NEW HORIZON IN MOBILE COMMUNICATIONS NETWORKS PLANNING

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Abstract

The new horizon in mobile communication network planning is a developed study on mobile communication services in developed and developing countries. The aim of the study is to introduce a method to predict the best country for investment in mobile communication services and industry on which the mobile communication networks planning depend. For this purpose the past and current mobile communication services are studied. The data are collected from the communication market reports of developed and developing countries and the questionnaire that was carried out in Iraq. The data are analysed using the SPSS program. The outcome is a regression model that explains the relation between the dependent variable (expenditure on mobile communication services) and the independent variables (age, gender, academic standing, money paid for mobile phone handset, interesting in mobile phone having ability to play movies, maximum price paid for mobile phone that have ability to play movies, the rating of mobile phone service quality, problems during the usage of internet on mobile phone handset, daily usage of mobile phone services, and the satisfaction in mobile phone customer support) which are the instruments used to achieve outcome. The model of the regression equation used is:

$Y = 3.703 - 0.123X_6 + 1.372\ X_9 + 0.001X_{10} - 0.173X_{12} – 0.675X_{19} - 0.010\ X_{22} - 0.271X_{24.}$

where Y represent the dependent variable and (X1 to X24) are the independent variables.

The research model will contribute toward more robust decision making and better strategic planning

The research focuses on mobile communications services in seven countries three from the developed world and four are from the developing world. Data sources for this research relies primarily which on the information obtained from the questionnaire (in English & Arabic languages targeted at operators and users of mobile communications services), a review of published information and market reports of seven countries (USA, UK, Australia, India, Egypt, Syria and Iraq). Such data include technical papers, financial reports and industry specific data. This research also provides an overview of the past history of the product in terms of (value, price trends, application trends, leading producers and their market shares).

The historical overview of mobile communication generations from 1G to Beyond 4G (B4G) confirms that the successive developments of new generation is based on outpacing the limitations of the previous one. The results show that more services and smooth global roaming at low cost are possible.

This research explains that the quality of mobile communications services depends on the requirements of consumers. The communications services refer to mobile services available to the consumer anytime and anywhere at high transmission speed, using advanced technologies such as Orthogonal Frequency Division Multiplexing (OFDM), MIMO, WiMAX, that allow the internet and mobile services providers to offer broadband services at hundreds of Mbps, with high quality voice, video & multimedia over the internet. Over the past decade, wireless communications has shown exponential growth and will certainly continue to witness spectacular developments due to the emergence of new interactive multimedia applications and highly integrated systems driven by rapid growth in information services and microelectronic devices.

At this time, broadband data access at high transmission rates are needed to provide users with packet-based services. The next generation wireless system will consist of complementary systems with a set of different standards and technologies along with different requirements and complementary capabilities, that will offer users ubiquitous wireless connectivity between mobile and desktop computers, games systems, cellular phones, a high network capacity, and throughput at low cost.

Studying the market reports of US, UK, Australia, India, Egypt, Syria, and Iraq explains that the future generation of mobile communications is based on the broadband access technologies which gives high quality voice and video services, the mobile Internet phone is a solution of all communications requirements of the people today, because most of the people always are moving, so that the best way to stay in touch with others is through the mobile internet phone.

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Contents

CHAPTER FIVE: CONCLUSIONS and FUTURE WORK

List of Tables

List of Figures

Abbreviations and acronym

WCDMA	Wide-band Code-Division Multiple Access
WLAN	Wide-band Local Area Network
GPS	Global Positioning System.
UWB	Ultra Wide Band
ATM	Asynchronous Transfer Mode,
GSM	Global System for Mobile Communications
GPRS	General Packet Radio Service
UMTS	Universal Mobile Telecommunications System
ITU	International Telecommunication Union,
TDMA	Time Division Multiple access
OFDM	: Orthogonal Frequency Division Multiplexing
LMDS	Local Multipoint distribution system
MC-CDMA	Multi-Carrier Code Division Multiple Access
LAS-CDMA	Large Area Synchronized Code Division Multiple Access
HSDPA	High-Speed Downlink Packet Access
HSUPA	High-Speed Uplink Packet Access
H.S	High Significant
IN.S	Insignificant
S	Significant
WWWW	(worldwide wireless web)
IPv6	Internet Protocol version 6
QoS	Quality of Service
SPSS	Statistical Package for Social science
GNSS	Global Navigation Satellite Systems
BOCP	Bandwidth Optimization Control Protocol

CHAPTER ONE: research overview

1.1 Introduction

The industry of mobile communications in the world has been witnessing a significant growth. More than fifty percent of the population in the world are using mobile communication services. The number of subscribers in 2013 are expected to pass 3.4 billions. There are still many people appreciate the economic and social benefits of mobile communication technology but are unable to use it, which explaining a good opportunity for future growth in the industry to expand the range of products and services of mobile communications. In next few years the number of subscribers will increased and expected to pass 4 billions in 2018. [72]

The mobile communication services started in Iraq after the war in 2003 and the penetration rate reached to more than (80%) in 2013 [47]. In light of the above mentioned information it therefore became evident that there is a need to explore the factors influencing the mobile communication services usage, industry and investment. Based on the discussion with many experts a set of factors which are relevant to the study are chosen and the effect of these factors are tested(age, gender, academic standing, payment for ordinary mobile phone handset, reasons of upgrading the mobile phone, payment for developed mobile phone handset, money spent on mobile phone services monthly, assessment of mobile services quality, importance of mobile communication in your life, criteria of selecting mobile phone handset, suitability of the price of mobile communication services, satisfaction with mobile communication customer support, factors increasing the usage of mobile phone services). A regression analysis was applied to develop a mathematical model. The model can be used by mobile services providers and investors to predict the best place for investment. The model also gives insight into the behaviour of the mobile service users so as to aid the effective development in marketing plans as to reach the market potential suitably. These factors have been found to affect the mobile services usage and therefore should

be taken into account when planning marketing of mobile communication services and industry.

The thesis is a study of the mobile communications situation in developed and developing countries to give an idea to investors about the most suitable places for their investments in mobile communications services and industries. The importance of the thesis is in its impact on mobile communications market development in both services and manufacture which yielding greater development in communication networks both wireless and wire-line. The aim is the availability of mobile communications services anytime anywhere with low cost. Currently broadband data access at high transmission rates are needed to provide users packet-based services. Mobile Internet telephony is a solution of most communications requirements of people today, with a progress achieved in a wireless technology (i.e. developed software and hardware design), because people today continuously on the move, so that the best way to stay in touch with others is through the mobile internet phone.

Mobile communications were developed continuously from the first generation, 1G wireless mobile communication systems, was analog and the speed up to 2.4kbps. The second generation, 2G system, was digital signal for voice and the speeds up to 64kbps. The third generation, 3G wireless system, provided transmission speeds from 125kbps to 2Mbps developed in the late 1990s and might be well-done in the late 2000s. The fourth generation (4G) is an evolution to move beyond the limitations and problems of 3G. The speeds of 4G can theoretically be promised up to 1Gbps. [

The differences between 3G and 4G lie in the data rate, services (global roaming, interface with wire-line Internet), QoS and security. 4G will be supported by IPv6, OFDM, MC-CDMA, LAS-CDMA, UWB and Network-LMDS. They can be arranged in different zone size. IPv6 can be designed for running in the widest zone, called World cell. OFDM, MC-CDMA and LAS-CDMA can be designed for running in the wide area, called Macro cell. Network-LMDS is in Micro cell, and UWB is in Pico cell. B4G

will be the completed version of WWWW (World Wide Wireless Web) to form a real wireless world with no more limitation with access and zone issue.

The development of communications networks by using technologies such as orthogonal frequency division multiplexing (OFDM), MIMO, and WiMAX, allow internet and mobile services providers to offer broadband services in a hundred of Mbps, with high quality voice, video and multimedia over internet. From the review of published information of CTIA, GSA, FCC, Ofcom and market reports of telecommunications of USA, UK, Australia, Egypt, India, Syria,(see sections 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.4.5, 2.4.6, 2.4.7) we see that the UK is moving towards super-fast broadband networks, by increasing its cable network and increasing the data rate up to 50 Mbps. Each region in the world has its own set of communication strengths and communication weakness. USA is global leader in the IT and data communications industry but is lagging behind in mobile coverage and penetration. EUROPE is the global leader in GSM. Today, mobile services are ubiquitously available, with a mobile penetration rate of 128% in Europe, versus 100% in Japan and 104% in the USA, as shown in figure below.

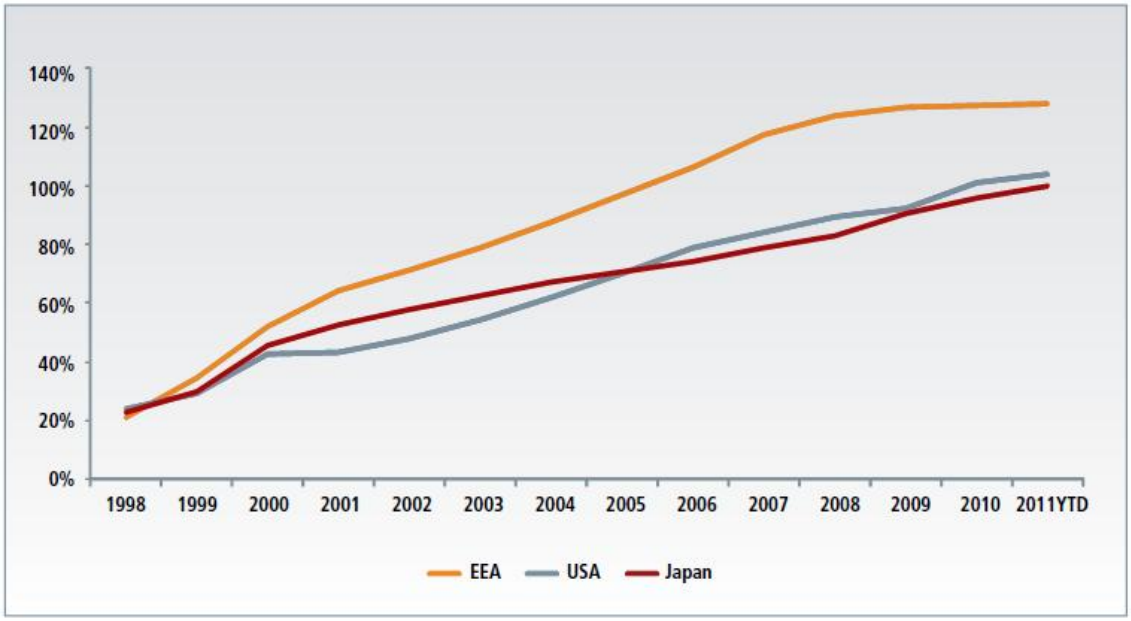


Fig. 1.1 Penetration rate of mobile comm.. services in Europe, US, Japan.

Source: Wireless Intelligence; EIU

All age groups in the world are using the mobile communications services. Mobile communications services are available with suitable prices to the most population in the world. In the recent recession, revenues declined by 3% in 2009, remained relatively flat in 2010, and expected that mobile communications services revenues will continue on this direction through 2011, especially as economic conditions remain to deteriorate in many countries. [73]

Asian countries are also important markets. Countries such as India, Egypt, Iraq, and Syria are slowly moving forward and they will be important consumer markets due to their size. The telecommunications market can be divided into end users, equipment and terminal vendors, operators, service providers, service. Wireless telecommunications is indeed a very important sector and truly global as shown by the growing number of users in figure below

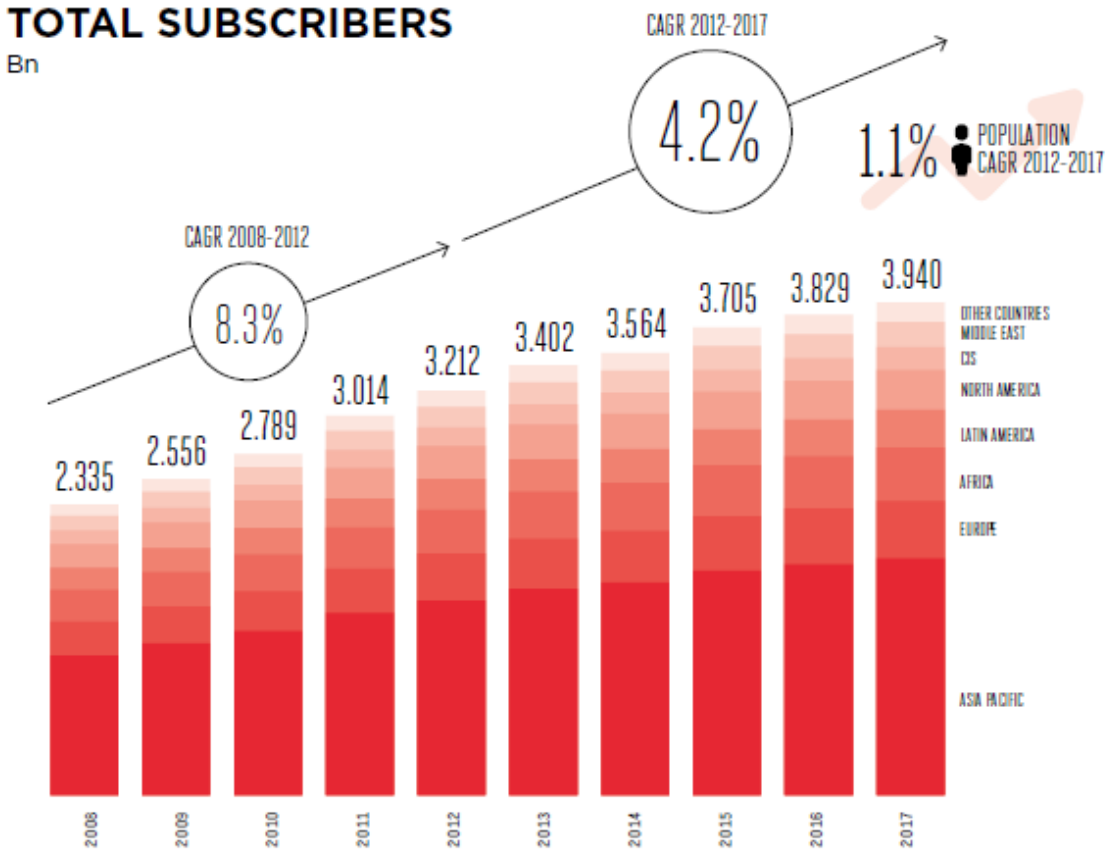


Fig. 1.2 Total Users of Mobile communication services from 2008 to 2018

Source: GSMA Wireless Intelligence

1.2 Developed Services of Mobile Communication

1.2.1 Voice over Internet Protocol (VoIP)

VoIP system is used to deliver voice communications over IP networks such as internet or other packet switched networks by using the same standards used for data

transmission. This system gave new facilities in telecommunications by enabling the convergence of data applications with voice which improve the functions like messaging and dynamic bandwidth. VoIP system was famous for the last years as a cheap voice communication form with a large number of subscribers because the providers were not bearing the costs of the infrastructure needed to achieve their job by exploiting the internet infrastructure that is already exist in the place. In VoIP the cost of the international calls is the same as that for the local calls because the calls not depend on the physical location. The basics of VoIP services are; using the capability of packet switches that allow the packets of voice to pass through the congested path this terminates the problems of latency, allowing the best utilization of communication network by using it for voice, video and data transmission, depending on the internet which was installed in many places made services on it cheaper than mobile or cable communications. The famous VoIP applications in the world today with a lot of peoples using them are; SKYPE which is reliable, low cost and used for short distances, therefore voice assistant is necessary to use with Skype to achieve the long distance [6, 7, 8].

1.2.2 Video telephony

Video-telephony is a telephone provided by a screen used for audio and video transmission between the persons .This system is used to help deaf persons who are using sign language, and persons who are needing Tele-medical and Tele-educational services. Video-telephony is a 3G network essential service that allows the connecting persons see each other's at a real time. Video-telephony provides people with ability to see their content, images that allowing them to take the right resolution for immediate feedback [9, 12].

1.2.3 Videoconferencing System

Videoconferencing is video and audio telecommunications among persons in different locations in the world; this is often occurring in large rooms at different locations in

addition to this activity videoconferencing can used to share documents and computer display information.

Videoconferencing system services are:

- Education, videoconferencing is useful to students and researchers.
- Health, Videoconferencing is useful in diagnosis and treatment.
- Business meetings lead to development of product and reduce the cost. [14]

1.2.4 Mobile TV

Mobile TV system is a service which allow cell phone owner to watch TV on their phone from a service provider. TV data can be obtained from cellular network. This technology has advantages , that you can watching a TV anytime anywhere but this service is restricted by battery power of the mobile , the memory capability of the mobile available, the size of TV screen of the mobile, also this service influence on user sight. So that the mobile TV industry open new markets for the contents specially tailored for the mobile TV [4, 5].

1.3 Aims and Objectives

The aim of this research can be formulated as follows:

- Identifying the factors influencing the mobile communications services usage and industry in developed and developing countries, what makes some countries better for investment in mobile communication services and manufacture?

In order to work towards this aim the following objectives are identified:

- Carry out a critical investigation of the mobile communications services in developed countries (USA, UK, Australia) and developing countries (India, Egypt, Syria, Iraq).
- Present an overview the technologies used to develop the mobile communication services.

1.4 Research Questions

Identification of the factors that make one country better for mobile communication investment is of interest for both investors and researchers. The investor's main concerns are with benefits associated with mobile communication services and industry, while the researchers are interested in theoretical model investigating the factors that influencing the usage of mobile communication services.

Answering the following questions are the main motivations of the research:

- What are the factors influencing the mobile communication services and industries? [Section 1.1]
- Does the investment in development of mobile communications services provide benefits to the investors and operators. [Section 2.4.3.1]
- What are the key developed mobile communication applications currently.[Section 1.2]
- What's the most perfect investment in the field of mobile communications? [section 2.4].

1.5 Thesis layout

The layout of this thesis will be of the following manner:

Chapter 1: Presents an introduction of mobile communication system services which explain the generations of mobile communication systems, technologies used to develop the mobile communication networks such as OFDM, MIMO, and WiMAX., developed services of mobile communication services such as VoIP, video telephony, video conferencing, and mobile TV.

Chapter 2: Presents a literature review, which explains:

i. The specifications and technologies of mobile communication systems;
ii. 1G, 2G, 3G, 4G, Beyond 4G.
iii. Explain briefly the development of the mobile communications technologies from 2G to 5G, transmission protocols, beyond 3G technologies
iv. Contains annual reports of mobile communication markets for developed and developing countries which explain the technologies, services , and the prediction of the future of these markets

Chapter 3: Methodology. Consists of; first data collection which explain that data is obtained from questionnaire in Arabic and English languages, second data analysis.

Chapter 4: Results, contains descriptive analysis, regression models,

Chapter 5: Conclusions and Future work, consist of; first the conclusions which contains regression model, the results of studying the markets, second the future work which explain the idea of extending the model

CHAPTER TWO

Literature Review

2.1 Introduction

The knowledge related to understanding and predicting mobile communication investment decisions accurately has become vital and critical in the present day business as it results in substantial improvement in the overall profitability of companies, if used suitably. The concept of predictive modelling has been in use for quite some time. A number of researchers have proposed predictive models, developed on the basis of different statistical techniques, to predict the investor`s choice.

Several econometric models, based on regression analysis, have been applied to predict choice of best country for mobile communication investment. The use of demographic variables in developing brand choice models is conceptually appealing and provides numerous managerial benefits. Demography is the study of the vital and measurable statistics of a population. The demographic variables play a vital role in marketing as they make a significant contribution in the consumer decision making process. Information on demographics is accessible and inexpensive to obtain. Even though a number of studies have proven that the impact of variables (age, gender, academic standing, price of mobile phone services, price of mobile phone handset and specifications of the mobile phone) had an effect on the mobile phone usage.. Previous studies on mobile and other information and communication technology services have exhibited a significant influence of demographics on the adoption of technology-based product and services. The regression has been preferred over other techniques, particularly for modelling results from multiple predictors of varying types. In a study on consumer choice

prediction, concerning e-banking service [59, 74], a logistic model was developed and it was found that the respondents' decision to use e-banking was influenced by select

demographic characteristics such as age, gender, marital status, education, ethnic group, area of residence, and income. In another study [59], a model for predicting consumer behaviour was developed on the basis of ordinal logistic regression. In 2008, research on customer classification substantiated that logistic regression has a high precision for predicting, especially from a perspective of conditions and structure of data, under conditions that have rich samples with plenty of support vectors, abundant indices, and larger probability of customer churn in the samples.

