Mobile phones

Technology, Mobile Phone

Chapter 1 The Problem and Its Background This chapter presents the introduction, statement of the problem, scope and delimitation of the problem, the significance of the study, and the definition of terms. Introduction Life without a cell-phone... How are we going to survive without it? From a fashion statement, status symbol, luxury to a necessity, the journey of cellular telephones has been one of great technological advancements. But do we, who take these " cells" for granted, ever think of thetechnologybehind it?

A cell phone service is based on a simple idea. It is like a two-way radio, turned into a circuit switched telephone network, comparable in functionality to its landline counterpart. We had wireless sets before, used by security, police, organizers etc. but cell phones were not only accessible easily, they were more personal. A mobile phone (also called mobile, cellular telephone, or cell phone) is an electronic device used for two-way radio telecommunication over a cellular network of base stations known as cell sites.

Mobile phones differ from cordless telephones, which only offer telephone service within limited range through a single base station attached to a fixed land line, for example within a home or an office. A mobile phone allows its user to make and receive telephone calls to and from the public telephone network which includes other mobiles and fixed-line phones across the world. It does this by connecting to a cellular network owned by a mobile network operator. A key feature of the cellular network is that it enables seamless telephone calls even when the user is moving around wide areas via a process known as handoff or handover.

Mobile phones are used for a variety of purposes, including keeping in touch withfamilymembers, conducting business, and having access to a telephone in the event of an emergency. Some people carry more than one cell phone for different purposes, such as for business and personal use. Multiple SIM cards may also be used to take advantage of the benefits of different calling plans—a particular plan might provide cheaper local calls, long-distance calls, international calls, or roaming. Mobile phones have really changed our lives with their amazing features like Bluetooth, megapixel cameras and MP3 players.

They have truly transformed our lives. Now, you can click snaps, make videos and do a whole lot of other functions on your handset. Mobile phones are definitely the best thing to have happened to our generation. You are sitting in your house and your daughter just calls you up from her university. Your son sends you snaps of his vacation in Australia. Mobile phones have completely infiltrated our lives with their impeccable styles and swish technology. Mobile phones are undoubtedly one of the biggest inventions of the 21st century. They are completely loaded with amazing features and brilliant technologies. obile phones have been the most wonderful digital inventions of the past 50 years. They have constantly changed and made our lives simply superb. This is the most convenient way ofcommunicationtowards others. Mostly user of these high tech device are teenagers and students. They savemoneyto have some load and used most of their time texting and calling. They are mostly addicted into it. Accident usually occurs for some reason that drivers used to text and call while on

board driving cars. This is for any reason abuse in using this device.

Statement of the Problem

Generally, this descriptive study aims to discover the Correlation Between the Frequency of Excessive use of mobile phone and the encountered problems Specifically, the research addressed the following questions: 1. What is the demographic profile of the respondents in terms of : a. age b. address, and c. gender 2. What is the frequency of use of mobile phones by the respondents? 3. What are the purposes and advantages that mobile phone users derive from the gadget? 4. What problems do respondents encounter due to prolonged use of mobile phone?

Scope and Delimitation of the study This study aims to shows that even the younger generation could afford to have the latest fashion technology of these gadget, This is a thorough research that uses a technique. This questionnaires is designed by us and will be evaluated by Mrs. Linag. The participant in this study were our group who was selected at random, The instrument will be floated to the respondent from various user of the mobile phone. Significance of the Study This study is significant to the following sectors of the society: Parents.

The goal of this research is to inform the parents for the proper usage of mobile phone to let them guide their children to the proper usage of mobile phone and to set some limitation in texting via mobile phone. Students. The study could be of help to students so that they may realize the effect of excessive time spent in using mobile phone onacademicperformance. Government. This study can be of value to the government because this

could inform them about the different effects of the technologies in the academic performance of the users, most specially on the use of the mobile phone.

Future Researchers. The goal of this study is to help the future students that will tackle the same topic and let this research be a reference for their study. Definition of Terms Mobile Phones - is an electronic device used for telecommunications, text messaging, etc. Addiction - many were so attached to their Mobile Phone that they relied on it to lift their mood. Prolonged Use - prolonged use or long- term use of Mobile Phone can damage your brain because of the radiation. Time Management - manage your time by using your mobile phone in few times or in case of emergency and important use only. Load - refers to the amount of money spend for texting. Excessive - exceeding what is usual, proper, necessary, or normal. Roaming - Connected - Significance of the Study This study is significant to the following sectors of the society: Parents. The goal of this research is to inform the parents for the proper usage of mobile phone to let them guide their children to the proper usage of mobile phone and to set some limitation in texting via mobile phone.

Students. The study could be of help to students so that they may realize the effect of excessive time spent in using mobile phone on academic performance. Government. This study can be of value to the government because this could inform them about the different effects of the technologies in the academic performance of the users, most specially on the use of the mobile phone. Future Researchers. The goal of this study is to

help the future students that will tackle the same topic and let this research be a reference for their study.

Scope and Delimitation of the Study This study focuses on the effect of the excessive use of mobile phone on the physical problems and academic performance of mobile phone enthusiasts among third year students. This study is descriptive in nature and did not attempt to conduct any standardized test to measure accurately how well mobile phone are engrossed. In addition to this, the point of average of the problems encountered by the respondents will be the basis to show what are the problems and effects of using mobile phone excessively.

This study did not include the opinion of the respondents regarding their performance in school. This study will neither attempt to describe the effect of mobile phone on their behavior. Neither did this study will attempt to describe the nature of mobile phone user that enthusiasts enjoy. This study gathered information between the first and second weeks of February only and selected only those mobile phone enthusiast among the third year students of URC BED in the school year 2009 – 2010 who agreed to participate in this study. CHAPTER II THEORETICAL FRAMEWORK

This chapter presents the relevant theories, review of related literature, related studies, conceptual framework, hypothesis and definition of terms. Review of Related Literature What is Mobile Phone? A mobile phone (also called mobile, cellular telephone, or cell phone) is an electronic device used for two-way radio telecommunication over a cellular network of base stations known as cell sites. Mobile phones differ from cordless telephones,

which only offer telephone service within limited range through a single base station attached to a fixed land line, for example within a home or an office.

