).

- **Education**
  New developments in cell phones provide the long–range potential for providing inexpensive access to the Internet, communication and other services. Wireless keyboards that interface with cell phones have already been tested. However, the language and symbols used in SMS have changed the way people communicate with one another in writing.

Turn over

- **Health**
  Through messaging services, cell phones have provided improvements in health care through reminders for appointments and taking medication on time. However, medical experts disagree about the extent to which cell phones are a health hazard and what measures can be taken to minimize any health hazard.

  Some governments are investigating the use of cell phone technology as an early warning system for informing citizens of natural disasters (*e.g.,* earthquakes, tsunami).

- **Arts, entertainment and leisure**
  The availability of digital cameras in cell phones has enabled the immediate capture, storage and sending of images among friends and family. Cell phone cameras have been used to report news stories as they have occurred. However, cell phone cameras have also been used to invade the privacy of individuals.

  Parents concerned about the safety and welfare of their children have purchased cell phones for them. However, constant availability by cell phone has also made tracking of individuals and cyber–stalking possible.

- **Science and the environment**
  The short life span and irresponsible disposal of cell phones has not only caused a health hazard for humans and animals, but has also contributed to pollution of the environment. National governments and other international legal bodies have passed laws to regulate the disposal of cell phones.

- **Politics and government**
  A serious concern in today's society is "how much privacy must individuals relinquish in order for governments to maintain national security?" Under what circumstances should information regarding private calls made with cell phones (*e.g.,* phone number, date, time) or wiretaps be accessible to government agencies? However, the availability of this cell phone information has also led to the FBI's concern that the safety of its agents may be in jeopardy.

  Cell phones have also found their way onto the battlefield. They are useful in rapid communication where confrontations are occurring and have saved civilian lives. On the other hand, cell phones have been used to detonate bombs.

Challenges Faced

The examples cited in this case study are not exhaustive. ITGS students are expected to research and investigate the use of cell phones in both developing and developed countries in a range of areas of impact and consider related social and ethical impacts on individuals and societies.

In order to understand social and ethical considerations related to cell phone technologies, it is necessary to understand:
• How cell phone technology works. Diagrams may be useful for this investigation.
• How cell phones communicate and interface with other digital technologies.
• How information from cell phones in use can be intercepted, stored and shared.
• What problems have emerged from the use of cell phones and the extent to which they have been effectively addressed.

Current developments in cell phone technology include explorations into face–to–face video calling, making payments using a cell phone and, for example, speech recognition for operating a cell phone. Some experts even predict that the cell phone will be merged with more computing technologies to create a low cost mobile digital device for the future.

Additional Terminology

Base station controller
Encryption
Global System for Mobile Communications (GSM)
Home Coverage Area
Intelligent Roaming Database (IRDB)
Personal Identification Number (PIN)
Protocol
Radio Transceiver
Roaming
Wireless Application Protocol (WAP)
Wireless radio wave transmission
Wireless service provider