In a recent study conducted in Peru, a logistic regression model was used to explain the probability of making an effective use of mobile phones based on education quality and some other select demographic characteristics of interest [74]. The service preferences of mobile users are dependent on their requirements, which bear a direct reflection even on the choice of mobile, as only the mobiles equipped with the latest software, consoles and other features shall be instrumental to users in availing the required services, as rendered by their service provider. Demographic variables have been observed to influence the choice of mobile as well as have been proven empirically to have a direct bearing on the choice of brands and products. Incorporating demographic variables in brand choice models is conceptually appealing and has numerous managerial benefits. The marketing research organisations and marketing practitioners have made a significant contribution in research concerning individual differences, specifically demographic differences, in the use of mobile services. There is a dearth of academic literature on mobile commerce. Moreover, the available literature is limited to select areas (for example: adoption and diffusion of mobile commerce and technological issues).

The previous mentioned literature thus shows evidence for a significant number of studies concerning predictive modelling done for consumer decision making with reference to choice/preference concerning products, services, brands, customer loyalty, etc. In the light of the above-mentioned discussion, this research seeks to introduce a model to predict the best country for mobile communication investment. The proposed

model, based on the regression analysis theory, has been developed on the basis of select demographic variables (for example: age, gender, academic standing,)

Influence of Gender as a Variable

A number of studies have tried to analyse the impact of gender on mobile service usage. In fact, some of these studies have found that females use more SMS services than males. Other study was exhibited that males are more active in using mobile services such as mobile e-mail and personalized information services than females, except in using MMS, ringtones and logos. Therefore, apart from age, gender was observed to be a strong determinant of mobile service usage. A need was therefore felt to analyse the impact of gender on choice of mobile service provider [74].

Influence of Educational Qualification as a Variable

Some researchers have empirically tested a significant influence of education on mobile service preference [74] (considerable extent in terms of their service portfolio, especially with reference to gaming applications, etc., therefore it was felt that the impact of educational qualifications on select mobile service preferences of users be examined.

2.2 Types of mobile communications systems

i.1G First generation mobile system

The main 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 as the user travelled between cells during a conversation. Cellular systems required advanced technology, including handover, which enable continuous conversation as a mobile phone user changes his position. The transmission power of the system is variable in base stations and phones controlled by the base stations, which cause the cell size and range to vary. When the system expanded new cells need to be

added to give more capacity. The range is depend on the height of the antennae position on the towers, when the antennae are high at the top of the tower the range is expanded, while when the antennae are lowered on the tower this means the range is reduced.

ii. 2G second generation mobile system

Phone systems differed from the previous generation (G1) in their use of digital transmission instead of analog transmission, and also by the introduction of advanced and fast phone-to-network signal. The second generation system

(GSM) of mobile is based on low-band digital data signalling ,with a 25 MHz frequency spectrum in the 900 MHz band developed by using FDMA , CDMA and TDMA, that increased the numbers of calls and improve voice . Today GSM system operates on 1.8 GHz band in the world except U.S uses 1.9 GHz. 2G networks used circuit switched technology expands the range of voice services; handle some data capabilities (fax, SMS and data rate 9.6 kbps). The first SMS message was sent in the UK on 3 December 1992. The first SMS text message between two persons began in Finland in 1993. SMS became the preferred communication method for the youth. Today in the mobile phone markets the consumers prefer sending text messages instead of voice calls.

2G system also gave the ability to use media content on mobile phones. The first commercial service system was launched in the Philippines in 1999 by mobile operators Globe and Smart. The first content sold to mobile phones was the ringing tone, was launched in 1998 in Finland. The first full internet service on mobile phones was introduced in Japan in 1999.

iii. 2.5G General packet radio services (GPRS)

This system used packet data capacity which is about ten times of circuit switches data services that used in GSM, GPRS speed equal 171kbps.

iv. 3G third generation mobile system

This system interested in roaming worldwide and multimedia applications such as VoIP, video conferencing, video telephony and mobile TV. The technologies used in this system are EDGE, WCDMA, and CDMA2000/1xRTT.3G transmission speed 384 kbps.

The mobile communication industry is developed by using the 3G technology: media streaming of radio &television content to 3G handsets became possible, In the 2000s an evolution of 3G technology was implemented, such as High-Speed Downlink Packet Access (HSDPA), it is an enhanced 3G mobile telephony-communications protocol in the High-Speed Packet Access (HSPA) family. Usage of the Universal Mobile Telecommunications System (UMTS) that gives higher data transfer speeds and capacity. The number of subscribers on 3G networks worldwide was 295 million By the end of 2007.

V. 4G Fourth-Generation mobile communication (also known as beyond 3G)

4G is a system that has the capability to provide different multimedia services, such as movies, moving pictures and television broadcasting. These include information services that depend on the location of the participant and the emergency services that send a picture or the position of the participant. Technologies with high quality (high data rate and coverage) and networks with wired and wireless infrastructure able to provide such services. A 4G system has the ability to provide a mobile services such as voice, data and streamed multimedia to users on an "Anytime, Anywhere" basis at higher data rates than third generation 3G . In 4G the aim is to integrate the existing mobile technologies such as GSM, GPRS and 3G, that leads to expand the mobile services all over the world, reducing the cost of services, improving quality of service, to get the above aims technologies with high bandwidth from (50-100) Mbps for high mobility users, to 2 Gbps for low mobility users must be provided. [18]

The difference between 4G & 3G there is no circuit switching technology employed in 4G generation network. 4G treated the voice calls just like streaming audio media, using packet switching over internet, LAN or WAN networks in all suggestions for 4G, The technologies used are Orthogonal Frequency Division Multiple Access (OFDMA), Multi Input Multi Output (MIMO) and (Long Term Evolution) LTE.[20]

vi.Beyond 4G (Generation)- Real Wireless World System.

The B4G wireless mobile internet networks are real wireless world which shall be supported by LAS-CDMA, OFDM, MC-CDMA, UWB, Network-LMDS and IPv6. IPv6 is a basic protocol for running on both 4G and B4G. B4G is designed for World Wide Wireless Web(WWWW) to mobile users based on network access management, but IPv6 assigns any IP address to any mobile node based on location management. This will cause B4G wireless networks resources waste and the IPv6 is difficulty working on the World Wide Wireless Web(WWWW). In order to solve this problem, the bandwidth optimization control protocol and the mix bandwidth data path for future real wireless world are used. The bandwidth optimization control protocol (BOCP) is implemented in between MAC layer and TCP/IP layer, which is used to establish the mix-bandwidth.

vii.(Beyond 4G)- With Satellite System

The B4G generation mobile communication networks can integrate satellite communication networks and to make global coverage. Satellite communications networks consist of navigation satellite networks, telecommunication satellite networks

and Earth imaging satellites networks. The navigation satellite networks are used for global position, the telecommunication satellite networks are used for global telephony, multimedia video and high-speed Internet connectivity and the Earth imaging satellite networks are used for resource monitoring and weather information. To integrate these three kinds of satellite networks to provide position identifier, multimedia and internet connectivity, and weather information services for mobile users are key objectives for this system. Many countries have been used Global Navigation Satellite Systems (GNSS) in their militaries such as US (GPS satellite network), Europe (Galileo satellite network), China (COMPASS satellite network), Russia (GLONASS satellite network). Since B4G is migration from 4G which is based on MC-CDMA standard, if B4G integrate with these four satellite networks, B4G should have four standards. On the other words, there are four technologies, networks and systems on B4G. Handoff/roaming must happen on space between any two networks and systems and technologies. This will drive the next generation of B4G mobile communication networks occur.

viii. B4G(Generation) with Space Roaming/Handoff System

The generation system can be supported by the global navigation satellite system, the telecommunication satellite system, the earth image satellite system and the cellular system. The global navigation satellites systems are essentially determine a use's position. The telecommunication satellite system can supply the voice and multimedia data for user's communication requirement.

The earth image satellite system contains the weather information as extra service for mobile users. The B4G cellular network system can be a wireless local network system to supply local voice and multimedia data services. Comparing with the satellites, cellular base stations are much cheaper and stable. The satellites are so expensive and to do movement to cover larger area. The speed of the satellite is about 7000 miles per hour .Thus, the handoff/roaming must happen between each satellite. Furthermore, any two different satellite systems are necessary which are making two complete orbits in

less than 24 hours for handoff/roaming when mobile users moving from one country to another. This kind of handoff/roaming is space handoff/roaming.

2.3 Development of Mobile Communications Technology

2.3.1 Development Technology from 2G to 3G

2G System is a narrow-band system digital data signalling using FDMA, CDMA, TDMA & circuit switched technology, while3G is using wide-band code division multiple access W-CDMA radio access technology. The development of mobile system were done by adding new elements to the 2G network elements the outcome of this development is new features such as rising the data rate to improve the multimedia services, increasing the coverage . 2G network elements are:

- Base Transceiver Station (BTS) – the 2G radio base station
- Base Station Controller (BSC) – controls a group of BTSs, including frequency/timeslot reassignments and handovers within the area of control
- Mobile Switching Centre (MSC) – switches voice calls between timeslots/incoming lines, controls handovers between BSCs and to/from other MSCs, maintains Visitor Location Register recording last known location of the mobile to cell level
- Home Location Register (HLR) – maintains user subscription profile and a pointer to the current VLR in whose coverage area the mobile is currently to be found
- Authentication Centre AuC – maintains the set of master keys used to authenticate mobile devices stolen mobiles
- Equipment Identity Register – records of physical hardware IDs used to bar access by

2.3.1.1 Development from 2G to 2.5G

Two new elements added to the 2G key network element

Serving GPRS Support Node (SGSN) – used by the packet network to follow the place of the mobile and to control handovers between BSCs and to/from other SGSNs.

Gateway GPRS Support Node (GGSN) – used to connect the mobile packet network to external packet networks like those of Internet Service Providers or corporate data networks

2.3.1.2 Development from 2.5G to 3G

Two elements added to the 2.5G key network elements

Node B – the 3G radio base station

Radio Network Controller (RNC) – the 3G base station controller. Unlike the BSC, the RNC has a peer to peer interface to other RNCs which can be used to coordinate handovers with other RNCs, offloading this task from the MSC or SGSN.

Note that in 2G and 2.5G the mobile is called the Mobile Station (MS) while in 3G the mobile is called the User Equipment (UE). In GSM and GPRS the Radio Access Network (RAN) consist of the Base Transceiver Station (BTSs) and the Base Station Controller (BSCs); while in 3G the RAN is consist of the Node Bs and the RNCs

2.3.2 Definitions of 3G to 4G and beyond (4G)

Today network technology developed according to the people`s requirements which have been accomplished by B3G technologies). 3G means the third generation of wireless technology with the following features: (improved roaming, broadband data services, excellent voice quality at 2Mbps). 2005, is the beginning of usage of 3G in computer networking and mobile devices.4G is

a fourth generation of wireless technology that moves beyond the limitations of 3G, and improves the quality of services, cost and increase the bandwidth. B4G is a wireless communication with no limitation which is called REAL wireless communications [21].

2.3.3 Development Time from 3G to 4G and Beyond

3G wireless system completed its development in 2000s. 3G features are: high transmission speed from (125 Kbps to 2 Mbps), global roaming and high voice quality). 4G is a communications system with high speed up to 1Gbps that can transmit multimedia and data. 4G was interface with wire-line network in 2002. Beyond 4G will be 5G with no limitations for transmission speed and zone size. The key factors that distinguish 4G from 3G are the interface with wire-line network ,access technology to the Internet, security , data transmission rates that ranges from 100 Mbps in full mobility large area coverage to 1Gbps in low mobility local area coverage, improved quality of services , global roaming any time-anywhere with low cost. While 3G features are: 200 Mbps speed, roaming globally difficult. Access technologies used in 3G are WCDMA, CDMA and TD-SDMA. 3G transmissions are done by applying circuit and packet switching. 4G services and applications depend on the convergence of wireless and wire line backbones .4G based on packet switching transmission method, broadband IP and uses all available access technologies. 4G is approximately perfect real world wireless [21, 11].

2.3.4: 4 G working principle

4G wireless networks depend on IPv6 instead of IPv4 because the first is higher data capacity. 4G networks formed from a permanent IP-address and a dynamic IP-address which represent the actual location. The connection between devices in the Internet and wireless network such as computer and cell-phone the first send a packet to the permanent IP-address of the cell-phone then the server of the cell-phone send the packet to the cell-phone dynamic address through a tunnel then the server also inform the computer the real location of the cell-phone, so the next packets from computer will be sent to the real position of cell- phone directly [21].

2.3.5 Comparison between IPv6 and IPv4

4G-IP address Internet Protocol version 6(IPv6) carry more data than the IP address Internet Protocol version 4(IPv4). IPv6 contains 128 bits, while IPv4 contains 32. The first set of the IP address named home address which likes IP address used in the internet and network. The second set is called care-of address and used for communication from the cell-phone to the computer. The third set is a channel of communication between the wireless network and wire-line network. The sever will use IP address to build a channel to cell phones. The last set of IP address is a local network address for virtual private network (VPN). The basic comparison of IPv6 and IPv4 is the data containing capacity.

2.3.6 Transmission protocol

IPv6 is the key protocol that can be used in all area. IPv6 is the 4G transmission protocol supported by OFDM, MC-CDMA, LAS-CDMA, UWB & LMDS network. Orthogonal Frequency Division Multiplexing (OFDM) is a technology used to transmit a large data on radio-wave, after dividing the radio signal to many signals which is transmitted at different frequencies to the receiver simultaneously. Multiplexing of the orthogonal wave increase the signal strength. In OFDM, the communication between any two wireless devices is done through a connection tunnel. Multi-Carrier Code Division Multiple Access MC-CDMA, is an OFDM with a CDMA overlay. OFDM used to distinguish users in Multi- carrier –CDMA & single carrier CDMA systems. It allows flexible system design between cellular system and signal cell system. Each user in MC-CDMA has several codes, while the data is divided in time or frequency. LAS-CDMA, Large Area Synchronized Code Division Multiple Access, is a global transmission protocol World Cell, which is suitable for large distance to wireless devices that need to use IPv6 with this protocol to make the connection between devices. It is a 4G wireless technology improved by Link-Air Communication which gives high-speed data and increases voice capacity. Code-Division Duplex (CDD) is most spectrally efficient, high capacity duplex system

today which is the result of combination between LAS-CDMA technology and Time-Division Duplex (TDD)

2.3.7:4 G Technologies

Multipath fading issues are solved with a help of UWB radio by using short electrical pulses to pass all frequencies at once. UWB needs low power requirement so that it is used indoor and underground. UWB is used with OFDM, to transmit large digital data with multi-path algorithm. To ensure signal strength, OFDM used outdoor& UWB used indoor. UWB used as Pico-Cell for small distance in the buildings in the 4G wireless technology. Local Multipoint Distribution System (LMDS), is the key transmission protocol in the wireless technology. It is the solution of signal fading issue in local area so it played as a micro cell & macro cell in 4G technology. It is a broadband wireless technology with spectrum higher than 25 GHz that carried data, voice, Internet and video services.

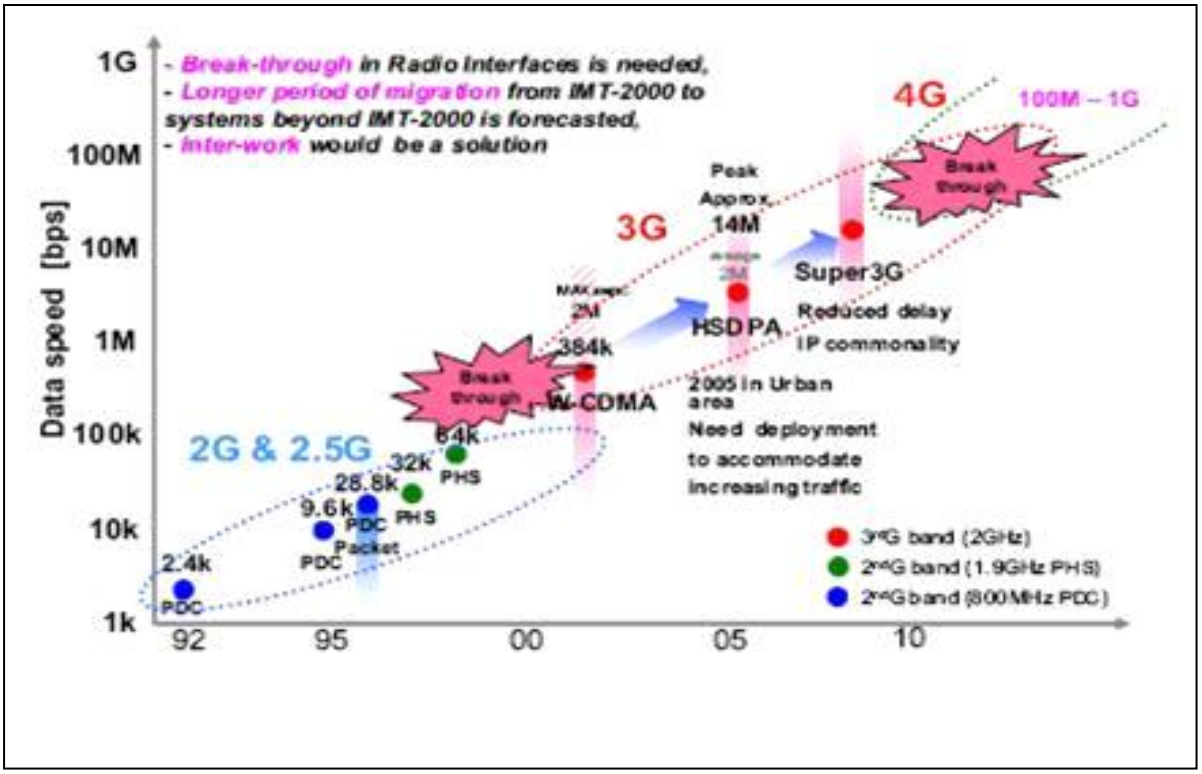
The zone size arrangements are: IPv6 is the key protocol for address issue that can be used in all area. LAS-CDMA (world cell) which is arranged for moving in the global area as a zone. OFDM and MC-CDMA (Macro-cell) which is arranged for moving in the wide area. Network-LMDS (Micro-cell) used for medium distances. UWB (Pico-cell) used for small distance.

2.3.8 (Real wireless world) (WWWW: World Wide Wireless Web)

World Wide Wireless Web (WWWW) is a developed technology begun from 4G technologies, and completed its idea to make a REAL wireless world. The difference between B4G & 4G is adding more services and benefits in which B4G interconnect the entire world without limits. Today the importance of wireless technology is emerged in Internet field and network. The historical overview for mobile communication generations 1G to B4G give an idea that the successive developments of new generation based on the outpacing the limitations of the previous one the results are offering more services and smooth global roaming with low cost.

2.3.9 Data transmission rate and mobile evolution.

The graph below explains how the data transmission rate changed with mobile evolution.



2.3.10 Requirements to Reach to B3G Technologies

i.Improve the capacity of base-station by using adaptive array antennas and interference cancellers to reduce interference.

ii.Implementing antenna signal processor & efficient adaptive modulation to improve the transmission rate per bandwidth.

iii.Using error control technology to assess radio transmission delay & reliability.

iv.Transmission rate and communication quality control the allocation of radio resources.

2.3.11Applications of B3G

The applications of beyond 3G mobile communication system are ; high quality voice calls, short message services, location based services, entertainment, and internet information and games.

2.3.12 Circuit Switching Network:

Circuit switching is a circuit established between nodes and terminals in communication networks, like the connection of nodes in electric circuit. The difference between circuit switched network and packet switched is the delay of bits which is constant in the first and variable in the second.. The circuit cannot be used by other callers until the connection of the circuit is changed.

Virtual circuit switching is a packet-switching technology that simulate circuit switching; it means that the connection is done before transferring any packet that delivered in a command. The circuit switching is used in analogue and digital communication voice and other services. The feature of the virtual circuit switched is providing continuous transfer without need to packets, making excellent usage of available bandwidth for that communication.

2.3.13 Packet switching Networks

Packet switching is a digital communications networking method that collect transmitted data in groups with any content. The feature of the packet switching circuits is sending data rate in streams. When packets are going through the (network nodes, routers and switches) are buffered and queued so different delay occur and the throughput is based on the traffic load in the network. The comparison between Packet switching and circuit switching in the case of traffic fees in the Packet switching the fees is calculated as per unit of information while the circuit switching is calculated as per time unit of connection time, in cellular communications.