A mobile phone allows its user to make and receive telephone calls to and from the public telephone network which includes other mobiles and fixed-line phones across the world. It does this by connecting to a cellular network owned by a mobile network operator. A key feature of the cellular network is that it enables seamless telephone calls even when the user is moving around wide areas via a process known as handoff or handover.

In addition to being a telephone, modern mobile phones also support many additional services, and accessories, such as SMS(or text) messages, e-mail, Internet access, gaming, Bluetooth and infrared short range wireless communication, camera, MMSmessaging, MP3 player, radio and GPS. Low-end mobile phones are often referred to as feature phones, whereas high-end mobile phones that offer more advanced computing ability are referred to as smartphones. The first handheld mobile phone was demonstrated by Dr.

Martin Cooper of Motorola in 1973, using a handset weighing 2 kg (4. 4 lb). Motorola released the first commercially available mobile phone, the DynaTAC 8000x, in 1983. In the year 1990, 12. 4 million people worldwide had cellular subscriptions. By the end of 2009, less than 20 years later, the number of mobile cellular subscriptions worldwide reached approximately 4. 6 billion, 370 times the 1990 number, penetrating the developing economies and reaching the bottom of the economic

pyramid. Advantages of Mobile Phone Cell phones are portable and hence, are convenient.

They are available in various shapes, sizes and features with enhanced communication speed. The ways of communication with cellular phones are increasing day-by-day, as cellular phones are being connected with the World Wide Web and even facilitate easy download of programs. The trends of cellular phones usage are continuously changing be it for business or personal communication purposes. With the availability of the 3G or the Third Generation technology, cell phones have become multi-tasking devices, as they provide facilities of video conferencing or live entertainment.

You can call for help if your car breaks down. It is useful during emergency and may act as a safety device too. You may use a cell phone to convey greetings. In fact, they reflect status and are style symbols nowadays. Disadvantages of Mobile Phone Cellular phones with plenty of advantages also have certain disadvantages. For example, communicating on a cell phone during driving or crossing roads may be dangerous. Many people are very much obsessed with cellular phones such that they cannot work without them and may get a feeling of incompleteness.

Cellular phones may be so addictive that you may try to find reasons of avoiding gatherings or events where usage of cell phones is restricted. In fact, medicalsciencehas also proved that extensive usage of cell phones may cause severehealthproblems such as damage to brain, heart, skin, ears and many other psychological problems. It is true that a personal computer, a

television and Internet have taken a compact form in cellular phones, but misuse or overuse of results in various problems. Therefore, usage of phones has to be proper complying with the rules and regulations.

Pager Call Systems Ltd offers a complete range of on site messaging solutions for a variety of industries utilising the Wireless Paging System. Restaurants looking forRestaurant Pagers, hospitals, leisure venues, hotels, offices and major retailers are just a few that have been utilising HME Wireless solutions to increase sales, improve customer satisfaction and staff productivity for many years in establishments worldwide. | | THEORETICAL FRAMEWORK This chapter presents the relevant theories, review of related literature, related studies, conceptual framework, hypothesis and definition of terms.

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modern mobile phones also support many additional services, and accessories, such as SMS(or text) messages, e-mail, Internet access, gaming, Bluetooth and infrared short range wireless communication, camera, MMSmessaging, MP3 player, radio and GPS.

Low-end mobile phones are often referred to as feature phones, whereas high-end mobile phones that offer more advanced computing ability are referred to as smartphones. The first handheld mobile phone was demonstrated by Dr. Martin Cooper of Motorola in 1973, using a handset weighing 2 kg (4. 4 lb). Motorola released the first commercially available mobile phone, the DynaTAC 8000x, in 1983. In the year 1990, 12. 4 million people worldwide had cellular subscriptions. By the end of 2009, less than 20 years later, the number of mobile cellular subscriptions worldwide reached approximately 4. billion, 370 times the 1990 number, penetrating the developing economies and reaching the bottom of the economic pyramid. History Radiophones have a long and varied history going back to Reginald Fessenden's invention and shore-to-ship demonstration of radio telephony, through the Second World War with military use of radio telephony links and civil services in the 1950s. The first mobile telephone call made from a car occurred in St. Louis, Missouri, USA on June 17, 1946, using the Bell System's Mobile Telephone Service, but the system was impractical from what is considered a portable handset today.

The equipment weighed 80 lbs, and theAT&T service, basically a massive party line, cost $30 USD per month (equal to $337. 33 today) plus 30 to 40 cents per local call, equal to $3. 37 to $4. 5 today. In 1960, the world’s first

partly automatic car phone system, Mobile System A (MTA), was launched in Sweden. MTA phones were composed of vacuum tubes and relays, and had a weight of 40 kg. In 1962, a more modern version called Mobile System B (MTB) was launched, which was a push-button telephone, and which used transistors in order to enhance the telephone’s calling capacity and improve its operational reliability.

In 1971, the MTD version was launched, opening for several different brands of equipment and gaining commercial success. Martin Cooper, a Motorola researcher and executive is considered to be the inventor of the first practical mobile phone for handheld use in a non-vehicle setting, after a long race against Bell Labs for the first portable mobile phone. Using a modern, if somewhat heavy portable handset, Cooper made the first call on a handheld mobile phone on April 3, 1973 to his rival, Dr. Joel S. Engel of Bell Labs.

The first commercially automated cellular network (the 1G generation) was launched in Japan by NTT in 1979, initially in the metropolitan area of Tokyo. Within five years, the NTT network had been expanded to cover the whole population of Japan and became the first nationwide 1G network. In 1981, this was followed by the simultaneous launch of the Nordic Mobile Telephone (NMT) system in Denmark, Finland, Norwayand Sweden. [8] NMT was the first mobile phone network featuring international roaming. The first 1G network launched in the USA was Chicago-based Ameritech in 1983 using the Motorola DynaTAC mobile phone.

Several countries then followed in the early-to-mid 1980s including the UK, Mexico and Canada. The first " modern" network technology on digital 2G (second generation) cellular technology was launched by Radiolinja (now part of Elisa Group) in 1991 in Finland on the GSMstandard, which also marked the introduction of competition in mobile telecoms when Radiolinja challenged incumbent Telecom Finland (now part of TeliaSonera) who ran a 1G NMT network. In 2001, the first commercial launch of 3G (Third Generation) was again in Japan by NTT DoCoMo on the WCDMA standard.