Packet switching modes are; first connectionless packet switching which is called datagram in which each packet contains complete addressing information. In which the packets are directed individually, as a result the sending information follow different paths and second, connection oriented packet switching, called virtual circuit switching, In which the node is restricted before sending packet of information.

2.3.14 Frequency Division Multiple Access (FDMA)

In wireless communications FDMA the frequency band is divided into many digital channels data or voice each restricted to one user at a time. In analogue mobile phone service the key technology used is FDMA. While TDMA technology is used in the Digital-Advanced Mobile Phone Service (D-AMPS), which uses three channels for each FDMA channel, this means that the number of calls increased three times. In FDMA, each transmitter is restricted frequency channel so that receivers can distinguish among them by tuning to the desired channel. TDMA and CDMA are used always with FDMA.

2.3.15 Code Division Multiple Access (CDMA)

Code Division Multiple Accesses is a digital technology use for wireless phone service. In CDMA all calls in the frequency spectrum are coded each call has a code distinguishing it from other calls. CDMA is a channel access method used by different radio communication technologies for mobile phone cdmaOne and CDMA2000 Multiplexing is the concept in data communication that allows many transmitters to send data simultaneously over a single communication channel which allows several users to share the various frequencies bandwidth. CDMA uses spread-spectrum technology and a special coding scheme to allow multiple users to be multiplexed over the same physical channel.

2.3.16 Time Division Multiple Access (TDMA)

Time Division Multiple Access, is a method of digital wireless communications transmission that allows a large number of users to access a single radio frequency channel without interference by restricting a single time slot to each user in the channel, or is a channel access method which allows many subscribers to use the same frequency channel by dividing the signal into different time slots. TDMA is a time with multiple transmitters connected to one receiver.

2.3.17 TDMA Characteristics:

Shares single carrier frequency with multiple users.

Non-continuous transmission makes handoff simpler.

Slots can be assigned on demand in dynamic TDMA.

Higher synchronization overhead than CDMA.

Cell breathing is more complicated than in CDMA.

Frequency/slot allocation complexity.

Pulsating power envelop: interference with other devices

2.3.16 TDMA in mobile phone systems

The key TDMA cellular systems which often 2G cellular are GSM, D-AMPS, PDC, iDEN and PHS. The combination of TDMA and frequency hopping and wideband transmission by GSM reduce the interference. The synchronization of the mobile phone in the GSM system is achieved

by sending timing commands from the base station to the mobile phone accurately. This compensates for the delay resulting from the low speed velocity of radio waves. The mobile phone is not allowed to transmit for its entire time slot, but there is a guard interval at the end of each time slot. Initial synchronization of a phone requires even more care. Before a mobile transmits there is no way to actually know the offset required. For this reason, an entire time slot has to be dedicated to mobiles attempting to contact the network.

2.3.17 W-CDMA

Wide band code division multiple access (W-CDMA) is the 3G mobile communications technology. In 3G the spreading codes in use at a given time do not have to have the same spreading factor provided that they are mutually orthogonal. The spreading code mix can be varied from one frame to another. These features provide considerable flexibility to handle a varying mix of voice (low bandwidth, steady flow) traffic and data (often high bandwidth, typically interrupted flows) in comparison with the original IS-95 CDMA which is limited to one spreading factor. Hence in 3G the combination of spreading code and scrambling code defines an individual channel. Within this, each channel has a frame structure in the time domain.

2.4 : Mobile Communications Markets

2.4.1 USA - Mobile Market - Analysis, Statistics and Forecasts

The number of US mobile subscribers became 285 million at the beginning of 2010, and the penetration rate of mobile services predicted to reach 95% at the beginning of 2011. The ARPU of voice service is decreased but balanced by the increasing of ARPU of data revenue. The increasing of mobile data revenues in 2009 leads to prediction that to continue in growing of data rates in the next five years i.e. between 2013 and 2018. Mobile broadband was improved by the usage of 3G networks in 2009, while the future development in mobile broadband on the usage of 4G.[39]

2.4.1.1 USA - Mobile Market – Key Operators

In 2010 the key operators of the US mobile phone market are; AT&T Mobility, Verizon Wireless, Sprint Nextel and T-Mobile, the first three represent 74% of the market share and the last one represent 12% of the market share. CDMA2000 is a technology used by Verizon Wireless and Sprint Nextel while W-CDMA technology used by AT&T Mobility. The number of subscribers increased after the deployment of HSDPA by AT&T Mobility. The usage of HSPA+ by T-Mobile`s in 2009 improve T-Mobile's service so it became the fastest mobile broadband service in the market. Other operators in US mobile communications market are; Motorola, LG, Samsung, Nokia, RIM, Apple, Microsoft, Google, Palm1.Sprint Nextel offering WiMAX services on the Clear network so that it dominated on the 85% of the largest US mobile markets, while other service providers, specially Verizon Wireless and AT&T Mobility moving towards their LTE.

Tables below explain the market share, mobile content usage and the Smart phone mobile market share [39]

Table 2.4.1.1a.USA Mobile subscribers (285 Million), 2010 [39]

Operator	Relative size
Motorola	22.9%
LG	21.7%
Samsung	21.1%
Nokia	9.1%
RIM	7.8%

Table 2.4.1.1b.USA Smart Phone Mobile subscribers (42.7 Million),2010 [39]

Operator	Relative size
RIM	43%
Apple	25.1%
Microsoft	15.7%
Google	7.1%
Palm	5.7%

Table 2.4.1.1c.Mobile content usage (US), 2010 [39]

Service	Relative size Oct.2009	Relative size Jan. 2010
Messaging	62%	63.5%
Browsing	26.8%	28.6%
Games	21.3%	21.7%
Download applications	18.3%	19.8%

Access social networking site	13.8%	17.4%
Listening to music on mobile	11.6%	12.8%

2.4.1.2 USA Telecommunications Revenue Sources

The basic revenue sources of US mobile telecommunications market are: [39]

Fixed-line communication services in spite of the decreasing of the number of subscribers and revenues during 2009 and 2010. In 2010 the US cable companies witness growth in providing telephone services. VoIP providers, such as Skype, is improving the US VoIP market. The VoIP market has also witnessed the entry of Microsoft and Apple and Internet Google and Yahoo. Mobile VoIP is improved by the adoption of WiFi-enabled handsets. The deployment of 3G networks, of the Clear WiMAX network on which Sprint Nextel and others provide mobile services and the decisions by Verizon Wireless and AT&T Mobility to upgrade to an open access LTE platform for their 4G investments will propel mobile VoIP into the mainstream of mobile telecommunications.

Broadband mobile communication services continue in growth and US represents the largest broadband market in the world. US are interested in VoIP service because of its high revenue and subscriber's growth. Cable companies such as Comcast had a high influence on the emerging of VoIP service. The switch-off analogue TV supported the growing of digital TV market. US now is one of the highest rates of pay TV penetration in the world, which cover 85% of US households by 2010. The shift toward video on demand is an important trend in the digital TV market. the cable companies began to build an advanced infrastructure has ability to offer triple services (voice over internet protocol, broadband Internet and DTV content) over the same cable pipeline into the home.

2.4.1.3 USA Mobile Market Forecasts

Growth in sectors of voice, broadband and digital TV.

Digital media have trends to develop in smart grids, e-health and e- government [39].

Key information on the major telecommunication operators the current and emerging broadband technologies and their long-term projections.

Deployment of 3G and 4G technologies which lead to the growth of mobile voice and data. US annual report explain; the fixed-line, mobile (wireless) and broadband markets, as well as checking the digital TV sector and the growth of new telecommunication services for example VoIP and IPTV. The cable companies continued to benefit from the telcos' landline decline. The participants of cable VoIP is expected to grow strongly in 2011/12. In addition, the leader of the broadband market is cable companies, with growth cable modem subscribers exceeding DSL growth in 2009/10. WiMAX and LTE open access 4G platforms in the mobile market which increased developments in mobile broadband usage.

The industry of mobile telecommunication is affected by the economic downturn. Despite the mobile and broadband sectors, is enjoying growth that is many times higher than broader economic growth.

The revenue for the telecommunications industry is expected to grow by around 10% during 2010. Growth will continue to be underpinned by broadband and mobile data services.

By 2010, mobile data usage increased more than voice services and expected to increase to 100% during the next five years.

Since 2009 the number of landline customers continues to fall.

In early 2010, number of participants reached nearly 22 million. Despite VoIP was increasing landline revenues, VoIP participants growth during 2009 was only 6%. Which is explained by the improving penetration of non-facilities based operators, such as Skype, into the VoIP market.

By 2010 the number of homes provided by FttH reached 18.5 million, representing about 13% of all households.

Despite a number of Wi-Fi projects face trouble in 2008/09, by 2010 it was becoming clear that the significant demand for iPhones and similar Wi-Fi enabled smart-phones, net-books and other Wi-Fi-enabled devices would pass the capacity of the cellular networks and would develop the business models for Wi-Fi networks [22].

The USA is considered as the leading country in adopting WiFi services, in 2010 reached nearly 70,000 public WiFi hotspots. It is expected that the number of free WiFi hotspots will increase by nearly 15% through 2010.

Table 2.4.1.3a USA - Forecast mobile broadband users and mobile services revenue growth (2011 – 2016),2010 [39]

Year	Mobile broadband users	Mobile services revenue ($ billion)
2010 (BYE)	40,000,000	160
2011	60,000,000	175
2012	85,000,000	190
2013	110,000,000	215

2014	130,000,000	235
2015	150,000,000	250
2016	165,000,000	270

2.4.1.4 Future of Mobile Communication Services in USA

IPTV strategy is one of two broad models involving the use of IP to deliver TV or video services. The other model is one involving video services offering content for download or streaming over PCs and other connected devices. Although by early 2010 subscribers number to these two emerging IPTV models were still modest, IPTV is expected to have a profound change on the face of TV delivery over the years to 2015.

Video downloading continued to grow significantly during 2009 and is expected to rapidly increase its role in the overall video market during 2011-2015. Rapid growth in revenues will also be driven by an increase in the amount of premium content available online and the increased penetration and speeds of broadband deployment. Another broadband access technology which is poised to make an impact on the digital TV market is WiMAX wireless broadband.

Table 2.4.1.4a USA Internet Usage and Population Growth,2010 [39]

YEAR	Population	Users	% Pop.
2000	281,421,906	124,000,000	44.1 %

2001	285,317,559	142,823,008	50.0 %
2002	288,368,698	167,196,688	58.0 %
2003	290,809,777	172,250,000	59.2 %
2004	293,271,500	201,661,159	68.8 %
2005	299,093,237	203,824,428	68.1 %
2007	301,967,681	212,080,135	70.2 %
2008	303,824,646	220,141,969	72.5 %
2009	307,212,123	227,719,000	74.1 %

Table 2.4.1.4b Internet Broadband participants in USA Subscriber Statistics - June 30, 2009

Providers	Total Subs. at End of 2Q 2009	New Subs. during 2Q 2009	Change (%)
Cable Companies	38,005,172	249,471	0.66 %
Telephone Companies	31,897,117	384,488	1.22 %
Total Broadband	69,902,289	633,959	

2.4.1.5 USA BROADBAND STATISTICS UPDATE

Broadband penetration rate grows 16 percentage points in rural areas over past two years, significantly outpacing that of metropolitan areas.

2.4.1.6 USA - Digital Media - Overview, Analysis and Statistics

The digital media market in US in growing continuously by improving the social media use, e-entertainment and search that arising from the emergence of VoIP and from convergence with the broadcasting industry.

2.4.2 UK Mobile Market Analysis and Forecasts

2.4.2.1 U.K Mobile Market Overview:

UK mobile communication market is developed from single content & services to multimedia applications & multiform services. Expanding the product offerings of entertainment, video and multimedia market causes important changes while the delivery systems and devices remain heterogeneous. [40]

The revenue of Internet content is improved globally because the Internet is the first program offering integrated contents such as travel, gambling, music, health services, and video from small clips to long films, TV &VoD applications.

The new digital media is delivered by the home Media centers that combine applications such as DVRs, CD/DVD &MP3.Cable TV operators, telcos, consumer electronics and IT companies are all in competitiveness for the Media Centre business.

DVRs and EPGs will form an important part of the digital revolution over the next few years. TiVo (USA) and BskyB (UK) are two of the leaders in this field.

UK is expected to be a leader in the next five years in digital TV and the penetration rate increases today. The dominant delivery systems are cable, satellite (DTH TV), Digital Terrestrial TV(DTTV) & Broadband TV (IPTV). These developments in broadcasting have led to interactive TV coming back into favors. Many TV programs now have an interactive element to them, particularly in the Asian and European markets, and further advances are expected in this area.

UK mobile communications is improved by the availability of many mobile services such as mobile TV, mobile gaming, mobile music, 2.thefreedictionary.com/mobile+Internet"mobile Internet, Mobile VoIP.

2.4.2.2 UK Broadband services comparison with other countries in 2010

Bundling – In UK the broadband services sold without a bundle were cheaper than that in Europe so the consumers selected bundle packages include telephone and/ television services which called dual play or triple play bundles.

Fixed line broadband – The number of fixed broadband connections per 100 households were Netherlands = 85, Canada = 80, United States = 71, UK = 70, China, Russia, Brazil are growing slower.

Mobile broadband – The number of mobile broadband connections per 100 households were US=30, Sweden a head of EU = 29, Australia = 27 and UK =16. UK market smart-phone grows fast by comparison with other countries and the number of consumers used the smart-phone about 20% of UK population and about 30% of the smart phone address the internet from their mobile handsets.

Devices – 83 % of UK people with ages between (18-24) years were using the laptops to access to Internet and 40% were using desktop.

Traffic – Consumer broadband Internet traffic is increasing by 42% during 2010. Internet traffic is explaining the difference among the HTTP web browsing streaming video of different formats and other miscellaneous traffic.

Broadband speeds – The maximum mobile broadband speed in UK is 7.2 Mbps which is considered low in comparison to other countries such as Sweden = 100 Mbps and in the range between (21or 42) Mbps in others .

A super fast broadband in UK household was 2% in 2009 and expected to be 66% at 2015 while in Japan 34% of the households had a super fast broadband the end of 2009,

2.4.2.3 Key highlights:

The penetration rate of digital TV increased and the number of homes having digital TV is expected to be around half a billion worldwide in 2011.

The number of IPTV subscribers expected to be about 25 million worldwide by 2010.

Internet economy is improved by entertainment services such as music and films.

The innovative economy incorporates innovative services such as tele-education and tele-health.

50% of revenue of companies in the world depends on the Internet economy.

The numbers of mobile game users in the world are expected about 130 million at 2010.

Mapping applications are mainly PC-based at this stage, but there is a flurry of activity and investment directed at applying this service to handheld devices and mobile phones. Number of mobile phones =77 million

2.4.2.4 U.K Mobile Service Operators:

Orange, AT&T operator joint venture = 30 million subscribers= 37% market share

O2 =28% market share

Vodafone =23% market share.

It was observed that since 2003, TV viewing hours have fallen 3.6% & radio listening has declined 2%. In contrast, mobile usage increased 58% between 2002 &2006, to 3.7 min/day/person. Fixed line fallen by 6% Since 2003 to 6.9 min/day/person. Media, total media consumption time per day in 2006 is 433 min/person. Monthly household spend on communications services 2006 =92. 3G mobile area coverage rose from 84.3% to 91.4%. Broadband speed increased from 1.6 Mbps to 4.6 Mbps in 2005. IPTV service is available to 15% of homes.

Table 2.4.2.4a UK Operators market share, 2011 [40]

Operator	Market share	Subscribers
Orange & T joint venture	37%	30 million
O2	28%	
Vodafone	23%	

2.4.2.5 United Kingdom Telecommunications Market Report Q3 2011:The UK

The Q311 update of the UK Telecommunications Report contains an analysis of market trends

and data using the latest data released by fixed-line and broadband providers, mobile operators and the telecoms regulator Ofcom. It also contains our updated forecasts for the fixed, mobile and broadband sectors looking forward through to the end of 2015. For the first time, it also includes BMI's forecasts for mobile monthly blended ARPU rates up until 2015, by operator. The report forecasts continued strong growth in 3G subscriptions which will increasingly become the norm, increasing to 53.511mn subscriptions in 2015. At this stage of market development, changing competitive dynamics and new patterns of revenue generation are becoming increasingly significant relative to subscription growth.

The contraction in the fixed-line market will also continue at a slower rate as operators increase bundled services. Vodafone, O2 and Everything Everywhere reported declining average revenue per user (ARPU) for the second successive quarter in Q111. Despite this decline, we believe ARPU declines will plateau as we expect growth in data revenues to continue as Everything Everywhere reported 64% of contract phones sold in Q310 were smart phones, compared to 42% Q409, and projections are that this will increase. Ofcom reports similar figures for the whole market comparing Q209 and Q210.

BT continues to lead in the broadband market although the market is not concentrated with BT. Cable operator Virgin Media reported positive Q111 results to follow a particularly strong 2010, with positive revenue and subscriber growth across its business. Further, with the launch of 100Mbps broadband and a new set top box to rival Sky+ it will likely have another positive year in 2012. Other alternative providers, including O2 and Orange, have reported strong uptakes of their broadband services. Satellite broadcaster BSkyB has also reported strong broadband subscriber growth on their networks. At the end of Q111, BT reported a retail broadband base of 5.7mn and wholesale broadband customer base of 8.112mn. BT claims to be on track with plans to roll out superfast fiber-optic broadband to two-thirds of UK households by 2015. Companies Mentioned:-BT-O2-Vodafone-T-Mobile-Orange.

2.4.3:Australia Mobile Market Analysis and Forecasts:

Australian communications market developed in 2010 by establishing a new high speed broadband network based on fiber-optics & wireless technology that developed communications industry [40].

The revenue growth of telecommunications market between 2008/2012 explained by the Australian mobile telecommunications key operators & providers as follows; The revenue growth of mobile services of key operators in 2010 is lower than that in 2008/2009, as a result of competition among the key operators. The revenue from mobile services is about $ 15 billion which represent more than 50% of industry revenues in Australia. The revenue growth is increasing about 7% yearly but in the next 4 years the revenue growth is affected by three factors which are:

The broader economic environment which represents the largest effect and economic growth in 2011 and 2012 could well be subdued in Australia.

The impacted of price competition.

The development of new telephony services

Australian companies are two types the first offer many telephony services such as mobile, landline and Internet services, the second type offer only one type of telephony service such as Vodafone or 3 with mobile voice and data services. Four of the second-tier players have annual revenues exceeding the $1 billion. In 2009 Vodafone and Hutchison in Australia, the third and fourth largest mobile network operators merged their operations. M2 mixed with People Telecom in mid-2009 to initiate the largest firm without significant infrastructure assets, and further development is expected over the period to 2011. The number of broadband participants

increased to 7.3 million by mid-2009, increase 17% over the mid of 2008. Growth in recent years has been done by the growing of DSL participants, despite recent growth is less than the previous two years as the majority of the market has now changed from dial-up to broadband.

In the longer term the development of a fiber optic network operated by a National Broadband operator is likely to have a significant impact on the take up of DSL or cable based services. The business market has been quick to embrace broadband – by 2009 the vast majority of the business sector had made the transition users gradually move to faster broadband access via ADSL2+ services from the fib. More growth is expected in 2010 in spite of difficult economic situations in Australia. As business based national broadband network, businesses are increasingly embracing new broadband applications. Total mobile services revenue earned by the major mobile operators in the financial year to 2009 surged surprisingly despite difficult broader economic conditions in Australia. The industry as a whole earned around $14.3 billion in revenue from mobile services – a growth rate of nearly 10% year-on-year. Despite subscriber penetration rates being between 110% and 115% of the population, growth is likely to continue for the foreseeable future though the overall rate of growth may slow slightly.

Between 2010 and 2012 revenue growth is expected to be influenced by the following three major factors. The wide economic environment has the largest effect economic growth in 2011 and 2012 could well be subdued in Australia. Revenue growth will also be impacted because of price competition, especially in light of the merger between Vodafone and 3 in Australia to form VHA. The revenue growth of mobile communication in Australia is affected by the communication services development. In the year 2009 Telstra got more than $6 billion in revenue from mobile services (Telstra have the largest market share of telecommunications market in Australia which represent 66% of overall revenue), Optus earned more than $4 billion for the first time, Vodafone Australia earned just under $2.5 billion and Hutchison just over $1.5 billion. In 2009 the merger between Vodafone and Hutchison in Australia will create a company with mobile services revenue approximately 5% lower than its nearest competitor Optus. This will create an interesting market dynamic for the first time in Australia as VHA may aspire to a gaining market share at the expense of Optus. Australian operators are likely to have more than

25 million mobile subscribers in 2011 as migration and business adoption continue to drive growth. Growth in the number of services has also been boosted in Australia in 2009 by the effective use of economic stimulus. Telstra continues to dominate the market with more than ten million subscribers, Optus has around eight million and VHA has roughly six million subscribers.

The sources of communication revenues are from all mobile services (which includes mobile data, wireless broadband and mobile media, but the mobile voice and SMS still brought 90% of mobile revenue) = $14.4 billion with growth rate 9.6% in 2008, and predicted to be $ 18 in 2010.

The annual growth of mobile market subscribers from 2007 to 2011 are;

Number of subscribers in 2007 = 20800 = 7%

Number of subscribers in 2008 = 22123 = 6.4%

Number of subscribers in 2009 = 23135 = 4.6% (expected)

Number of subscribers in 2010 = 23714 = 2.5% (expected)

Number of subscribers in 2011 = 24188 = 2% (expected)

Mobile operators are :

Hutchison, is the market leader in the mobile broadband services with revenue growth 11.8% in 2008,

Telstra, take 44% of the market in terms of mobile service revenue, the subscribers market share is 42% in June 2008

Optus, is the weakest mobile operator in terms of revenue growth which equal to 4.2%, subscribers market share = 33% in 2008

Vodafone, the revenue growth from mobile services was 7%, the subscribers market share = 17% in 2008

Mobile networks :

All the mobile operators in Australia are beginning to upgrade the 3G networks (Telstra, Optus, Vodafone, Hutchison)

Table 2.4.3a Annual growth of mobile subscribers (Australia) [42]

Years	Subscribers	Annual growth
2007	2%	7%
2008	22.123	6.4%
2009	23.135	4.6%
2010	23.714	2.5%
2011	24.188	

2.4.4 : India communications

The assessment of the communications market in India based on the 3G subscribers market, the internet users, broadband subscribers sector and mobile average revenue per user (ARPU) rates. The number of mobile subscribers reached 584 million at the Q1 of 2010 with growth rate about 11.3% that equal to 59.2 million. The mobile licenses had raised the mobile services cost more than double. Infotel Broadband Services paid INR 128.48 billion to win Broadband Wireless Access (BWA) licenses for all 22 of India's telecoms circles, Mobile network operator Aircel is paid INR 34.38 to win licenses for 8 Indian`s telecoms circles. The largest mobile operator by subscribers in India is BhartiAirtel. Mobile market competitors Reliance Communications (RCom), Aircel, Idea Cellular, Tata Teleservices, Vodafone Essar and STel were also awarded concessions. BSNL and MTNL are the Indians State-owned operators offer commercial 3G services. India announced the sale of new communication service (new wireless broadband spectrum which important to the development of WiMAX in India).

2.4.4.1 The sources of communication published revenue in India

Landline telephone services (the number of subscribers 37.75 million in Jan 2009).

Mobile phone services (the number of subscribers in March 2008 was 375 million and became 403 million in April 2009, the new mobile services gave Indian mobile market the capability to grow from $ 500 million in 2006 to $ 10 billion in 2009).

Internet services (enhanced by broadband are developed continuously the total connection at end of 2008 became 4.73 million broadband connections, more than 256 Kbps considered broadband in India while in other countries is 2Mbps, the number of the subscribers 60 million in 2007,the increasing of ISPs (Internet Service Providers) decreasing the cost of internet services , the total subscribers using broadband services 2.3 million in April 2007 , the penetration level is low when it's compared with other countries

2.4.4.2: The key mobile services operators are:

BhartiAirtel number of subscribers =88382758=33.04%

Vodafone number of subscribers =63340024=23.68%

BSNL number of subscribers =42673357=15.95%

IDEA number of subscribers =40016153=14.96%

Aircel number of subscribers =16761397=6.27%

Reliance Telecom , subscribers =10353841=3-87%

MTNL number of subscribers =4003807 =1.5%

BPL number of subscribers =2007303=.75%

All India subscribers =267538640 The above numbers represent GSM subscribers till Jan 2009 & increased to 584 million at the Q1 2010.

The major mobile communication networks in India are:

i.Hutch

ii. Airtel

2.4.5: Egypt Mobile communication market, analysis, statistics &forecasts

The mobile communications system in Egypt is 3G. The penetration rate is reached about 80% at the mid 2010. The mobile market in Egypt has good potential because of the good price that was paid for the license.

The network operators are:

Mobinil, Vodafone Egypt (VFE) and Etisalat, they have introduced advanced services and represent a key players in a broadband and Internet, also developing the mobile broadband services to 3.5G HSPA technology which made Egypt to become one of the leaders of the Internet markets in Africa in terms of services offered, users, and international bandwidth. Egypt is combined by many international submarine fiber optic cables that combined with a national fiber-backbone infrastructure. The competition among the Internet and data service providers reduced the cost of broadband services in Africa and ADSL2+ services was available up to 24Mb/s . Many companies introduced VoIP Internet telephony, data and Internet services. Fiber-to-the-Home (FttH) network has been introduced in Cairo. Egypt's telecoms regulator, NTRA has offered a license to a new mobile operator. Many investors are interested to invest in Egypt mobile communications market. In 2010 Egypt mobile communications regulator announced two triple play licenses for fixed-line voice, high-speed broadband and pay TV services.

Market highlights:[5] The expected penetration rate of mobile communications between 2012 and 2015 will be around 80%, fixed line subscriptions and Mobile ARPU will be declined, Fixed line average revenue per user (ARPU) confirm that a decreasing of broadband and mobile cost services. New licences of triple play services for high speed broadband, fixed line voice and pay TV services, new mobile operator licence. Market Penetration rates in Q1 2010 were; Mobile communication (77%), Fixed line (12%) and Internet broadband (22%).

The key telecommunications information which is necessary for the scientific research is:

Mobile application and content developments.

Average Revenue per User (ARPU)

Telecoms operators Internet and broadband development.

Government policies affecting the telecoms industry, market liberalization

And regulatory issues, privatization acquisitions, new licenses and competition

2.4.5.1: Key telecommunications services in Egypt

GPRS enabled services such as SMS, MMS, Wireless Fax and E-mail, and IVR (Interactive Voice Response).

3.75G services such as (video calls, watch live TV) which depends on UMTS, HSDPA and HSUPA protocols[44]

2. 4. 5.2: Egypt mobile communication networks

Egyptian Company for Mobile Services (ECMS) , operates as Mobinil. Technology GSM900/GPRS/EDGE

Vodafone Egypt Telecommunications S.A.E. ,operate as Vodafone (formerly Click GSM).Technology GSM900,GPRS

2.4.6: Syria - Telecoms, Mobile, Broadband and Forecasts

Syria telecoms sector most regulated but with low development in the Middle East. This case is a good opportunity for investors if the Syrian government rules are relaxed. Syrian Telecommunications Establishment (STE) considered as a telecommunication regulator in Syria and owned the fixed line network the aim of the STE is to develop its network to cover 100% Syrian area in 2013. The penetration rates are low & Fixed-line subscribers number is still raising. Syria is developing its communications systems by linking to the UGARIT submarine cable which leads to increase Internet capacity. In addition, a land cable connecting Syria, Turkey, Jordan and Saudi Arabia is expected to come online in mid 2010. The key operators providing mobile communication services in Syria are Syriatel which is locally owned and MTN which is a subsidiary of MTN in South of Africa. Syrian mobile communications markets have low Mobile penetration rates. Both operators want to reduce their payment to the government by getting licenses contracts. A new mobile license will be released which represent good opportunity for major operators in this region such as Zain or Qatar's Qtel. 3G and HSPA services are released by Syria-tel operator but it's restricted to a few subscribers because of its high cost. Internet and broadband penetration are very low. Syrian government put many Internet sites such as U-Tube and Facebook under the strict censorship. The cost of the broadband services is high and difficult to offer to the user, with ADSL to be the least affordable in the Middle East. The mobile communications market in Syria has a great potential for development it needs higher liberalization to attach that potential. Syriatel Mobile Telecom, provide mobile and internet services, the number of mobile subscribers =4250546 million in 2008 which represent 54% 0f the market share, the annual revenue in 2007 = $782.8 million.

MTN ,the number of mobile subscribers = 3.359 million at the end of 2008 which represent 46% of market share, beside this MTN announced new tariff plan and improve the performance of the existing network infrastructure to attract more subscribers and expected increasing the subscribers by 400000 in 2009. Syria Networks:

SYRIATEL (GSM 900/1800 Technology , Live February 2001,Web Site: www.syriatel.sy)

MTN Syria (JSC) (GSM 900/1800 Technology)

Syrian Telecommunication Est. (MOBILE SYRIA, GSM 900 Technology)

The telecommunication revenue = $1.25 billion in 2008. .Sources of telecommunication revenue is:

From mobile phone , the services are voice calls and SMS)

Wire line services (3.5 million landline in use).

Internet services with broadband internet access (ADSL service in Syria available since 2003) .The providers of internet services are (Syrian Telecommunication Establishment, SAWA, Runnet, AYA, E-LCOM, SCS, ZAD, Teranet, INET, Extra), the number of internet users is 1.5 million

2.4.7: Iraq- Telecoms, Mobile, Broadband and Forecasts

The telecommunications in Iraq moves toward mobile. Before 2003 mobile telecommunications exist in Kurdish area only. Since 2004 the subscribers number increased to reach penetration rate over 74.2%, which is higher than in neighboring Syria and Lebanon. Five operators share the market but Zain of Iraq has the largest market share, equal 53.3% of the market. Asiacell has

35.6% of the market, Korek has 9% of the market, Sanatel has 1.3% and Moutiny has 0.9%. Korek, has a national license.

2.4.7.1 Key highlights

The mobile communications sector in Iraq is booming because the infrastructure of fixed line network is completely destroyed after the Iraqi war at 2003 and the penetration rate of fixed line is about 5% , also there is a weakness in backbone infrastructure of the fiber-optic. Mobile communication services by using CDMA networks are released by many operators who got local loop wireless license. The numbers of Internet users are low in comparison with the mobile subscriber's number; the 3G/HSPA services are weak. The future of mobile communication sector in Iraq is good opportunity to investors which depend on the security situation and better regulation. Mobile communications services launched in 2004 Subscribers number=23 million at the end of 2010 Mobile penetration rate expected=74.2 % Subscribers increased 9% in 2009 Mobile phone services Operators (Zain, Asiacel,Korek, Sanatel, Moutiny,Kalimat, Etisal.)

Fixed line size is less than 5% , number of subscriber= 1.082 million

Great lack of fibre-optic

Technology used CDMA network

Very low level of internet, number of users= 300000 in 2008

High cost of mobile phone services

Table2.4.7 a Iraq Mobile,2011 [47]

Service	User

Mobile Services	23 Million
Fixed line service	1.082 Million= 5%
Internet	.300 Million

Table 2.4.7b OPERATORS, 2011 [47]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Zain	120	53.3	53.3	53.3
	Asiacell	80	35.6	35.6	88.9
	Korek	20	8.9	8.9	97.8
	Sanatel	3	1.3	1.3	99.1
	Moutiny	2	.9	.9	100.0
	Total	225	100.0	100.0	

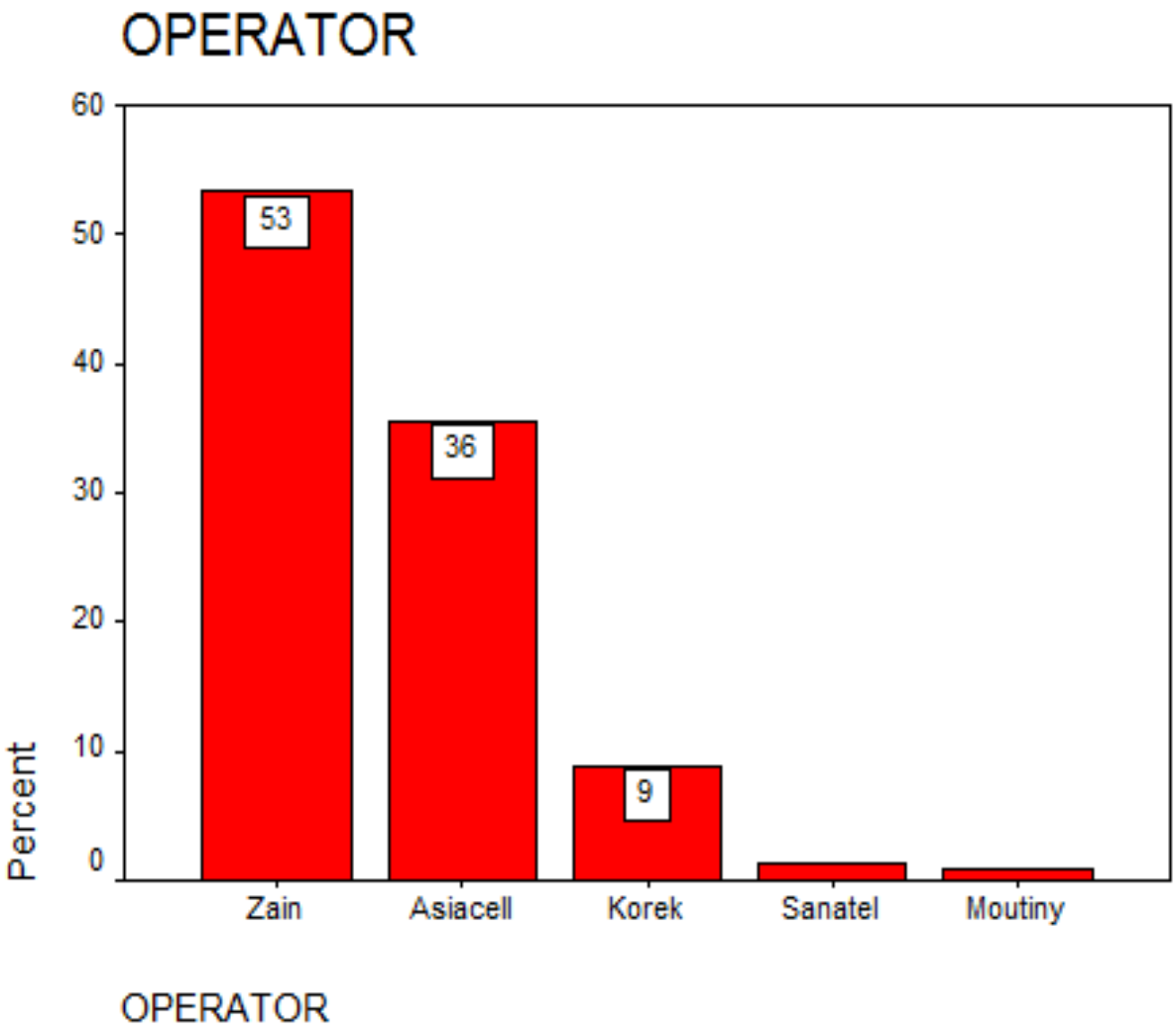


Fig 4.7a Iraqi Mobile Services Operators

CHAPTER THREE: METHODOLOGY

3.1 DATA COLLECTION METHODS

The study is based on data obtained from the questionnaire in Arabic and English languages on mobile communication services in Iraq and Syria and market reports of seven countries (USA, UK, Australia, India, Egypt, Syria and Iraq) which include industry data, technical papers and financial reports. This research provides a consensus of the past history of the product (value, price trends, application trends, leading producers and their market shares). The survey had been done with operators and users of mobile communications services. Data are collected by face to face interviews. In order to get good results, the respondents were selected from different age groups and job profile. The questionnaire was distributed among teachers, students of Iraqi universities, secondary schools and public. The sample consist of 1000 respondents. References stated that a sample size of 300 to be sufficient, 100 as poor and 1000 an excellent [65]. From this sample 40% of the respondents belong to the 22 to 40 years age group,25% of the respondents belong to the more than 40 years age group, 15% of the respondents belong to the 17 to 22 years age group, 15% of the respondents belong to the 11 to 16 age group and 5% of the respondents belong to the under 10 years age group. Since the largest part of the survey is conducted in the university so the age group of 22 to 40 years represent the largest number of respondents. Several studies recommended pretesting questionnaire to test deficiencies in design and question wording , so the questionnaire was pre-tested on a sample of 60 teachers and students selected and interviewed [66]. Pre-test respondents took about one hour to complete the

questionnaire which led to some changes in the design of questionnaire structure. The questions of the questionnaire are selected according to the requirements of our research. The questions are clear and simple so to reduce the respondent confusion and time (68). Spector provided four characteristics of rating scales"a scale must contain multiple items, each item in the scale is a statement and respondents are asked to give ratings about statement" (71). Spector support this scale through three reasons ";it can produce scales that have good psychometric properties-that is good reliability and validity… it is relatively cheap and easy to develop… and it is usually quick and easy for respondents to complete and typically does not make complaints from them".

To address validity of the questionnaire a group of statistic, marketing, business management, economic professors, doctoral students, and industry experts were asked to read and refine the questionnaire. Based on their feedback, several items were changed to reflect the purpose of this research better. This pre-test examination provided us reasonable assurance of the validity of the questionnaire items.

Main attributes for mobile phone services depend on the previous studies (Ofcom). The criteria of measuring the performance of the mobile communication services globally are;(network performance, customer service quality, brand image, range of services, service plans, range of phones, accuracy of billing and payment, value for money and entertainment features). The participants were asked to rate the performance of service attributes based on the scale range. For measuring customer satisfaction the participants were asked to comment on the satisfaction level of the mobile phone service provider.

3.2 DATA ANALYSIS

The data are analyzed by using SPSS program to find the regression equation which explains the relation between the dependent variable which represent the money spent on mobile phone services and the independent variables which include the age of the subscriber, gender, academic standing, money paid for the price of mobile phone handset, interesting in mobile phone having ability to play movies, the maximum price paid for mobile phone handset having

ability to play movies, problems facing the user during the usage of internet on the mobile phone handset, period of daily usage mobile phone services and the satisfaction in mobile phone services customer support. The research explain that the mobile communications services depend on the requirements of consumers (which means that mobile services available to the consumer anytime anywhere with high transmission speed and low cost), which have done by using advanced technologies such as Orthogonal Frequency Division Multiplexing (OFDM), MIMO, WiMAX, that allow the internet and mobile services providers to offer broadband services in a hundred of Mbps, with high quality voice, video & multimedia over internet. The age of participant has a large effect on the type of mobile communication services i.e. the penetration of the mobile within specific subgroups, such as youth market, is significant as well. According to a recent Harris Interactive study, 12% of 8 to 12 years old and almost 50% of teens aged 13 to 15 now have mobile phones. The growing of mobile communications and data services among the youth market is evidenced by the growth of content providers such as MTV networks (the music and entertainment network targeting teens and young adults where MTV is now the world's largest content provider for the mobile phone (69). For many young consumers, mobile phone represents not only a communication device, but a way to express one's individuality through customized faceplates, wallpapers, and ringtones. Some scholarly research (71) has suggested that the determinant of the mobile phone usage differs by age and gender. Regarding differences across male and female mobile phone users, there is indirect evidence that sex differences might explain variations in mobile phone usage. For instance, in the study of video game play and sex differences, Sherry and Lucas (2003) suggest that individual interpersonal orientations (i.e. inclusion, affection, and control) are related by sex differences. So sex factors have an effect on mobile communication marketing. Academic standing effects have been shown to correlate with consumer, including studies that have shown correlations with consumer innovativeness. More recently, the effect of the country characteristics on the diffusion of wireless communication was examined and found a broad relationship among country, Academic standing, and diffusion rates. Overall, cross-culture research suggests that consumers across different academic standing may exhibit similar perceptions regarding product attributes and terminal outcomes, yet the same consumers may place varying degrees of importance on those attributes and outcomes. In order

to examine the impact of culture, we examine differences in culture by looking at two different markets (Developing & Developed markets) in global arena. The research model will contribute towards more robust decision making and better strategic planning. The thesis extract the data from literature review, survey, a questionnaire of Iraqi and Syrian population. The responses were analyzed by using multiple regression analysis.

3.2.1 Regression Analysis Theory

Regression analysis is one of the most tools used in market research. Regression analysis enables market researchers to analyze relation between independent and dependent variables. In marketing applications, dependent variable is usually the outcome we care about, while the independent variables are the instruments we have to achieve those outcomes with. Regression analysis can provide insights that few other techniques can.

The key benefits of using regression analysis are:

Indicate if independent variables have a significant relationship with a dependent variable.