One of the newest 3G technologies to be implemented is High-Speed Downlink Packet Access (HSDPA). It is an enhanced 3G (third generation) mobile telephony communications protocol in the High-Speed Packet Access (HSPA) family, also coined 3. 5G, 3G+ or turbo 3G, which allows networks based on Universal Mobile Telecommunications System (UMTS) to have higher data transfer speeds and capacity. History of Mobile phones The history of mobile phones begins with early efforts to develop mobile telephony concepts using two-way radios and continues through emergence of modern mobile phones andassociated services.

Radiophones have a long and varied history going back to Reginald Fessenden's invention and shore-to-ship demonstration of radio telephony, through the Second World War with military use of radio telephony links and civil services in the 1950s, while hand-held mobile radio devices have been available since 1973. Mobile phone history is often divided intogenerations (first, second, third and so on) to mark significant step

changes in capabilities as the technology improved over the years. Pioneers of Radio Telehpony In Europe, radio telephony was first used on the first-class passenger trains between Berlin and Hamburg in 1926.

At the same time, radio telephony was introduced on passenger airplanes for air traffic security. Later radio telephony was introduced on a large scale in German tanks during the Second World War. After the war German police in the British zone of occupation first used surplus tank telephony equipment to run radio patrol cars. In all of these cases the service was confined to specialists that were trained to use the equipment. In the early 1950s ships on the Rhine were among the first to use radio telephony with an untrained end customer as a user.

However it was the 1940s onwards that saw the seeds of technological development which would eventually produce the mobile phone that we know today. Motorola developed a backpacked two-way radio, the Walkie-Talkie and a large hand-held two-way radio for the US military. This battery powered " Handie-Talkie" (HT) was about the size of a man's forearm. In 1946 in St. Louis, the Mobile Telephone Service was introduced. Only three radio channels were available, and call set-up required manual operation by a mobile operator. Also that year, Soviet engineers G. Shapiro and I.

Zaharchenko successfully tested their version of a radio mobile phone mounted inside a car. This device could connect to local telephone network with a range of up to 20 kilometers. Top of cellular telephone tower During the 1950s the experiments of the pioneers started to appear as usable services across society, both commercially and culturally. In the 1954

movie Sabrina, the businessman Linus Larrabee (played by Humphrey Bogart) makes a call from the phone in the back of his limousine. In 1957 a young Soviet radio engineer Leonid Kupriyanovich from Moscow created a portable mobile phone, and named it the LK-1 after himself. 1] This mobile phone consisted of a relatively small handset equipped with an antenna and rotary dial, and communicated with a base station. The LK-1 weighed 3 kilograms and could operate in a range of up to 20 or 30 kilometers. The battery lasted 20 to 30 hours. The LK-1 was depicted in popular Soviet magazines as Nauka i zhizn. Kupriyanovich patented his mobile phone in the same year. The base station serving the LK-1 (called ATR, or Automated Telephone Radiostation) could connect to local telephone network and serve several customers. During 1958, Kupriyanovich produced a " pocket" version. The weight of mproved lighter handset was about 500 grams. In 1964 Improved Mobile Telephone Service was introduced with additional channels and more automatic handling of calls to the public switched telephone network. Even the addition of radio channels in three bands was insufficient to meet demand for vehicle-mounted mobile radio systems. In 1969, a patent for a wireless phone using an acoustic coupler for incoming calls was issued in US Patent Number 3, 449, 750 to George Sweigert of Euclid, Ohio on June 10, 1969, but did not include dialing a number for outgoing calls. Cellular concepts n December 1947, Douglas H.

Ring and W. Rae Young, Bell Labs engineers, proposed hexagonal cells for mobile phones in vehicles. Philip T. Porter, also of Bell Labs, proposed that the cell towers be at the corners of the hexagons rather than the centers and have directional antennas that would transmit/receive in three directions

(see picture at right) into three adjacent hexagon cells. At this stage the technology to implement the ideas did not exist nor had the frequencies had been allocated and it would be some years until Richard H. Frenkiel and Joel S. Engel of Bell Labs developed the electronics to achieve this in the 1960s.

In all these early examples, a mobile phone had to stay within the coverage area serviced by one base station throughout the phone call, i. e. there was no continuity of service as the phones moved through several cell areas. The concepts of frequency reuse and handoff, as well as a number of other concepts that formed the basis of modern cell phone technology, were described in the 1970s. In 1970 Amos E. Joel, Jr. , a Bell Labs engineer, invented an automatic " call handoff" system to allow mobile phones to move through several cell areas during a single conversation without interruption.

In December 1971, AT&T submitted a proposal for cellular service to the Federal Communications Commission (FCC). After years of hearings, the FCC approved the proposal in 1982 forAdvanced Mobile Phone System (AMPS) and allocated frequencies in the 824–894 MHz band. Analog AMPS was eventually superseded by Digital AMPS in 1990. A cellular telephone switching plan was described by Fluhr and Nussbaum in 1973, and a cellular telephone data signaling system was described in 1977 by Hachenburg et al. In 1979 a U. S. Patent 4, 152, 647 was issued to Charles A. Gladden and Martin H.

Parelman, of Las Vegas for an emergency cellular system for rapid deployment in areas where there was no cellular service. Emergence of

Commercial Mobile Phone Services Alongside the early developments outlined above, a different technology was also growing in popularity. Two-way mobile radios (known as mobile rigs) were used in vehicles such as taxicabs, police cruisers, and ambulances, but were not mobile phones, because they were not connected to the telephone network. The first fully automated mobile phone system for vehicles was launched in Sweden in 1960.

Named MTA (Mobile Telephone system A), it allowed calls to be made and received in the car using a rotary dial. The car phone could also be paged. Calls from the car were direct dial, whereas incoming calls required an operator to determine which base station the phone was currently at. It was developed by Sture Lauren and other engineers at Televerket network operator. Ericsson provided the switchboard while Svenska Radioaktiebolaget (SRA) andMarconi provided the telephones and base station equipment. MTA phones consisted of vacuum tubes and relays, and weighed 40 kg.