Indicate the relative strength of different independent variables' effects on a dependent variable.

Make predictions.

Knowing about the effects of independent variables on dependent variables can help market researchers in many different ways. For example, it can help direct spending if we know promotional activities significantly increases sales. Knowing about the relative strength of effects is useful for marketers because it may help answer questions for example (sales depend more strongly on price or on advertising). Most importantly, regression analysis allows us to compare the effects of variables measured on different scales such as the effect of price changes and the number of promotional activities. Regression analysis can also help make predictions. For example, if we have data on sales, prices, and promotional activities, regression analysis could provide a precise answer to what would happen to sales if prices were to increase by 5% and

promotional activities were to increase by 10%. Such precise answers can help market managers to make decisions. Furthermore, by providing various scenarios, such as calculating the sales effects of price increases of 5%, 10%, and 15%, managers can evaluate marketing plans and create marketing strategies [39]. In statistics, regression analysis includes any techniques for modeling and analyzing several variables, when the focus is on the relationship between a dependent variable and one or more independent variables. More specifically, regression analysis helps one understand how the typical value of the dependent variable changes when any one of the independent variables is varied, while the other independent variables are held fixed. Most commonly, regression analysis estimates the conditional expectation of the dependent variable given the independent variables that is, the average value of the dependent variable when the independent variables are held fixed In all cases, the estimation target is a function of the independent variables called the regression function.

In regression analysis, it is also of interest to characterize the variation of the dependent variable around the regression function, which can be described by a probability distribution. Regression analysis is widely used for prediction and forecasting, where its use has substantial overlap with the field of machine learning (making software that automatically learns from data). Regression analysis is also used to understand which among the independent variables are related to the dependent variable, and to explore the forms of these relationships. In restricted circumstances, regression analysis can be used to conclude causal relationships between the independent and dependent variables. A large body of techniques for carrying out regression analysis has been developed. Familiar methods such as linear regression and ordinary least squares regression are parametric, in that the regression function is defined in terms of a finite number of unknown parameters that are estimated from the data. The techniques that permit the regression function to lie in a certain set of functions is called nonparametric regression, which may be infinite-dimensional. The performance of regression analysis methods in practice depends on the form of the data generating process, and how it relates to the regression approach being used. Since the true form of the data-generating process is in general not known, regression analysis often depends to some extent on making assumptions about this process. These assumptions are sometimes (but not always) testable if a large amount of data is available. Regression models for

prediction are often useful even when the assumptions are moderately violated, although they may not perform optimally. However, in many applications, especially with small effects or questions of causality based on observational data, regression methods give misleading results

3.2.2 Review of Simple Regression

A simple regression is a linear model with one variable. The primary purpose is to establish a common notation and to point out the need for matrix notation. A light reading should suffice for most students. Modeling refers to the development of mathematical expressions that describe in some sense the behavior of a random variable of interest, which is called the dependent variable and denoted with Y. Most commonly the modeling is aimed at describing how the mean of the dependent variable E(Y) changes with changing conditions; the variance of the dependent variable is assumed to be unaffected by the changing conditions. Other variables which are thought to provide information on the behavior of the dependent variable are incorporated into the model as predictor or explanatory variables these variables are called the independent variables and are denoted by X with subscripts as needed to identify different independent variables. Additional subscripts denote the observational unit from which the data were taken. The Xs are assumed to be known constants. In addition to the Xs, all models involve unknown constants, called parameters, which control the behavior of the model. These parameters are denoted by Greek letters and are to be estimated from the data. The mathematical complexity of the model and the degree to which it is a realistic model depend on how much is known about the process being studied and on the purpose of the modeling exercise. In preliminary studies of a process or in cases where prediction is the primary objective, the models usually fall into the class of models that are linear in the parameters. The parameters enter the model as simple coefficients on the independent variables or functions of the independent variables. Such models are referred to loosely as linear models. The more realistic models, on the other hand, are often nonlinear in the parameters. Most growth models, for example, are nonlinear models. Nonlinear models fall into two categories: intrinsically linear models, which can be linearised by an appropriate transformation on the dependent variable, and those that cannot be so transformed.

Most of the discussion is devoted to the linear class of models and to those nonlinear models that are intrinsically linear.

3.2.3 The Linear Model and Assumptions

The simplest linear model involves only one independent variable and states Model that the true mean of the dependent variable changes at a constant rate as the value of the independent variable increases or decreases. Thus, the functional relationship between the true mean of Yi, denoted by E(Yi), and Xi is the equation of a straight line:

$E(Yi) = \beta 0 + \beta 1\ Xi.$

β0 is the intercept, the value of E(Yi) when X = 0, and β1 is the slope of the line, the rate of change in E(Yi) per unit change in X. The observations on the dependent variable Yi are assumed to be random Assumptions observations from populations of random variables with the mean of each population given by E(Yi). The deviation of an observation Yi from its population mean E(Yi) is taken into account by adding a random error _i to give the statistical model $Yi = \beta 0 + \beta 1Xi + \_i$. Where (I) is the subscript represents the particular observational unit, i= 1, 2, . . . , n. The Xi are the n observations on the independent variable and are assumed to be measured without error. That is, the observed values of X are assumed to be a set of known constants. The Yi and Xi are paired observations; both are measured on every observational unit.

3.2.4 Models with Several Independent Variables

Most models will use more than one independent variable to explain the behavior of the dependent variable. The linear model with the several independent variables can be extended to include any number of independent variables.

$$Yi = \beta 0 + \beta 1Xi1 + \beta 2Xi2 + \beta 3Xi3 + \cdot \cdot \cdot + \beta pXip$$

The subscript notation has been extended to include a number on each X and β to identify each independent variable and its regression coefficient. There are p independent variables. The i are assumed to be independent and to have common variance σ2. For constructing tests of significance or confidence interval statements, the random errors are also assumed to be normally distributed. The independent variables are assumed to be measured without error

Validity of Regression Models

Regression analysis is one of the most important statistical techniques for business applications. It's a statistical methodology that helps estimate the strength and direction of the relationship between two or more variables. The analyst may use regression analysis to determine the actual relationship between these variables by looking at a corporation's sales and profits over the past several years. The regression results show whether this relationship is valid.

In addition to sales, other factors may also determine the corporation's profits, or it may turn out that sales don't explain profits at all. In particular, researchers, analysts, portfolio managers, and traders can use regression analysis to estimate historical relationships among different financial assets. They can then use this information to develop trading strategies and measure the risk contained in a portfolio.

Regression analysis is an indispensable tool for analyzing relationships between financial variables. For example, it can:

Identify the factors that are most responsible for a corporation's profits

Determine how much a change in interest rates will impact a portfolio of bonds

Develop a forecast of the future value of the Dow Jones Industrial Average

The following ten sections describe the steps used to implement a regression model and analyze the results.

Step 1: Specify the dependent and independent variable(s)

To implement a regression model, it's important to correctly specify the relationship between the variables being used. The value of a dependent variable is assumed to be related to the value of one or more independent variables. For example, suppose that a researcher is investigating the factors that determine the rate of inflation. If the researcher believes that the rate of inflation depends on the growth rate of the money supply, he may estimate a regression model using the rate of inflation as the dependent variable and the growth rate of the money supply as the independent variable.

A regression model based on a single independent variable is known as a simple regression model; with two or more independent variables, the model is known as a multiple regression model.

Step 2: Check for linearity

One of the fundamental assumptions of regression analysis is that the relationship between the dependent and independent variables is linear (i.e., the relationship can be illustrated with a straight line.) One of the quickest ways to verify this is to graph the variables using a scatter plot. A scatter plot shows the relationship between two variables with the dependent variable (Y) on the vertical axis and the independent variable (X) on the horizontal axis.

For example, suppose that an analyst believes that the excess returns to Company (A) stock depend on the excess returns to the Company B. (The excess return to a stock equals the actual return minus the yield on a Treasury bill.) Using monthly data from September 2008 through

August 2013, the following image shows the excess returns to the Company B on the horizontal axis, whereas the excess returns to Company A are on the vertical axis.

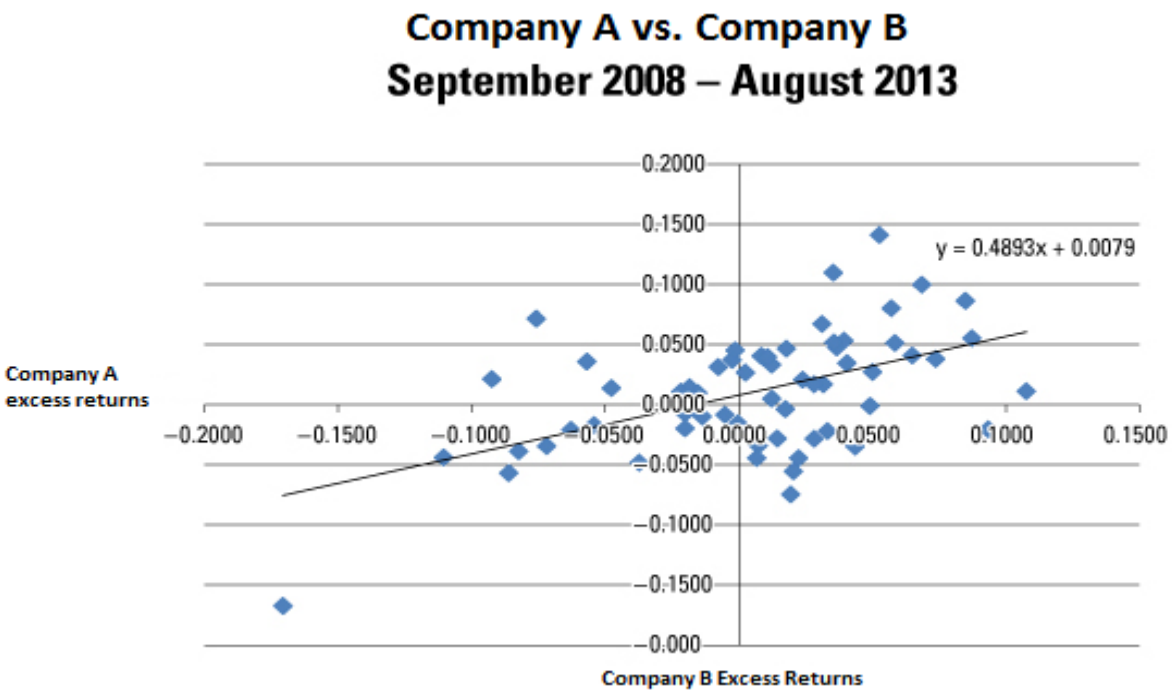


Fig.3.1 Shows the relationship between two variables A&B. [76]

It can be seen from the scatter plot that this relationship is at least approximately linear. Therefore, linear regression may be used to estimate the relationship between these two variables.

Step 3: Check alternative approaches if variables are not linear

If the specified dependent (Y) and independent (X) variables don't have a linear relationship between them, it may be possible to transform these variables so that they do have a linear relationship. For example, it may be that the relationship between the natural logarithm of Y and X is linear. Another possibility is that the relationship between the natural logarithm of Y and the

natural logarithm of X is linear. It's also possible that the relationship between the square root of Y and X is linear.

If these transformations don't produce a linear relationship, alternative independent variables may be chosen that better explain the value of the dependent variable.

Step 4: Estimate the model

The standard linear regression model may be estimated with a technique known as ordinary least squares. This results in formulas for the slope and intercept of the regression equation that "fit" the relationship between the independent variable (X) and dependent variable (Y) as closely as possible.

For example, the following tables (Table 3.1a, Table 3.1b, and Table 3.1c) show the results of estimating a regression model for the excess returns to Company (A) stock and the Company B over the period September 2008 through August 2013.

Table 3.1a

Regression statistics	
Multiple R	0.521340069
R Square	0.271795467
Adjusted R Square	0.259240217
Standard Error	0.043299456
Observation	60

Table 3.1b Anova

Source	df	SS	MS	F- TEST	Significance F
Regression	1	0.04058651	0.04058651	21.64795245	1.94506E-05
Residual	58	0.108740888	0.001874843		
Total	59	0.149327398			

Table 3.1c

	Coefficients	Standard error	t-test	p-value	Lower 95%	Upper 95%
Intercept	0.007893308	0.005624319	1.403424761	0.165821546	-0.003364989	0.019151606
Slope	0.48927098	0.105157692	40652736018	1094506E-05	0,27877499	0.69976697

In this model, the excess returns to Company (A) stock are the dependent variable, while the excess returns to the Company B are the independent variable. Under the Coefficients column, it can be seen that the estimated intercept of the regression equation is 0.007893308, and the estimated slope is 0.48927098.

Steps 5: Test the fit of the model using the coefficient of variation

The coefficient of variation (also known as R^2) is used to determine how closely a regression model "fits" or explains the relationship between the independent variable (X) and the dependent variable (Y). R^2 can assume a value between 0 and 1; the closer R^2 is to 1, the better the regression model explains the observed data.

As shown in the tables from Step 4, the coefficient of variation is shown as "R-Square"; this equals 0.271795467. The fit isn't particularly strong. Most likely, the model is incomplete, such as factors other than the excess returns to the Company B also determine or explain the excess returns to Company (A) stock.

For a multiple regression model, the adjusted coefficient of determination is used instead of the coefficient of determination to test the fit of the regression model.

Step 6: Perform a joint hypothesis test on the coefficients

A multiple regression equation is used to estimate the relationship between a dependent variable (Y) and two or more independent variables (X). When implementing a multiple regression model, the overall quality of the results may be checked with a hypothesis test. In this case, the null hypothesis is that all the slope coefficients of the model equal zero, with the alternative hypothesis that at least one of the slope coefficients is not equal to zero.

If this hypothesis can't be rejected, the independent variables do not explain the value of the dependent variable. If the hypothesis is rejected, at least one of the independent variables does explain the value of the dependent variable.

Step 7: Perform hypothesis tests on the individual regression coefficients

Each estimated coefficient in a regression equation must be tested to determine if it is statistically significant. If a coefficient is statistically significant, the corresponding variable

helps explain the value of the dependent variable (Y). The null hypothesis that's being tested is that the coefficient equals zero; if this hypothesis can't be rejected, the corresponding variable is not statistically significant.

This type of hypothesis test can be conducted with a p-value (also known as a probability value.) The tables in Step 4 show that the p-value associated with the slope coefficient is 1.94506 E-05. This expression is written in terms of scientific notation; it can also be written as 1.94506 X 10-5 or 0.0000194506.

The p-value is compared to the level of significance of the hypothesis test. If the p-value is less than the level of significance, the null hypothesis that the coefficient equals zero is rejected; the variable is, therefore, statistically significant.

In this example, the level of significance is 0.05. The p-value of 0.0000194506 indicates that the slope of this equation is statistically significant; for example, the excess returns to the independent variable B explain the excess returns to dependent variable A.

Step 8: Check for violations of the assumptions of regression analysis

Regression analysis is based on several key assumptions. Violations of these assumptions can lead to inaccurate results. Three of the most important violations that may be encountered are known as: autocorrelation, heteroscedasticity and multicollinearity.

Autocorrelation results when the residuals of a regression model are not independent of each other. (A residual equals the difference between the value of Y predicted by a regression equation and the actual value of Y.)

Autocorrelation can be detected from graphs of the residuals or by using more formal statistical measures such as the Durbin-Watson statistic. Autocorrelation may be eliminated with appropriate transformations of the regression variables.

Heteroscedasticity refers to a situation where the variances of the residuals of a regression model are not equal. This problem can be identified with a plot of the residuals; transformations of the data may sometimes be used to overcome this problem.

Multicollinearity is a problem that can arise only with multiple regression analysis. It refers to a situation where two or more of the independent variables are highly correlated with each other. This problem can be detected with formal statistical measures, such as the variance inflation factor (VIF). When multicollinearity is present, one of the highly correlated variables must be removed from the regression equation.

Step 9: Interpret the results

The estimated intercept and coefficient of a regression model may be interpreted as follows. The intercept shows what the value of Y would be if X were equal to zero. The slope shows the impact on Y of a change in X.

Based on the tables in Step 4, the estimated intercept is 0.007893308. This indicates that the excess monthly return to Company (A) stock would be 0.007893308 or 0.7893308 percent, if the excess monthly return to the Company B were 0 percent.

Also, the estimated slope is 0.48927098. This indicates that a 1 percent increase in the excess monthly return to the Company B would result in a 0.48927098 percent increase in the excess monthly return to Company (A) stock. Equivalently, a 1 percent decrease the excess monthly return to the Company (B) would result in a 0.48927098 percent decrease in the excess monthly return to Company (A) stock.

Step 10: Forecast future values

An estimated regression model may be used to produce forecasts of the future value of the dependent variable. In this example, the estimated equation is:

$$\hat{Y}_i = \hat{\beta}_0 + \hat{\beta}_1 X_i = 0.007893308 + 0.48927098 X_i$$

Suppose that an analyst has reason to believe that the excess monthly return to the Company (B) in September 2013 will be 0.005 or 0.5 percent. The regression equation can be used to predict the excess monthly return to Company (A) stock as follows:

$$\hat{Y}_i = 0.007893308 + 0.48927098(0.005) = 0.010339663$$

The predicted excess monthly return to Company (A) stock is 0.010339663 or 1.0339663 percent.

CHAPTER FOUR: RESULTS

4.1 Introduction

Chapter Three has discussed the research approach to the data collection, which is employed to achieve the objectives of the research. This chapter presents quantitative analysis and interpretation of the data collected by means of the questionnaire survey.

The main objective of the research is to:

- Identify the factors influencing the mobile communications services usage and industry in developed and developing countries what make some countries better for investment in mobile communication services and industry.
- Study the mobile communications services of developed countries (USA, UK, Australia) and developing countries (India, Egypt, Syria, Iraq).
- Overview the technologies used to develop the mobile communication services.

The objectives and the research questions set in Chapter One, as well as the research model presented in Chapter Four, should be borne in mind when analyzing the

questionnaire survey.

The content is basically divided into three main areas':

Background information;

Factors influencing the usage of mobile communication services means factors influencing the expenditure on mobile communication services.

4.2 Background Information

This section gives background information about the respondents and their ages, gender, education and their interest in the mobile communication services.

4.2.1 The respondents:

Table 4.1b provides information about the participant ages.

Table 4.2b provides information about the participant gender.

Table 4.4b provides information about the participant academic standing.

The researcher distributes 1000 questionnaires to the lecturers, students, in the university, ordinary people and operators of mobile communication services. The returned questionnaires were 932 copies fully completed. The returned copies were explained as follows

Q1. What is your age? [ ] less than 10 years, [ ] (11-16) years, [ ] (17-22) years, [ ] (22-40) years, [ ] more than 40 years.

Statistics

Table 4.1a Age mobile phone participants accumulative

N	Valid	932
	Missing	68

Table 4.1b Age mobile phone participants

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	less than 10 years	27	2.9	2.9	2.9
	11-16 years	123	13.2	13.2	16.1
	17-21years	150	16.1	16.1	32.2
	22-40 years	388	41.6	41.6	73.8
	more than 40 years	244	26.2	26.2	100.0

Table 4.1b Age mobile phone participants

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	less than 10 years	27	2.9	2.9	2.9
	11-16 years	123	13.2	13.2	16.1
	17-21years	150	16.1	16.1	32.2
	22-40 years	388	41.6	41.6	73.8
	more than 40 years	244	26.2	26.2	100.0
	Total	932	100.0	100.0	

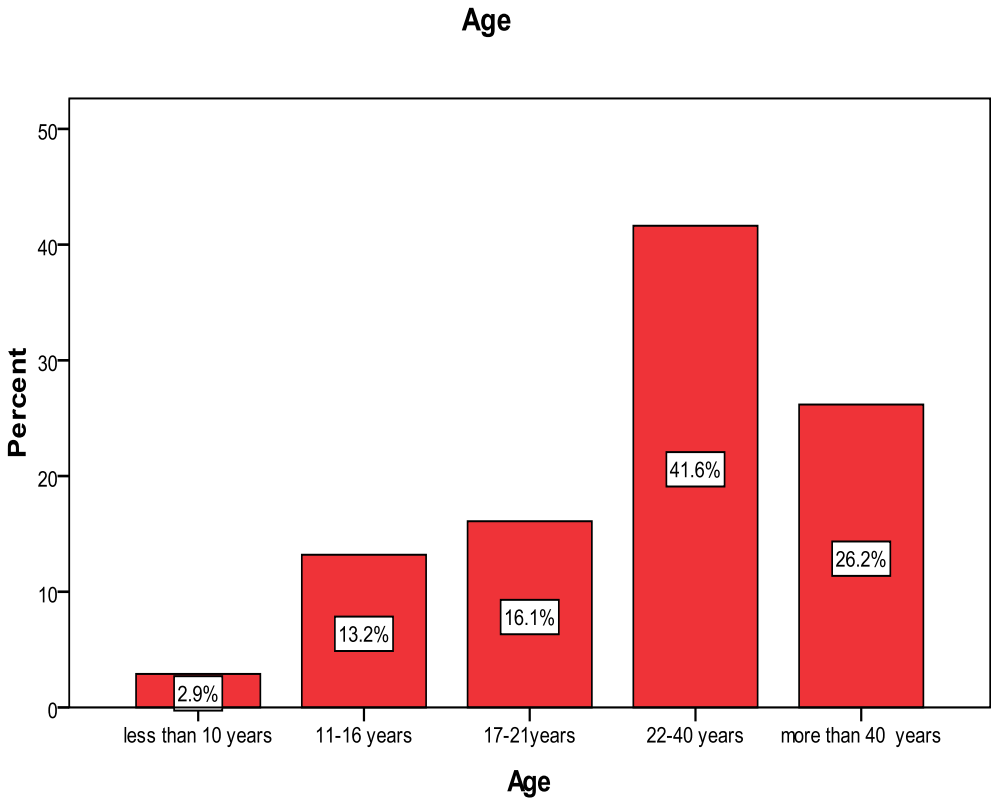


Fig.4.1.Shows that 41.6% of the participants belong to 22-40 age group, 26.2% 0f the participant belong to more than 40 years age group, 16.1% of the participants belong to the 17 to 22 years age group, 13.2% of the participants belong to the 11 to 16 age group and 2.9% of the participants belong to the under 10 years age group. Since the largest part of the survey is conducted in the university so the age group of 22 to 40 years represent the largest number of participants.

Q2.What is your gender? [ ] male, [ ] female.

Statistics

Table 4.2a. Gender of mobile phone service participants

N	Valid	932
	Missing	68

Table 4.2b. Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	185	19.8	19.8	19.8
	Male	747	80.2	80.2	100.0
	Total	932	100.0	100.0	

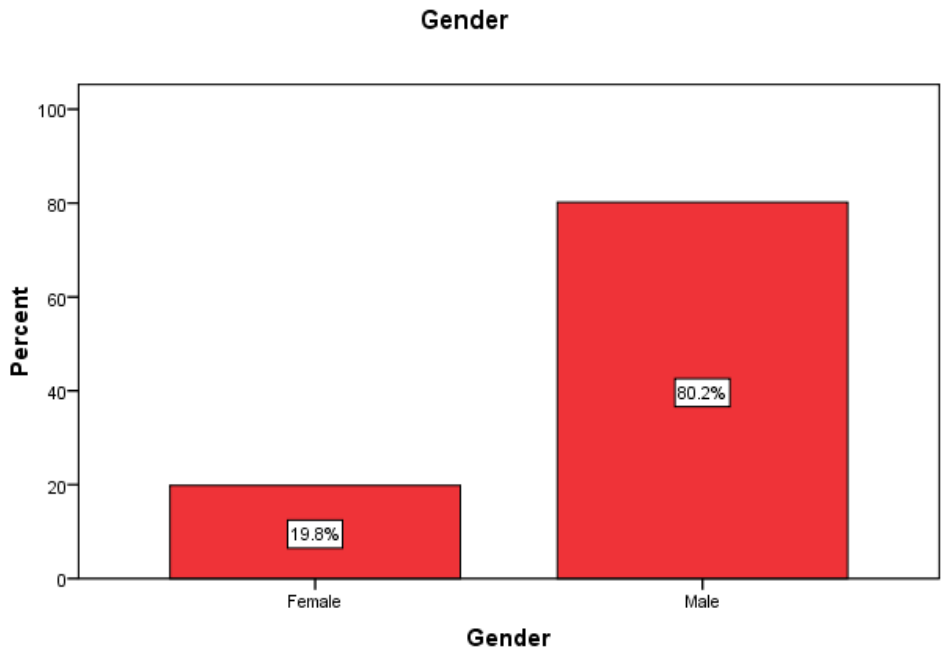


Fig. 4. 2 shows the distribution of gender among the participants of the survey which represents that 80.2% of the participants are males and 19.8% of the participants are females.

A number of studies have tried to analyse the impact of gender on mobile service usage. In fact, some of these studies have found that females use more SMS services than males, while males are more active in using mobile services such as mobile e-mail and personalized information services than females, except in using MMS, ringtones and logos. Therefore gender was observed to be a strong determinant of mobile service usage.

Q3. What is your Country? Iraq.

Q4. Academic standing of participant?

Statistics

Table. 4.4a Academic standing of participant

N	Valid	933
	Missing	67

Table 4.4b. Academic standing of participant

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Primary	47	5.0	5.0	5.0
	University	401	43.0	43.0	48.0
	Post	83	8.9	8.9	56.9
	Secondary	402	43.1	43.1	100.0
	Total	933	100.0	100.0	

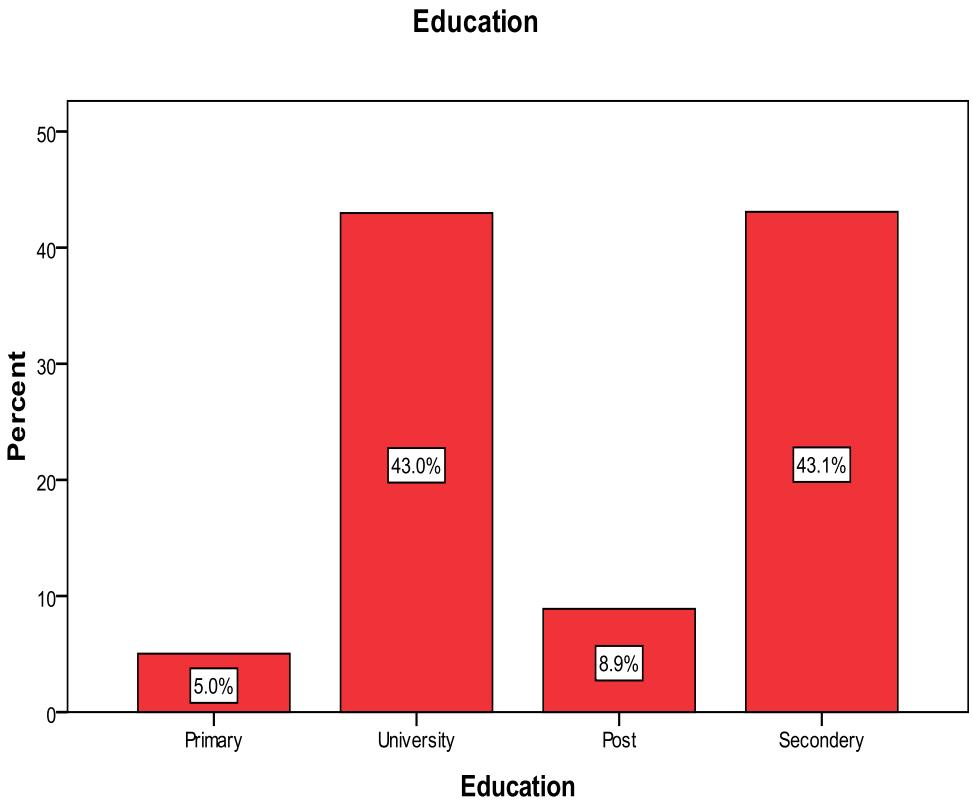


Fig.4.4 shows the education level of the participants which explain that 43% of them are university, 5% of them are primary school educated, 43.1% of them are secondary school educated and 8.9% of them are post-graduate educated.

Q5. Do you have a mobile phone?

Statistics

Table 4.5a. Mobile phone possession

N	Valid	932
	Missing	68

Table 4.5b. Mobile phone possession

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	904	97.0	97.0	97.0
	No	28	3.0	3.0	100.0
	Total	932	100.0	100.0	

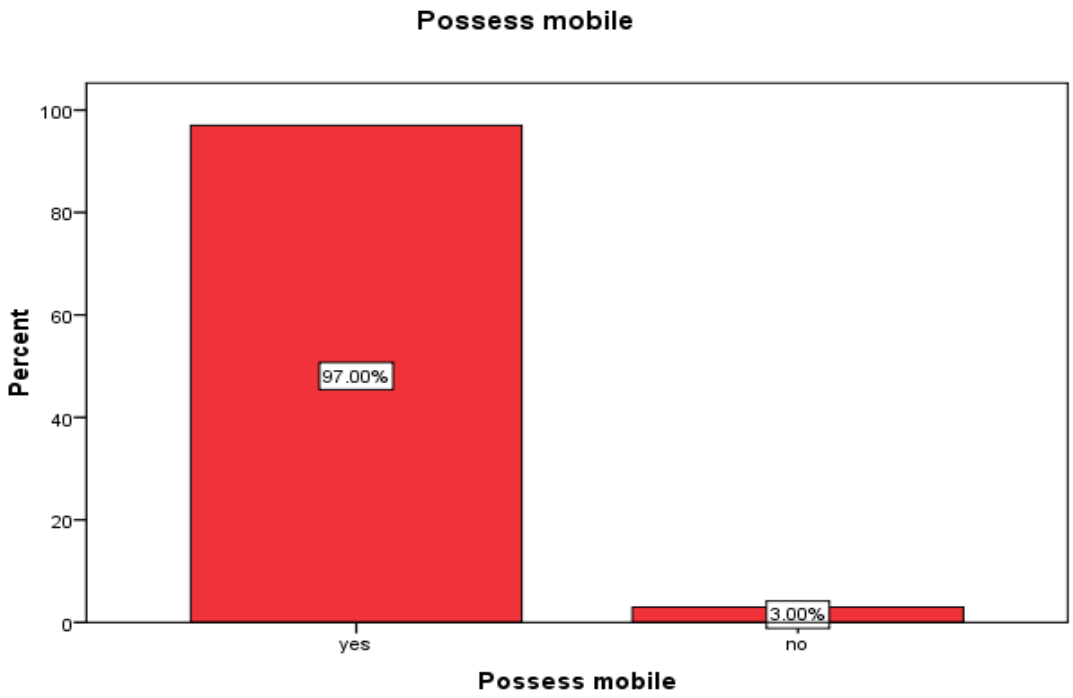


Fig. 4.5 shows how out of 932 participants of our survey which explain that 97% of them had a mobile phone and only 3% did not. This goes to show how saturated the mobile phone market has become. It is not a wonder that mobile phone manufacturers are continually trying to improve mobile phones to keep industry in profit.

Q6. How much do you pay for mobile phone?

Statistics

Table 4.6a. Money paid for purchasing mobile phone accumulative

N	Valid	932
	Missing	68

Table. 4.6b Money paid for purchasing mobile phone

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 100	373	40.0	40.0	40.0
	100-150	186	20.0	20.0	60.0
	150-200	187	20.1	20.1	80.0
	200-250	65	7.0	7.0	87.0
	More than 250	121	13.0	13.0	100.0
	Total	932	100.0	100.0	

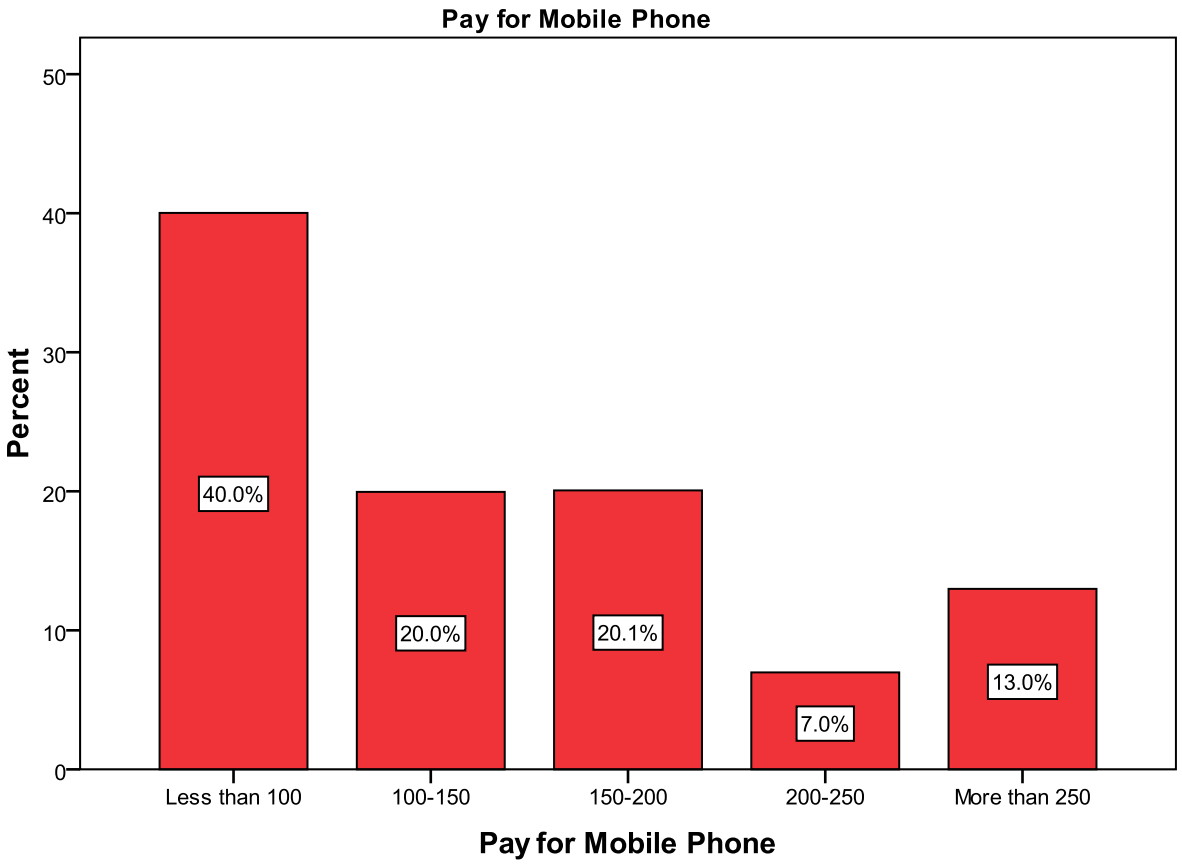


Fig. 4.6 shows how much participants pay for their mobile phones. It is interesting to note that 40% of participants to the survey paid 100$, 20.% paid 150$, 20.1% paid 200$, 7% paid 250$ and 13% paid more than $250.

Q7. How many mobile phones have you?

Statistics

Table. 4.7a. Number of mobiles that the participant have accumulative

N	Valid	932
	Missing	68

Table 4.7b. Number of mobiles that the participant have

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.0	559	60.0	60.0	60.0
	2.0	308	33.0	33.0	93.0
	3.0	65	7.0	7.0	100.0
	Total	932	100.0	100.0	

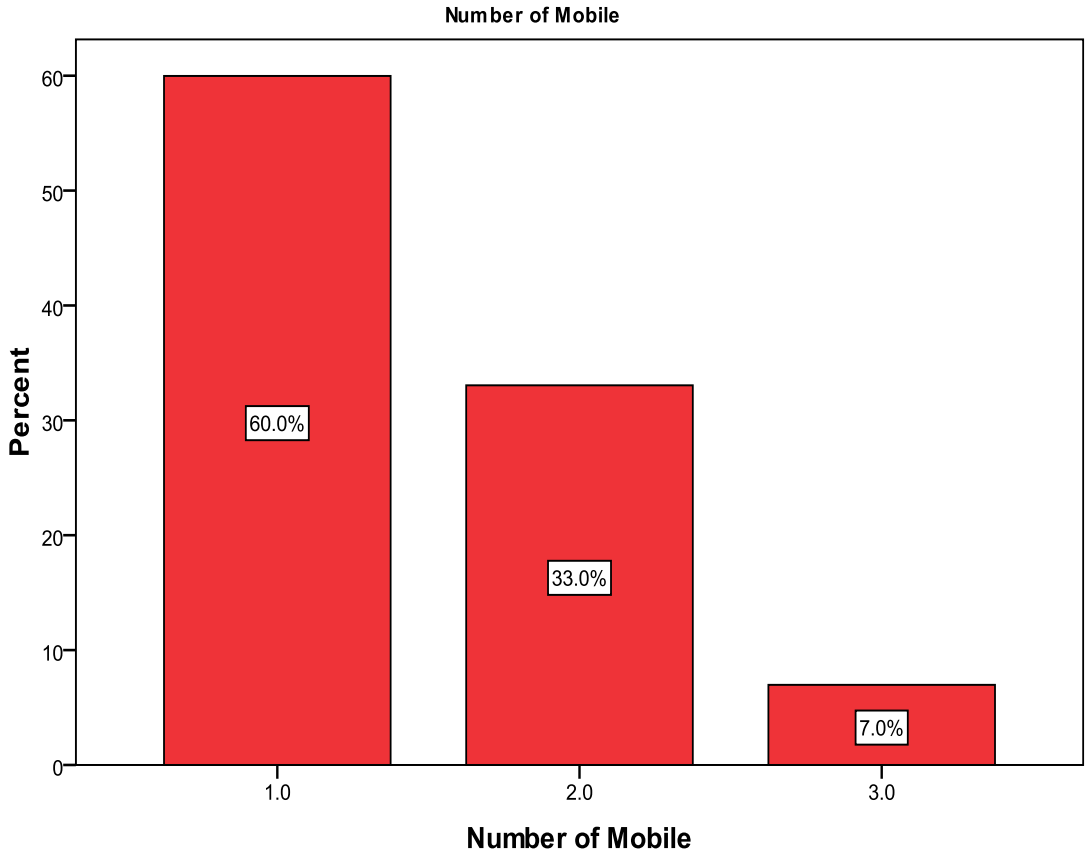


Fig.7 shows how many mobile phones handsets participants have owned. It is particularly important to note that 60% of the participants have one handset, 33% have two handsets and 7% have 3 handsets.

Q8.If you want to upgrade your phone what are reasons?

Statistics

Table 4.8a. Reasons for upgrading mobile phone accumulative

N	Valid	932
	Missing	68

Table 4.8b. Reasons for upgrading mobile phone

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Previous is Faulty	252	27.0	27.0	27.0
	Previous is Out of Date	186	20.0	20.0	47.0
	Wanted to Change	186	20.0	20.0	67.0
	Wanted a Smaller Type	122	13.1	13.1	80.0
	Special Offer	186	20.0	20.0	100.0
	Total	932	100.0	100.0	

the

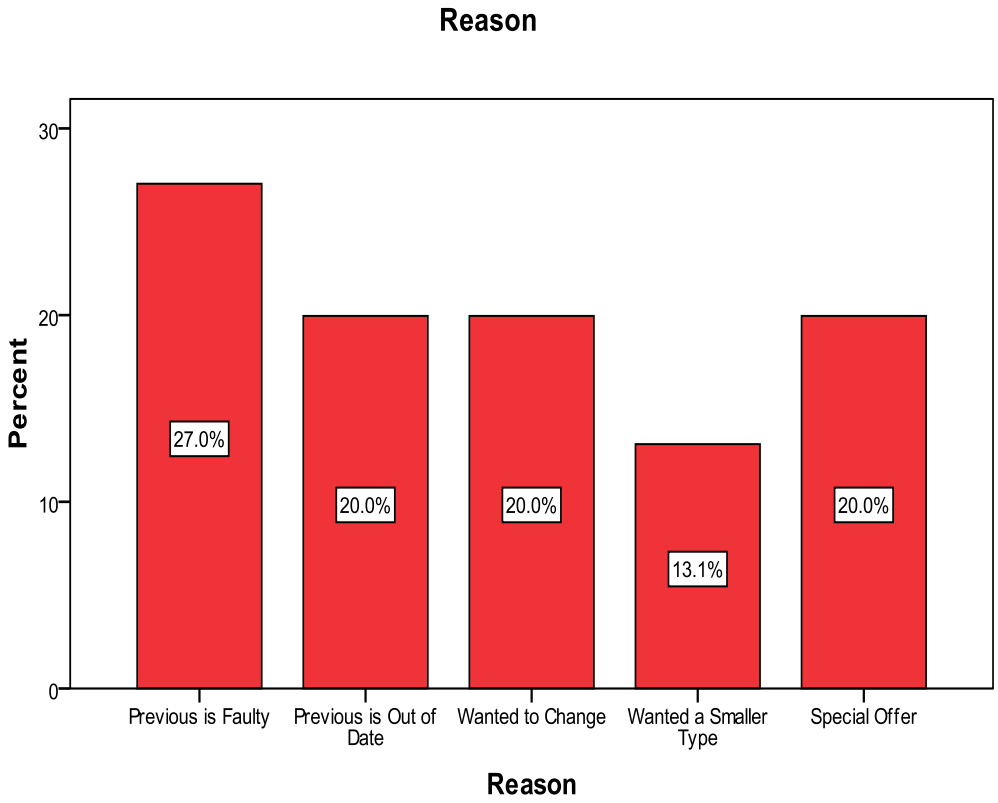


Fig. 8 shows reasons of upgrading the mobile phone, the bar chart explain that 27% of the participants surveyed are upgrading their mobile phones because are faulty, 20% of them are upgrading their phone because of special offers, 20% of them are upgrading their phones because they are out of date, 20% of them are upgrading their phones they want to change and 13.1% of the participants surveyed are upgrading their phones because they wanted a smaller type.