In 1962, an upgraded version called Mobile System B (MTB) was introduced. This was a push-button telephone, and used transistors and DTMF signaling to improve its operational reliability. In 1971 the MTD version was launched, opening for several different brands of equipment and gaining commercial success. The network remained open until 1983 and still had 600 customers when it closed. In 1958 development began on a similar system for motorists in the USSR. The " Altay" national civil mobile phone service was based on Soviet MRT-1327 standard.

The main developers of the Altay system were the Voronezh Science Research Institute of Communications (VNIIS) and the State Specialized Project Institute (GSPI). In 1963 the service started in Moscow, and by 1970 was deployed in 30 cities across the USSR. Versions of the Altay system are still in use today as a trunking system in some parts of Russia. In 1959 a private telephone company located in Brewster, Kansas, USA, the S&T Telephone Company, (still in business today) with the use of Motorola Radio Telephone equipment and a private tower facility, offered to the public mobile telephone services in that local area of NW Kansas.

This system was a direct dial up service through their local switchboard, and was installed in many private vehicles including grain combines, trucks, and automobiles. For some as yet unknown reason, the system, after being placed online and operated for a very brief time period, was shut down. The management of the company was immediately changed, and the fully operable system and related equipment was immediately dismantled in early 1960, not to be seen again. In 1966, Bulgaria presented the pocket mobile automatic phone RAT-0, 5 combined with a base station RATZ-10 (RATC-10) on Interorgtechnika-66 international exhibition.

One base station, connected to one telephone wire line, could serve up to six customers. One of the first successful public commercial mobile phone networks was the ARP network in Finland, launched in 1971. Posthumously, ARP is sometimes viewed as a zero generation(0G) cellular network, being slightly above previous proprietary and limited coverage networks. Handheld Cellphone On April 3, 1973, Martin Cooper, a Motorola researcher and

executive, made the first analogue mobile phone call using a heavy prototype model. He called Dr. Joel S. Engel of Bell Labs.

There was a long race between Motorola and Bell Labs to produce the first portable mobile phone. Cooper is the first inventor named on " Radio telephone system" filed on October 17, 1973 with the US Patent Office and later issued as US Patent 3, 906, 166. John F. Mitchell, Motorola's chief of portable communication products (and Cooper's boss) was also named on the patent. He successfully pushed Motorola to develop wireless communication products that would be small enough to use anywhere and participated in the design of the cellular phone.

First generation: Cellular networks The technological development that distinguished the First Generation mobile phones from the previous generation was the use of multiple cell sites, and the ability to transfer calls from one site to the next as the user travelled between cells during a conversation. The first commercially automated cellular network (the 1G generation) was launched in Japan by NTT in 1979. The initial launch network covered the full metropolitan area of Tokyo's over 20 million inhabitants with a cellular network of 23 base stations.

Within five years, the NTT network had been expanded to cover the whole population of Japan and became the first nation-wide 1G network. Analog Motorola DynaTAC 8000XAdvanced Mobile Phone Systemmobile phone as of 1983 The next 1G network to launch was the Nordic Mobile Telephone (NMT) system in Denmark, Finland, Norway and Sweden in 1981. NMT was the first mobile phone network to feature international roaming.

The Swedish electrical engineer Osten Makitalo started work on this vision in 1966, and is considered to be the father of the NMT system, and by some the father of the cellular phone itself.

The NMT installations were based on the Ericsson AXE digital exchange nodes. Several other countries also launched 1G networks in the early 1980s including the UK, Mexico and Canada. A two year trial started in 1981 in Baltimore and Washington DC with 150 users and 300 Motorola DynaTAC pre-production phones. This took place on a seven tower cellular network that covered the area. The DC area trial turned into a commercial services in about 1983 with fixed cellular car phones also built by Motorola. They later added the 8000X to their Cellular offerings.

A similar trial and commercial launch also took place in Chicago by Ameritech in 1983 using the famous first hand-held mobile phone Motorola DynaTAC. AT; T's 1971 proposal for Advanced Mobile Phone System (AMPS) was approved by the FCC in 1982 and frequencies were allocated in the 824–894 MHz band. Analog AMPS was superseded by Digital AMPS in 1990. In1984, Bell Labs developed modern commercial cellular technology (based, to a large extent, on the Gladden, Parelman Patent), which employed multiple, centrally controlled base stations (cell sites), each providing service to a small cell area.

The sites were set up so that cells partially overlapped and different base stations operated using the same frequencies with little or no interference. Vodafone made the UK's first mobile call at a few minutes past midnight on 1 January 1985. The technology in these early networks was pushed to the

limit to accommodate increasing usage. The base stations and the mobile phones utilised variable transmission power, which allowed range and cell size to vary. As the system expanded and neared capacity, the ability to reduce transmission power allowed new cells to be added, resulting in more, smaller cells and thus more capacity.

The evidence of this growth can still be seen in the many older, tall cell site towers with no antennae on the upper parts of their towers. These sites originally created large cells, and so had their antennae mounted atop high towers; the towers were designed so that as the system expanded—and cell sizes shrank—the antennae could be lowered on their original masts to reduce range. Second generation: Digital networks In the 1990s, the 'second generation' (2G) mobile phone systems emerged, primarily using the GSM standard.

These differed from the previous generation by using digital instead of analog transmission, and also fast out-of-band phone-to-network signaling. The rise in mobile phone usage as a result of 2G was explosive and this era also saw the advent of prepaid mobile phones In 1991 the first GSM network (Radiolinja) launched in Finland. In general the frequencies used by 2G systems in Europe were higher than those in America, though with some overlap. For example, the 900 MHz frequency range was used for both 1G and 2G systems in Europe, so the 1G systems were rapidly closed down to make space for the 2G systems.

In America the IS-54 standard was deployed in the same band as AMPS and displaced some of the existing analog channels. Coinciding with the

introduction of 2G systems was a trend away from the larger " brick" phones toward tiny 100–200g hand-held devices. This change was possible not only through technological improvements such as more advanced batteries and more energy-efficient electronics, but also because of the higher density of cell sites to accommodate increasing usage. The latter meant that the average distance transmission from phone to the base station shortened, leading to increased battery life whilst on the move.