Q.9 Would you interested in mobile phone that has ability to play movies?

Statistics

Table 4.9a. The interested in mobile phone that have ability to play movies accumulative

N	Valid	932
	Missing	68

Table. 4.9b. The interested in mobile phone that have ability to play movies

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	494	53.0	53.0	53.0
	No	438	47.0	47.0	100.0
	Total	932	100.0	100.0	

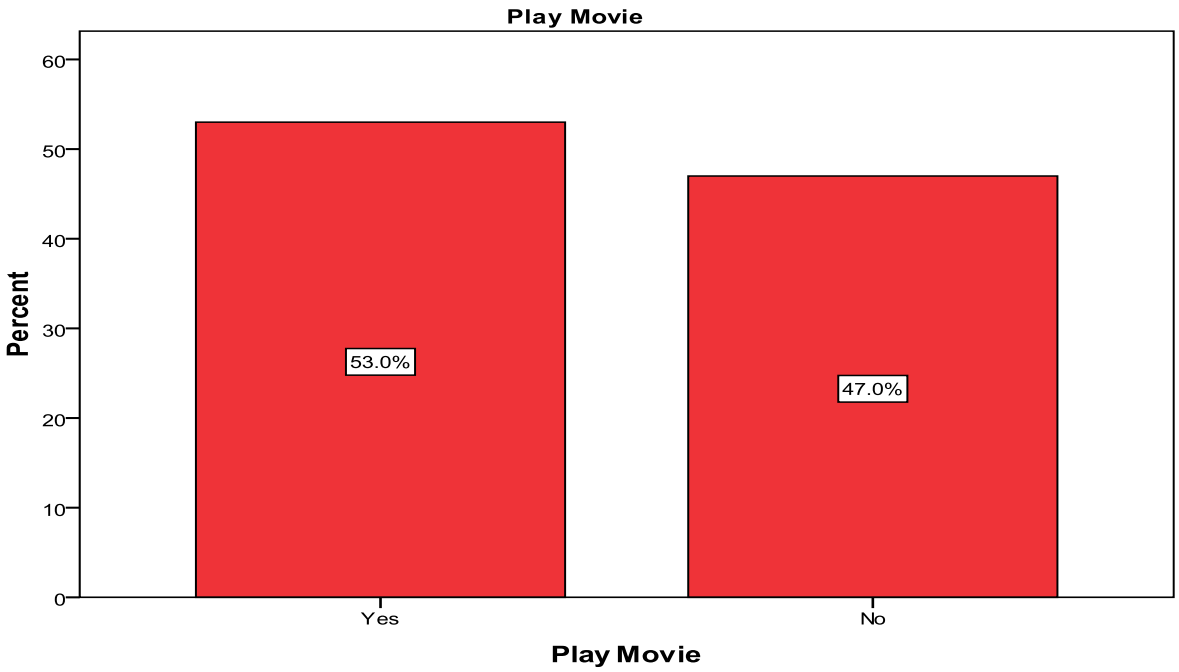


Fig. 4.9 shows the responses of the participants which indicate the interest towards the movie industry which explain that 53% of the participants in the survey are interested and 47% were not interested.

Q10. What is the maximum price you would pay for a movie phone?

Statistics

Table. 4.10a.

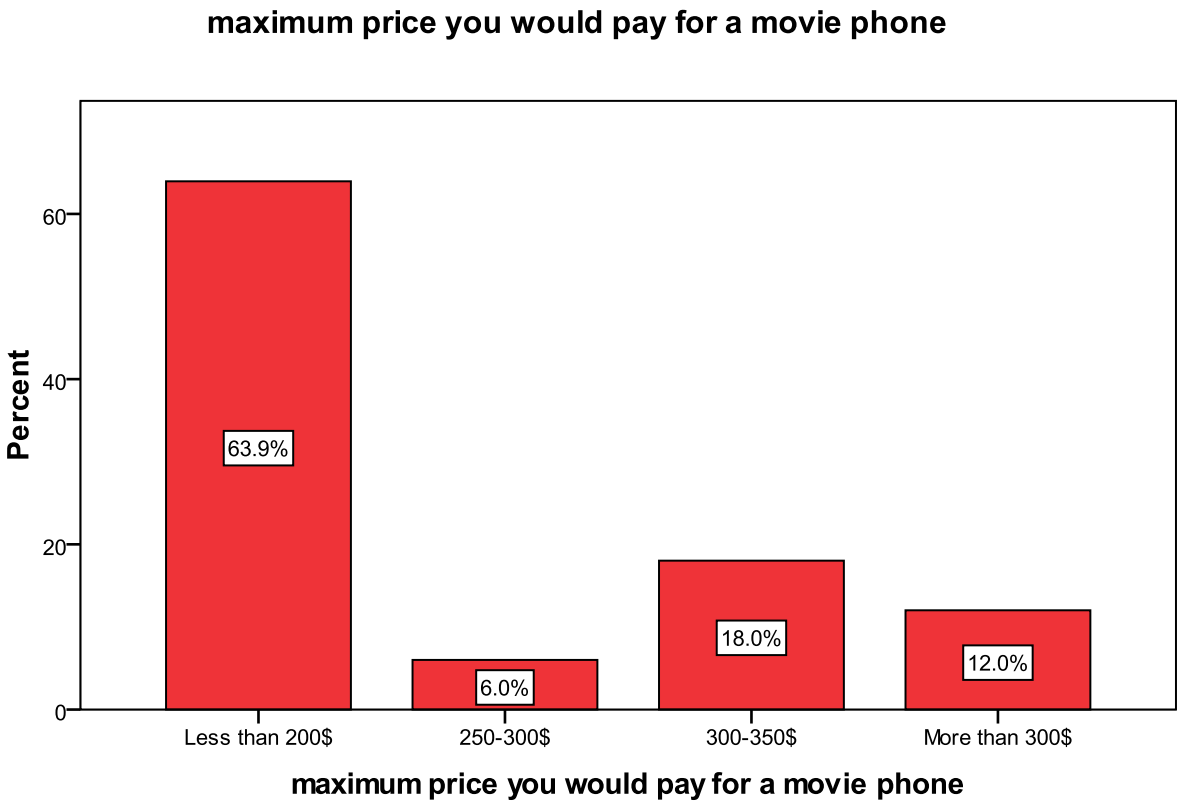
maximum price the participant would pay for a mobile phone presents movies , accumulative

N	Valid	932
	Missing	68

Table 4.10b maximum price the participant would pay for a mobile phone presents movies

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 200$	596	63.9	63.9	63.9
	250-300$	56	6.0	6.0	70.0
	300-350$	168	18.0	18.0	88.0
	More than 300$	112	12.0	12.0	100.0
	Total	932	100.0	100.0	

Fig. 4.10 shows the



maximum price to the movie phone , which explain that 63.9% of the participants will pay $ 200 for such a phone, 6% of them pay $[250-300],18%of them pay $ [300-350], and 12% of them pay more than $[350] .

Q.11 How much money do you spend on mobile phone services monthly?

Statistics

Table. 4.11a.

Money Spent on Mobile Phone Usage Monthly accumulative

N	Valid	932
	Missing	68

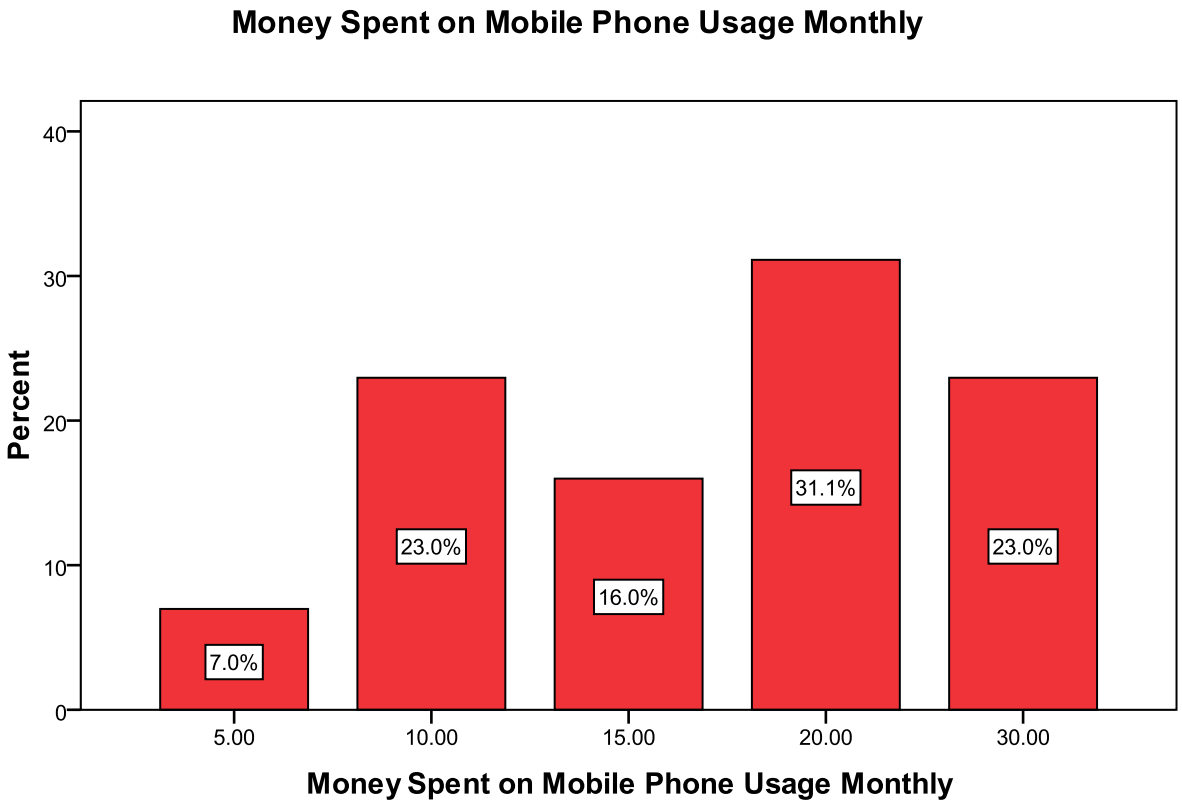
Table 4.11b money spent on mobile phone usage monthly

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	5.00	65	7.0	7.0	7.0
	10.00	214	23.0	23.0	29.9
	15.00	149	16.0	16.0	45.9
	20.00	290	31.1	31.1	77.0
	30.00	214	23.0	23.0	100.0

Table 4.11b money spent on mobile phone usage monthly

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	5.00	65	7.0	7.0	7.0
	10.00	214	23.0	23.0	29.9
	15.00	149	16.0	16.0	45.9
	20.00	290	31.1	31.1	77.0
	30.00	214	23.0	23.0	100.0
	Total	932	100.0	100.0	

Fig. 4.11



shows the monthly spent money of participants which explain that 7% of participants spend $5, 23% spend $10, 16% spend $15, 31.1% spend $20 and 23% spend $30 from which we conclude that the money spent per user monthly is equal to $18 in Iraq.

Q.12 How do you rate the mobile services quality?

Statistics

Table 4.12a Services Quality assessment of mobile phone , accumulative

N	Valid	932
	Missing	0

Table 4.12b Services Quality assessment of mobile phone.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Excellent	65	7.0	7.0	7.0
	Fair	373	40.0	40.0	47.0
	Good	252	27.0	27.0	74.0
	Poor	186	20.0	20.0	94.0
	v-good	56	6.0	6.0	100.0
	Total	932	100.0	100.0	

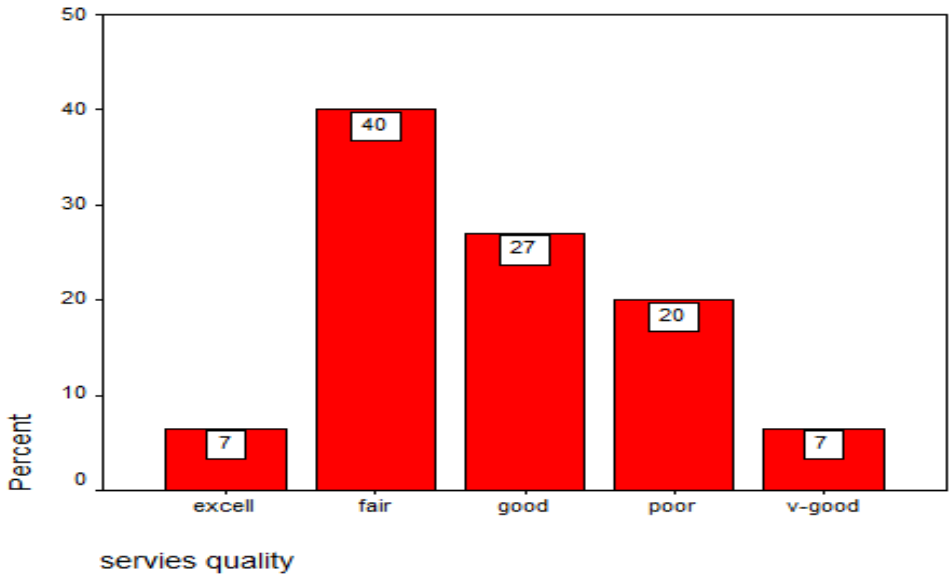


Fig.4.12 shows the assessment of mobile phone service quality which explain that 7% of participants assessed the services excellent, 40% assessed fair, 27% assessed good, 20% assessed poor and 7% assessed very good.

Q.13 How much money you spend on Internet services monthly?

Statistics

Table 4.13a. Money spent on the usage of Internet services accumulative

N	Valid	931
	Missing	68

Table 4.13b Money spent on the usage Internet services

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	186	20.0	20.0	20.0
	10.00	186	20.0	20.0	40.0
	20.00	186	20.0	20.0	59.9
	40.00	308	33.1	33.1	93.0
	60.00	65	7.0	7.0	100.0
	Total	931	100.0	100.0	

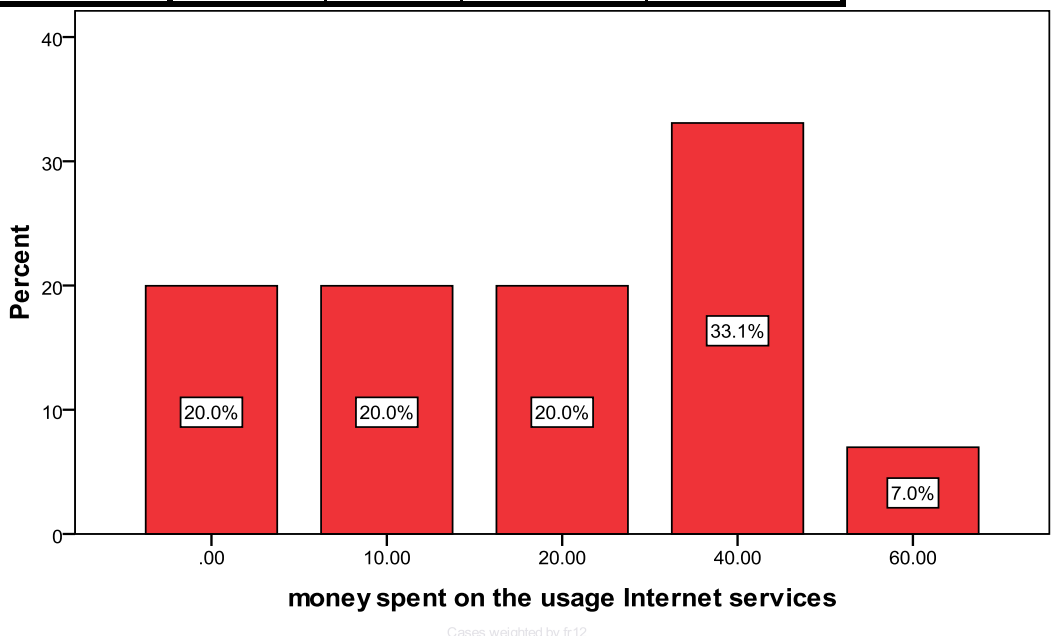


Fig.4.13 shows the monthly spent money by the

participants of our survey which explain that 20% of the participants are spending $5 on the usage of the Internet services monthly, 20% of the participants are spending $10 on the usage Internet services monthly, 20% of the participants are spending $20 on the usage of the Internet services, 33.1% of the participants are spending $40 on the usage of the Internet services and 7% of the participants are spending $60 on the usage of the Internet services. The conclusion is the money spent per user for the usage of Internet services monthly in Iraq is about $25.

Q.4.14 How do you rate internet service quality of your internet service provider?

[ ] Excellent, [ ] V.good. [ ] Good, [ ] Fair, [ ] Poor.

Table 4.14

Internet service quality of your Internet provider

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	V.good	43	4.6	4.6	4.6
	Good	407	43.7	43.7	48.3
	Fair	451	48.4	48.4	96.7
	Poor	31	3.3	3.3	100.0
	Total	932	100.0	100.0	

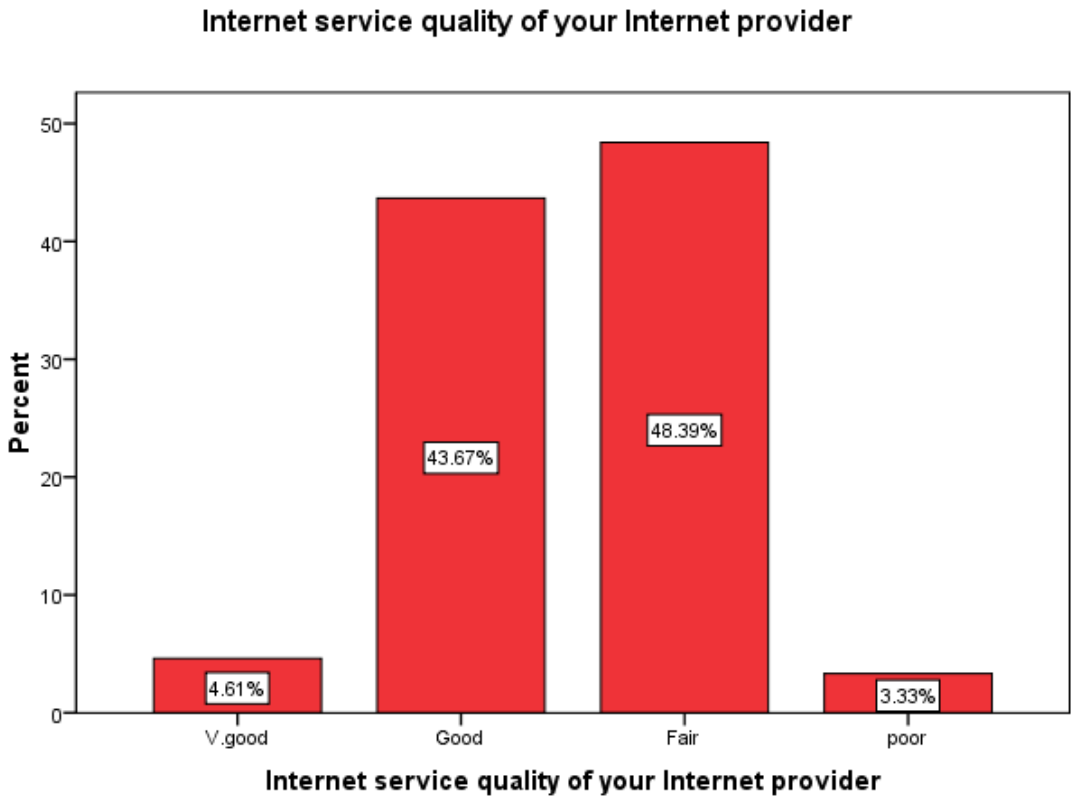


Fig. 4.14 Shows the internet service provider assessment by the subscribers which explain that 4.61% answer V.good, 43.6% answer good, 48.39% answer fair and 3.33% answer bad.