Personal Handy-phone System mobiles and modems used in Japanaround 1997–2003 The second generation introduced a new variant of communication called SMS or text messaging. It was initially available only on GSM networks but spread eventually on all digital networks. The first machine-generated SMS message was sent in the UK on 3 December 1992 followed in 1993 by the first person-to-person SMS sent in Finland. The advent of prepaid services in the late 1990s soon made SMS the communication method of choice amongst the young, a trend which spread across all ages. G also introduced the ability to access media content on mobile phones. In 1998 the first downloadable content sold to mobile phones was the ring tone, launched by Finland's Radiolinja (now Elisa). Advertising on the mobile phone first appeared in Finland when a free daily SMS news headline service was launched in 2000, sponsored by advertising. Mobile payments were trialled in 1998 in Finland and Sweden where a mobile phone was used to pay for a Coca Cola vending machine and car parking. Commercial launches followed in 1999 in Norway.

The first commercial payment system to mimic banks and credit cards was launched in the Philippines in 1999 simultaneously by mobile operators Globe and Smart. The first full internet service on mobile phones was introduced by NTT DoCoMo in Japan in 1999. Third Generation: High Speed IP Data Network As the use of 2G phones became more widespread and people began to utilize mobile phones in their daily lives, it became clear that demand for data services (such as access to the internet) was growing.

Furthermore, experience from fixed broadband services showed there would also be an ever increasing demand for greater data speeds. The 2G technology was nowhere near up to the job, so the industry began to work on the next generation of technology known as 3G. The main technological difference that distinguishes 3G technology from 2G technology is the use of packet switching rather than circuit switching for data transmission. [19] In addition, the standardization process focused on requirements more than technology (2 Mbit/s maximum data rate indoors, 384 kbit/s outdoors, for example).

Inevitably this led to many competing standards with different contenders pushing their own technologies, and the vision of a single unified worldwide standard looked far from reality. The standard 2G CDMA networks became 3G compliant with the adoption of Revision A to EV-DO, which made several additions to the protocol whilst retaining backwards compatibility: ??? the introduction of several new forward link data rates that increase the maximum burst rate from 2. 45 Mbit/s to 3. 1 Mbit/s. ??? protocols that would decrease connection establishment time. ??? he ability for more than one

mobile to share the same time slot. ??? the introduction of QoS flags. All these were put in place to allow for low latency, low bit rate communications such as VoIP. [20] The first pre-commercial trial network with 3G was launched by NTT DoCoMo in Japan in the Tokyo region in May 2001. NTT DoCoMo launched the first commercial 3G network on October 1, 2001, using the WCDMA technology. In 2002 the first 3G networks onthe rivalCDMA2000 1xEV-DO technology were launched by SK Telecom and KTF in South Korea, and Monet in the USA. Monet has since gone bankrupt.

By the end of 2002, the second WCDMA network was launched in Japan by Vodafone KK (now Softbank). European launches of 3G were in Italy and the UK by the Three/Hutchison group, on WCDMA. 2003 saw a further 8 commercial launches of 3G, six more on WCDMA and two more on the EV-DO standard. During the development of 3G systems, 2. 5G systems such as CDMA2000 1x and GPRS were developed as extensions to existing 2G networks. These provide some of the features of 3G without fulfilling the promised high data rates or full range of multimedia services. CDMA2000-1X delivers theoretical maximum data speeds of up to 307 kbit/s.

Just beyond these is the EDGE system which in theory covers the requirements for 3G system, but is so narrowly above these that any practical system would be sure to fall short. The high connection speeds of 3G technology enabled a transformation in the industry: for the first time, media streaming of radio (and even television) content to 3G handsets became possible , with companies such as RealNetworks and Disney among the early pioneers in this type of offering. In the mid 2000s an evolution of

3G technology begun to be implemented, namely High-Speed Downlink Packet Access (HSDPA).

It is an enhanced 3G (third generation) mobile telephony communications protocol in the High-Speed Packet Access (HSPA) family, also coined 3. 5G, 3G+ or turbo 3G, which allows networks based on Universal Mobile Telecommunications System (UMTS) to have higher data transfer speeds and capacity. Current HSDPA deployments support down-link speeds of 1. 8, 3. 6, 7. 2 and 14. 0 Mbit/s. Further speed increases are available with HSPA+, which provides speeds of up to 42 Mbit/s downlink and 84 Mbit/s with Release 9 of the 3GPP standards.

By the end of 2007 there were 295 Million subscribers on 3G networks worldwide, which reflected 9% of the total worldwide subscriber base. About two thirds of these were on the WCDMA standard and one third on the EV-DO standard. The 3G telecoms services generated over 120 Billion dollars of revenues during 2007 and at many markets the majority of new phones activated were 3G phones. In Japan and South Korea the market no longer supplies phones of the second generation. Earlier in the decade there were doubts about whether 3G might happen, and also whether 3G might become a commercial success.

By the end of 2007 it had become clear that 3G was a reality and was clearly on the path to become a profitable venture. Growth of Mobile Broadband and the emergence of 4G Although mobile phones had long had the ability to access data networks such as the Internet, it was not until the widespread availability of good quality 3G coverage in the mid 2000s that specialized

devices appeared to access the mobile internet. The first such devices, known as " dongles", plugged directly into a computer through the USB port.

Another new class of device appeared subsequently, the so-called " compact wireless router" such as the Novatel MiFi, which makes 3G internet connectivity available to multiple computers simultaneously over Wi-Fi, rather than just to a single computer via a USB plug-in. Such devices became especially popular for use with laptop computers due to the added portability they bestow. Consequently, some computer manufacturers started to embed the mobile data function directly into the laptop so a dongle or MiFi wasn't needed.

Instead, the SIM card could be inserted directly into the device itself to access the mobile data services. Such 3G-capable laptops became commonly known as " netbooks". Other types of data-aware devices followed in the netbook's footsteps. By the beginning of 2010, E-readers, such as the Amazon Kindle and the Nook from Barnes & Noble, had already become available with embedded wireless internet, and Apple Computer had announced plans for embedded wireless internet on its iPad tablet devices beginning that Fall.

By 2009, it had become clear that, at some point, 3G networks would be overwhelmed by the growth of bandwidth-intensive applications like streaming media. Consequently, the industry began looking to data-optimized 4th-generation technologies, with the promise of speed improvements up to 10-fold over existing 3G technologies. The first two commercially available technologies billed as 4G were the WiMAX standard

(offered in the U. S. by Sprint) and the LTE standard, first offered in Scandinavia by TeliaSonera.

One of the main ways in which 4G differed technologically from 3G was in its elimination of circuit switching, instead employing an all-IP network. Thus, 4G ushered in a treatment of voice calls just like any other type of streaming audio media, utilizing packet switching over internet, LAN or WAN networks via VoIP. Introduction: The effect mobile phone radiation has on human health is the subject of recent interest and study, as a result of the enormous increase in mobile phone usage throughout the world (as of June 2009, there were more than 4. billion users worldwide. Mobile phones useelectromagnetic radiation in the microwave range, which some believe may be harmful to human health. Other digital wireless systems, such as data communication networks, produce similar radiation. A large body of research exists, both epidemiological and experimental, in non-human animals and in humans, of which the majority shows no definite causative relationship between exposure to mobile phones and harmful biological effects in humans.

This is often paraphrased simply as the balance of evidence showing no harm to humans from mobile phones, although a significant number of individual studies do suggest such a relationship, or are inconclusive. The World Health Organization, based upon the majority view of scientific and medical communities, has stated that cancer is unlikely to be caused by cellular phones or their base stations and that reviews have found no

convincing evidence for other health effects. The WHO expects to make recommendations about mobile phones in 2010.

Some national radiation advisory authorities have recommended measures to minimize exposure to their citizens as a precautionary approach. Effects of Excessive Use of Mobile Phone: Many scientific studies have investigated possible health effects of mobile phone radiations. These studies are occasionally reviewed by some scientific committees to assess overall risks. A recent assessment was published in 2007 by the European Commission Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR).

It concludes that the three lines of evidence, viz. animal, in vitro, and epidemiological studies, indicate that " exposure to RF fields is unlikely to lead to an increase in cancer in humans. " Radiation Absorption: Part of the radio waves emitted by a mobile telephone handset are absorbed by the human head. The radio waves emitted by a GSM handset can have a peak power of 2 watts, and a US analogue phone had a maximum transmit power of 3. 6 watts. Other digital mobile technologies, such as CDMA2000 and D-AMPS, use lower output power, typically below 1 watt.

The maximum power output from a mobile phone is regulated by the mobile phone standard and by the regulatory agencies in each country. In most systems the cellphone and thebase station check reception quality and signal strength and the power level is increased or decreased automatically, within a certain p, to accommodate different situations, such as inside or outside of buildings and vehicles. The rate at which radiation is absorbed by

the human body is measured by the Specific Absorption Rate (SAR), and its maximum levels for modern handsets have been set by governmental regulating agencies in many countries.

In the USA, the Federal Communications Commission (FCC) has set a SAR limit of 1. 6 W/kg, averaged over a volume of 1 gram of tissue, for the head. In Europe, the limit is 2 W/kg, averaged over a volume of 10 grams of tissue. SAR values are heavily dependent on the size of the averaging volume. Without information about the averaging volume used, comparisons between different measurements cannot be made. Thus, the European 10-gram ratings should be compared among themselves, and the American 1-gram ratings should only be compared among themselves.

SAR data for specific mobile phones, along with other useful information, can be found directly on manufacturers' websites, as well as on third party web sites. Thermal effects One well-understood effect of microwave radiation is dielectric heating, in which any dielectric material (such as living tissue) is heated by rotations of polar molecules induced by the electromagnetic field. In the case of a person using a cell phone, most of the heating effect will occur at the surface of the head, causing its temperature to increase by a fraction of a degree.

In this case, the level of temperature increase is an order of magnitude less than that obtained during the exposure of the head to direct sunlight. The brain's blood circulation is capable of disposing of excess heat by increasing local blood flow. However, the cornea of the eye does not have this temperature regulation mechanism and exposure of 2–3 hours duration

has been reported to produce cataracts in rabbits' eyes at SAR values from 100-140W/kg, which produced lenticular temperatures of 41°C.

There were no cataracts detected in the eyes of monkeys exposed under similar conditions. [8] Premature cataracts have not been linked with cell phone use, possibly because of the lower power output of mobile phones Non-thermal effects The communications protocols used by mobile phones often result in low-frequency pulsing of the carrier signal. Whether these modulations have biological significance has been subject to debate. Some researchers have argued that so-called " non-thermal effects" could be reinterpreted as a normal cellular response to an increase in temperature.

The German biophysicist Roland Glaser, for example, has argued that there are several thermo receptor molecules in cells, and that they activate a cascade of second and third messenger systems, gene expression mechanisms and production of heat shock proteins in order to defend the cell against metabolic cellstresscaused by heat. The increases in temperature that cause these changes are too small to be detected by studies such as REFLEX, which base their whole argument on the apparent stability of thermal equilibrium in their cell cultures.

Other researchers believe the stress proteins are unrelated to thermal effects, since they occur for both extremely low frequencies (ELF) and radio frequencies (RF), which have very different energy levels. Blood-brain barrier effects Swedish researchers from Lund University (Salford, Brun, Perrson, Eberhardt, and Malmgren) have studied the effects of microwave radiation on the rat brain. They found a leakage ofalbumin into the brain via a

permeated blood-brain barrier. This confirms earlier work on the blood-brain barrier by Allan Frey, Oscar and Hawkins, and Albert and Kerns.

Other groups have not confirmed these findings in cell or animal studies. Cancer In 2006 a large Danish study about the connection between mobile phone use and cancer incidence was published. It followed over 420, 000 Danish citizens for 20 years and showed no increased risk of cancer. The German Federal Office for Radiation Protection (BfS) considers this report inconclusive. The following studies of long time exposure have been published: ??? The 13 nation INTERPHONE project - the largest study of its kind ever undertaken - has now been published and did not find a solid link between mobile phones and brain tumours.

The International Journal of Epidemiology published a combined data analysis from a multi national population-based case-control study of glioma and meningioma, the most common types of brain tumour. The authors reported the following conclusion: Overall, no increase in risk of glioma or meningioma was observed with use of mobile phones. There were suggestions of an increased risk of glioma at the highest exposure levels, but biases and error prevent a causal interpretation. The possible effects of long-term heavy use of mobile phones require further investigation.

In the press release accompanying the release of the paper, Dr Christopher Wild, Director of the International Agency for Research on Cancer (IARC) said: An increased risk of brain cancer is not established from the data from Interphone. However, observations at the highest level of cumulative call time and the changing patterns of mobile phone use since the period studied

by Interphone, particularly in young people, mean that further investigation of mobile phone use and brain cancer risk is merited.

A number of independent health and government authorities have commented on this important study including The Australian Centre for Radiofrequency Bioeffects Research (ACRBR) which said in a statement that: Until now there have been concerns that mobile phones were causing increases in brain tumours. Interphone is both large and rigorous enough to address this claim, and it has not provided any convincing scientific evidence of an association between mobile phone use and the development of glioma or meningioma.

While the study demonstrates some weak evidence of an association with the highest tenth of cumulative call time (but only in those who started mobile phone use most recently), the authors conclude that biases and errors limit the strength of any conclusions in this group. It now seems clear that if there was an effect of mobile phone use on brain tumour risks in adults, this is likely to be too small to be detectable by even a large multinational study of the size of Interphone.

The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA)which said in a statement that: On the basis of current understanding of the relationship between brain cancer and use of mobile phones, including the recently published data from the INTERPHONE study, ARPANSA: concludes that currently available data do not warrant any general recommendation to limit use of mobile phones in the adult population, continues to inform those concerned about potential health

effects that they may limit their exposure by reducing call time, by making calls where reception is good, by using hands-free devices or speaker options, or by texting; and recommends that, due to the lack of any data relating to children and long term use of mobile phones, parents encourage their children to limit their exposure by reducing call time, by making calls where reception is good, by using hands-free devices or speaker options, or by texting.

The Cancer Council Australia said in a statement that it cautiously welcomed the results of the largest international study to date into mobile phone use, which has found no evidence that normal use of mobile phones, for a period up to 12 years, can cause brain cancer. Chief Executive Officer, Professor Ian Olver, said findings from the Interphone study, conducted across 13 countries including Australia, were consistent with other research that had failed to find a link between mobile phones and cancer. This supports previous research showing mobile phones don’t damage cell DNA, meaning they can’t cause the type of genetic mutations that develop into cancer,” Professor Olver said.

However, it has been suggested that electromagnetic fields associated with mobile phones may play a role in speeding up the development of an existing cancer. The Interphone study found no evidence to support this theory. ??? A Danish study (2004) that took place over 10 years found no evidence to support a link. However, this study has been criticized for collecting data from subscriptions and not necessarily from actual users. It is known that some subscribers do not use the phones themselves but provide

them for family members to use. That this happens is supported by theobservationthat only 61% of a small sample of the subscribers reported use of mobile phones when responding to a questionnaire. ???

A Swedish study (2005) that draws the conclusion that " the data do not support the hypothesis that mobile phone use is related to an increased risk of glioma or meningioma. " ??? A British study (2005) that draws the conclusion that " The study suggests that there is no substantial risk of acoustic neuroma in the first decade after starting mobile phone use. However, an increase in risk after longer term use or after a longer lag period could not be ruled out. " ??? A German study (2006) that states " In conclusion, no overall increased risk of glioma or meningioma was observed among these cellular phone users; however, for long-term cellular phone users, results need to be confirmed before firm conclusions can be drawn. " ???

A joint study conducted in northern Europe that draws the conclusion that " Although our results overall do not indicate an increased risk of glioma in relation to mobile phone use, the possible risk in the most heavily exposed part of the brain with long-term use needs to be explored further before firm conclusions can be drawn. " Other studies on cancer and mobile phones are: ??? A Swedish scientific team at the Karolinska Institute conducted an epidemiological study (2004) that suggested that regular use of a mobile phone over a decade or more was associated with an increased risk of acoustic neuroma, a type of benign brain tumor. The increase was not noted in those who had used phones for fewer than 10 years. ??? The

INTERPHONE study group from Japan published the results of a study of brain tumour risk and mobile phone use.

They used a new approach: determining the SAR inside a tumour by calculating the radio frequency field absorption in the exact tumour location. Cases examined included glioma, meninigioma, and pituitary adenoma. They reported that the overall odds ratio (OR) was not increased and that there was no significant trend towards an increasing OR in relation to exposure, as measured by SAR. In 2007, Dr. Lennart Hardell, from Orebro University in Sweden, reviewed published epidemiological papers (2 cohort studies and 16 case-control studies) and found that: ??? Cell phone users had an increased risk of malignant gliomas. ??? Link between cell phone use and a higher rate of acoustic neuromas. ???

Tumors are more likely to occur on the side of the head that the cell handset is used. ??? One hour of cell phone use per day significantly increases tumor risk after ten years or more. In a February 2008 update on the status of the INTERPHONE study IARC stated that the long term findings ‘…could either be causal or artifactual, related to differential recall between cases and controls. ’ A self-published and non-peer reviewed meta-study by Dr. Vini Khurana, an Australian neurosurgeon, presented what it termed " increasing body of evidence ... for a link between mobile phone usage and certain brain tumours" and that it " is anticipated that this danger has far broader public health ramifications than asbestos andsmoking".

This was criticised as ‘… an unbalanced analysis of the literature, which is also selective in support of the author’s claims. ’ A publication titled " Public

health implications of wireless technologies" cites that Lennart Hardell found age is a significant factor. The report repeated the finding that the use of cell phones before age 20 increased the risk of brain tumors by 5. 2, compared to 1. 4 for all ages. A review by Hardell et al. concluded that current mobile phones are not safe for long-term exposure. In a time trends study in Europe, conducted by the Institute of Cancer Epidemiology in Copenhagen, no significant increase in brain tumors among cell phone users was found between the years of 1998 and 2003. The lack of a trend change in incidence from 1998 to 2003 suggests that the induction period relating mobile phone use to brain tumors exceeds 5–10 years, the increased risk in this population is too small to be observed, the increased risk is restricted to subgroups of brain tumors or mobile phone users, or there is no increased risk. " Cognitive effects A 2009 study examined the effects of exposure to radiofrequency radiation (RFR) emitted by standard GSM cell phones on the cognitive functions of humans. The study confirmed longer (slower) response times to a spatial working memory task when exposed to RFR from a standard GSM cellular phone placed next to the head of male subjects, and showed that longer duration of exposure to RFR may increase the effects on performance.

Right-handed subjects exposed to RFR on the left side of their head on average had significantly longer response times when compared to exposure to the right side and sham-exposure. [edit]Electromagnetic hypersensitivity Main article: Electromagnetic hypersensitivity Some users of mobile handsets have reported feeling several unspecific symptoms during and after its use; ranging from burning and tingling sensations in the skin of the head and extremities, fatigue, sleep disturbances, dizziness, loss of

mental attention, reaction

times and memory retentiveness, headaches, malaise, tachycardia (heart pal pitations), to disturbances of the digestive system.

Reports have noted that all of these symptoms can also be attributed to stress and that current research cannot separate the symptoms fromnocebo effects. Genotoxic effects A large early 2009 meta-study of 101 scientific publications on genotoxicity of RF electromagnetic fields shows that 49 report a genotoxic effect and 42 do not. Research published in 2004 by a team at the University of Athens had a reduction in reproductive capacity in fruit flies exposed to 6 minutes of 900 MHz pulsed radiation for five days. Subsequent research, again conducted on fruit flies, was published in 2007, with the same exposure pattern but conducted at both 900 MHz and 1800 MHz, and had similar changes in reproductive capacity with no significant difference between the two frequencies.

Following additional tests published in a third article, the authors stated they thought their research suggested the changes were “…due to degeneration of large numbers of egg chambers after DNA fragmentation of their constituent cells …”. Australian research conducted in 2009 by subjecting in vitrosamples of human spermatozoa to radio-frequency radiation at 1. 8 GHz and specific absorption rates (SAR) of 0. 4 to 27. 5 W/kg showed a correlation between increasing SAR and decreased motility and vitality in sperm, increased oxidative stress and 8-Oxo-2'-deoxyguanosine markers, stimulating DNA base adduct formation and increased DNA fragmentation. In 1995, in the journal Bioelectromagnetics, Henry Lai and Narenda P. Singh

reported damaged DNA after two hours of microwave radiation at levels deemed safe according to government standards.

Later, in December 2004, a pan-European study named REFLEX (Risk Evaluation of Potential Environmental Hazards from Low Energy Electromagnetic Field (EMF) Exposure Using Sensitive in vitro Methods), involving 12 collaborating laboratories in several countries showed some compelling evidence of DNA damage of cells in in-vitro cultures, when exposed between 0. 3 to 2 watts/kg, whole-sample average. There were indications, but not rigorous evidence of other cell changes, including damage to chromosomes, alterations in the activity of certain genes and a boosted rate of cell division. Reviews of in vitro genotoxicity studies have generally concluded that RF is not genotoxic and that studies reporting positive effects had experimental deficiences. Sleep and EEG effects

Sleep, EEG and waking rCBF have been studied in relation to RF exposure for a decade now, and the majority of papers published to date have found some form of effect. While a Finnish study failed to find any effect on sleep or other cognitive function from pulsed RF exposure, most other papers have found significant effects on sleep. Two of these papers found the effect was only present when the exposure was pulsed (amplitude modulated), and one early paper actually found that sleep quality (measured by the amount of participants' broken sleep) actually improved. While some papers were inconclusive or inconsistent, a number of studies have now demonstrated reversible EEG and rCBF alterations from exposure to pulsed RF exposure.

German research from 2006 found that statistically significant EEG changes could be consistently found, but only in a relatively low proportion of study participants (12 - 30%). Health Hazards of Base Stations Another area of concern is the radiation emitted by the fixed infrastructure used in mobile telephony, such as base stations and their antennas, which provide the link to and from mobile phones. This is because, in contrast to mobile handsets, it is emitted continuously and is more powerful at close quarters. On the other hand, field intensities drop rapidly with distance away from the base of the antenna because of the attenuation of power with the square of distance. Base station emissions must comply with safety guidelines (see Safety standards and licensing below).

Some countries however (such as South Africa for example) have no health regulations governing the placement of base stations. Several surveys have found increases of symptoms depending upon proximity to electromagnetic sources such as mobile phone base stations. A 2002 survey study by Santini et al. in France found a variety of self-reported symptoms for people who reported that they were living within 300 metres (984 ft) of GSM cell towers in rural areas, or within 100 m (328 ft) of base stations in urban areas. Fatigue, headache, sleep disruption and loss of memory were among the symptoms reported. Similar results have been obtained with GSM cell towers in Spain, Egypt, Poland and Austria.

No major studies have been reported in which health effects did not occur on actual populations living near mobile base stations. However, there are significant challenges in conducting studies of populations near base

stations, especially in assessment of individual exposure. Self-report studies can also be vulnerable to the nocebo effect. A study conducted at the University of Essex and another in Switzerland concluded that mobile phone masts were unlikely to be causing these short term effects in a group of volunteers who complained of such symptoms. The Essex study has been criticised as being skewed due to drop-outs of test subjects, although these criticisms were answered by the authors.

As technology progresses and data demands have increased on the mobile network, towns and cities have seen the number of towers increase sharply, including 3G towers which work with larger bandwidths. Many measurements and experiments have shown that transmitter power levels are relatively low - in modern 2G antennas, in the range of 20 to 100 W, with the 3G towers causing less radiation than the already present 2G network. An average radiation power output of 3 W is used. The use of 'micro-cell geometries' (large numbers of transmitters in an area but with each individual transmitter running very low power) inside cities has decreased the amount of radiated power even further.

The radiation exposure from these antennas, while generally low level, is continuous. Experts consulted by France consider it is mandatory that main antenna axis not to be directly in front of a living place at a distance shorter than 100 meters. This recommendation was modified in 2003 to say that antennas located within a 100-metre radius of primary schools or childcare facilities should be better integrated into the cityscape and was not included in a 2005 expert report. Occupational health hazards Telecommunication

workers who spend time at a short distance from the active equipment, for the purposes of testing, maintenance, installation, etcetera, may be at risk of much greater exposure than the general population.

Many times base stations are not turned off during maintenance, but the power being sent through to the antennas is cut off, so that the workers do not have to work near live antennas. A variety of studies over the past 50 years have been done on workers exposed to high RF radiation levels; studies including radar laboratory workers, military radar workers, electrical workers, and amateur radio operators. Most of these studies found no increase in cancer rates over the general population or a control group. Many positive results could have been attributed to other workenvironmentc