Q15. How long have you been using the mobile phone services?

Statistics

Table 4.15a. The period usage of mobile phone service accumulative

N	Valid	932
	Missing	68

Table 4.15b. The period usage mobile phone service

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 6 months	124	13.3	13.3	13.3
	2-3 year	62	6.7	6.7	20.0
	more than 3 year	746	80.0	80.0	100.0
	Total	932	100.0	100.0	

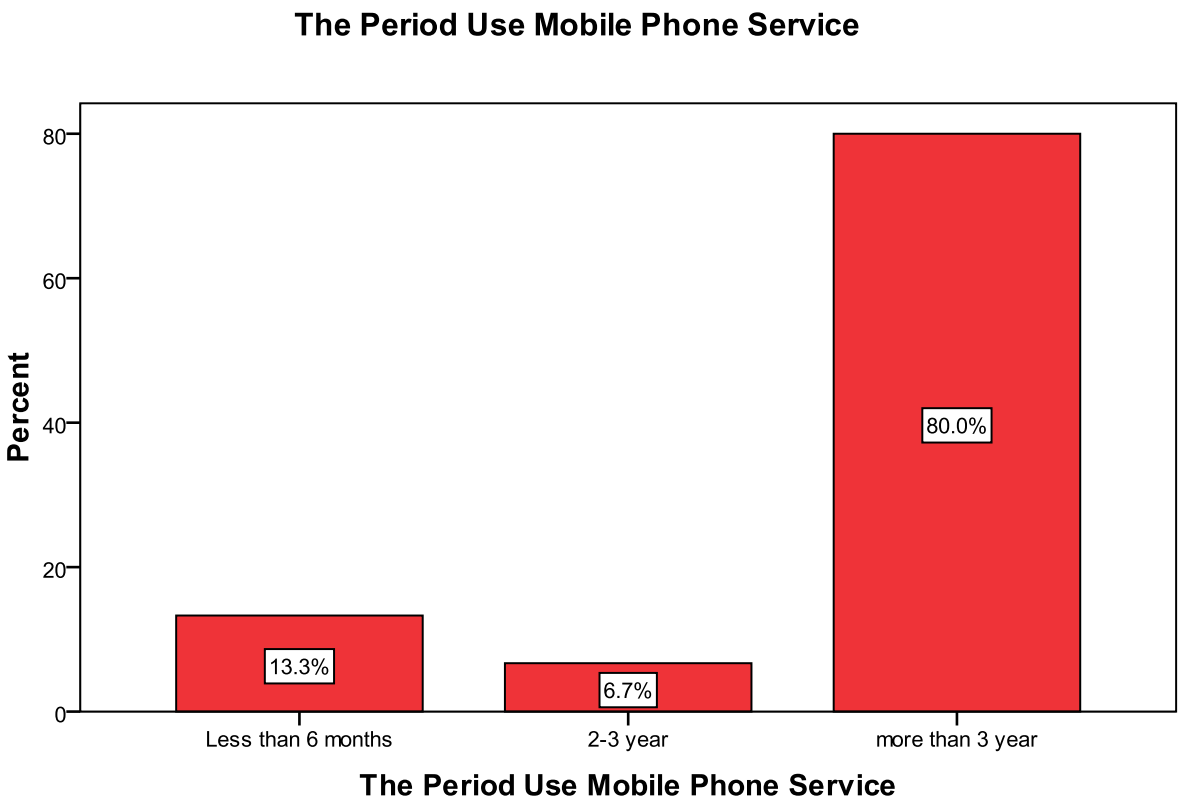


Fig.4.15 shows the period of mobile phone usage of participants surveyed which explain that 80% of them used the mobile phone services for more than 3 years, 6.7% of them used the mobile phone for [2 to 3] years and 13.3% of them used it for less than 6 months.

Q16. Is the purchasing of mobile phone services necessary for your life?

[ ] Yes, [ ] Just a luxury.

Table 4.16 Importance of Mobile Phone

the purchasing of mobile phone services necessary for your life

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	751	80.6	80.6	80.6
	No	181	19.4	19.4	100.0
	Total	932	100.0	100.0	

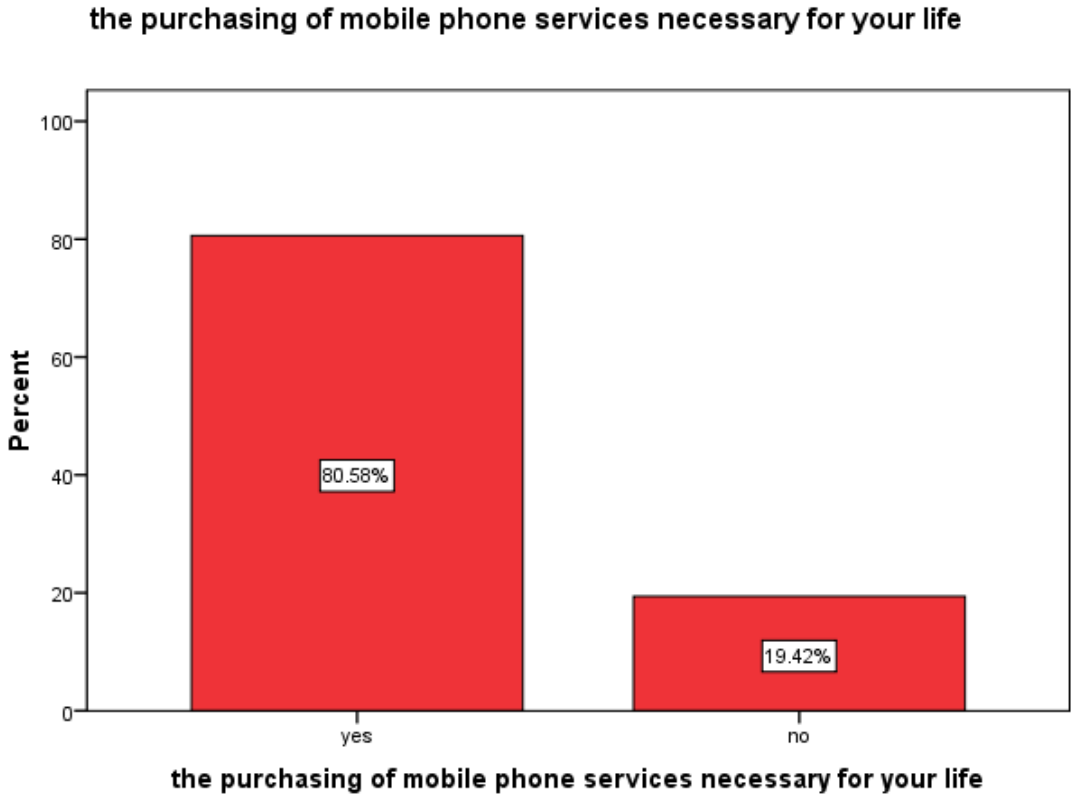


Fig.4.16 shows that 80.58% of the participants answer that purchasing of the mobile phone services necessary for their life and 19.42% answer just luxury.

Q.17 On what criteria you select your mobile phone handset?

Statistics

Table 4.17a. Criteria of mobile phone handset selection accumulative

N	Valid	932
	Missing	68

Table 4.17b. Criteria of mobile phone Handset Selection

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	features	811	87.0	87.0	87.0
	Price	121	13.0	13.0	100.0
	Total	932	100.0	100.0	

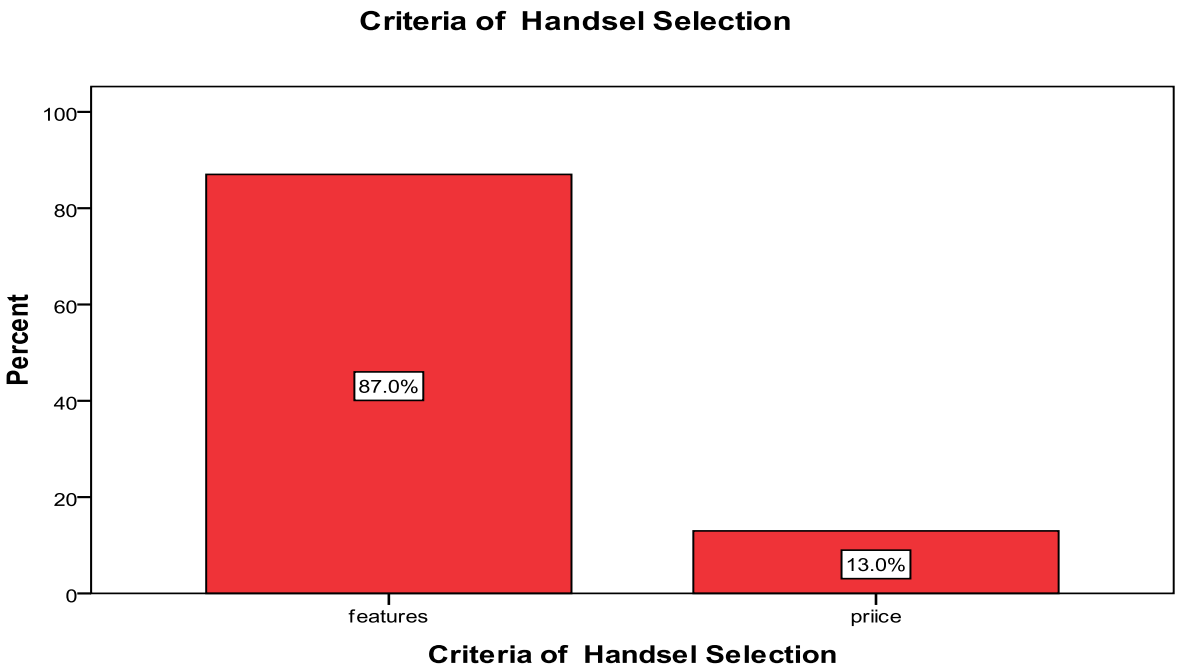


Fig.4.17 Shows the criteria of selection of mobile phone handsets, which explain that 87% of the participants select their mobile phone depend on the features and 13% depend in their selection on the price. So the investment in the mobile phone handset industry is good.

Q. 18. What are the problems facing the Internet users?

Statistics

Table 4.18a.

Problems facing Internet services users accumulative.

N	Valid	932

Statistics

Table 4.18a.

Problems facing Internet services users accumulative.

N	Valid	932
	Missing	68

Table 4.18b. Problems facing Internet services users

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Others	121	13.0	13.0	13.0
	Service	131	14.1	14.1	27.0
	Speed	680	73.0	73.0	100.0
	Total	932	100.0	100.0	

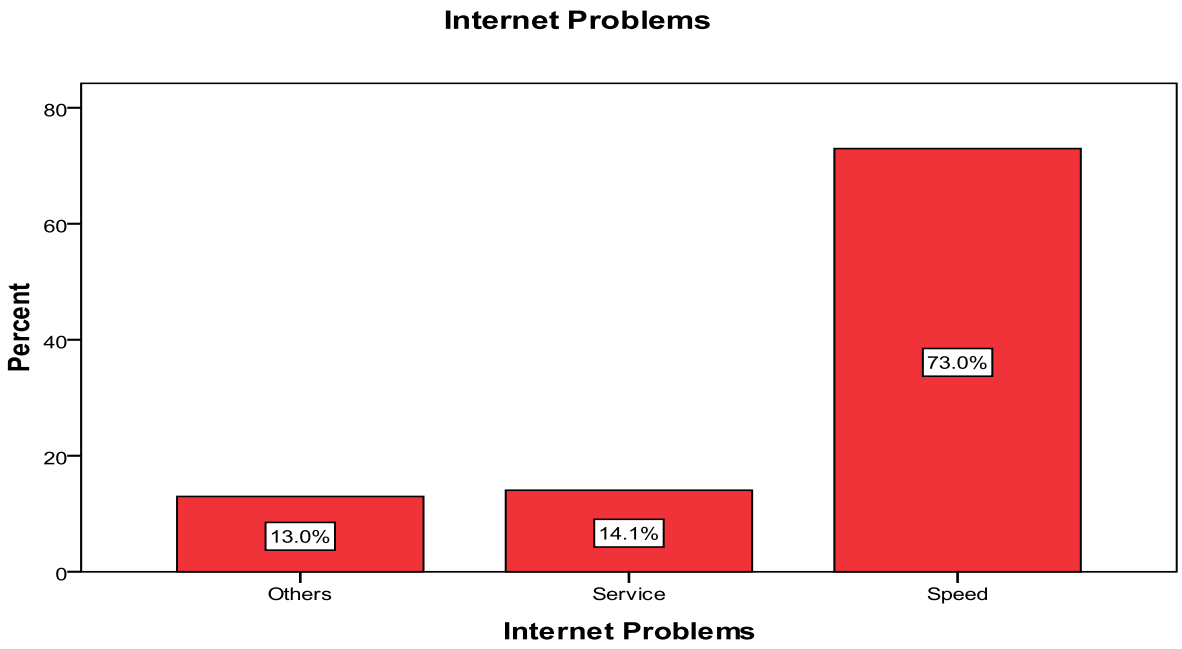


Fig.4.18 shows the problems that are facing the Internet users which explain that 73.4% of the participants are facing speed problem, 14.1% of the participants are services availability problem and 13% of them are facing other problems.

Q.19 Are there any problems when using Internet services on your mobile?

Statistics

Table 4.19a

Assessment problem existence when using Internet services on mobile phone accumulative

N	Valid	932

Statistics

Table 4.19a

Assessment problem existence when using Internet services on mobile phone accumulative

N	Valid	932
	Missing	68

Table 4.19b Assessment problem existence when using Internet services on mobile phone

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	624	67.0	67.0	67.0
	No	308	33.0	33.0	100.0
	Total	932	100.0	100.0	

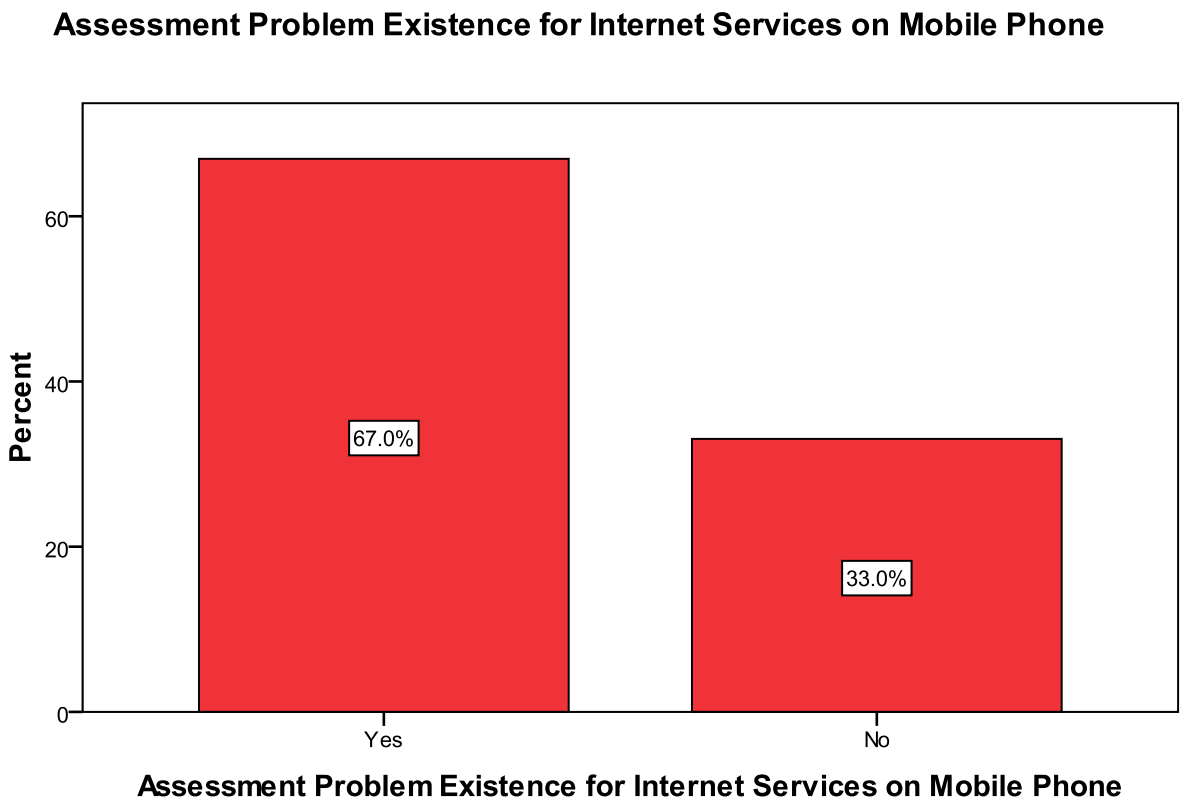


Fig.4.19 shows the assessment of internet services on mobile phone which explain that 67% of participants facing many problems such as high cost and quality of services when using Internet services on mobile phone, while 33% of participants said that the services are acceptable. So the investment in this region is necessary.

Q. 20 which of the following mobile phone services are you interested in? Voice, Games, Internet, Text phone, MMS.

Statistics

Table 4.20a.

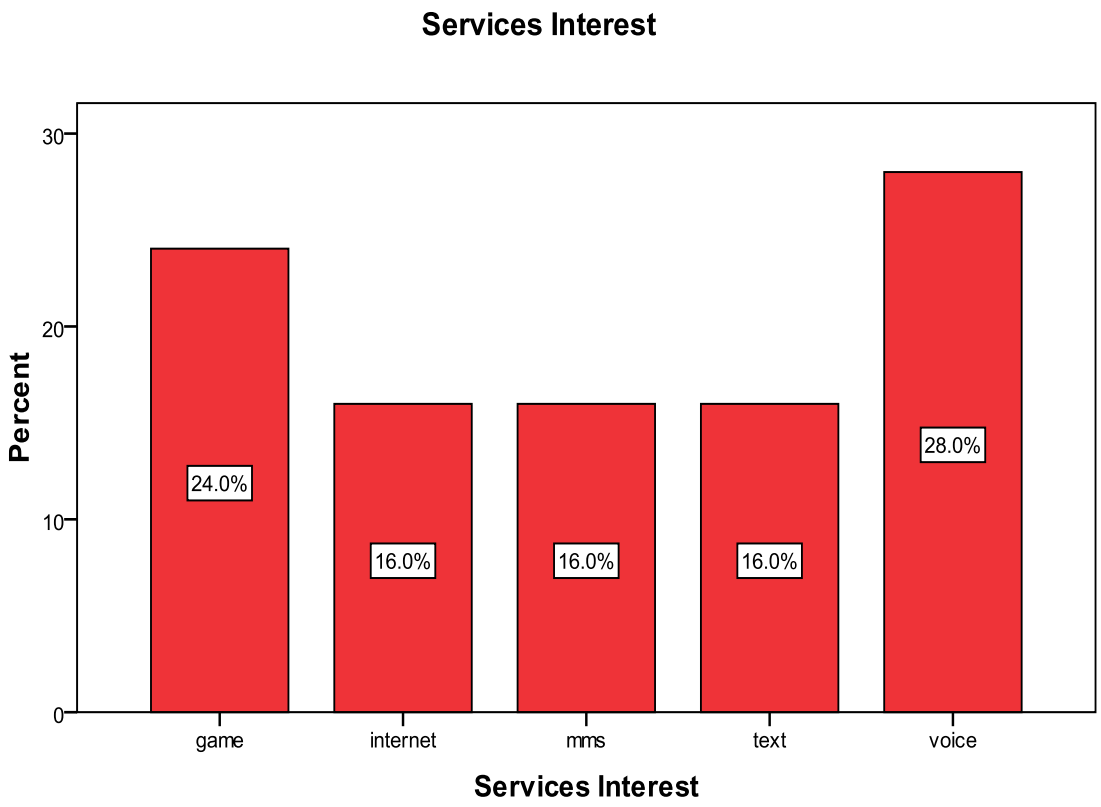
Mobile phone services participants Interested in , accumulative

N	Valid	932
	Missing	68

Table . 20b. Mobile phone services participants interested in

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Game	224	24.0	24.0	24.0
	internet	149	16.0	16.0	40.0
	mms	149	16.0	16.0	56.0
	Text	149	16.0	16.0	72.0
	Voice	261	28.0	28.0	100.0
	Total	932	100.0	100.0	

Fig.4.20 shows how the



participants interested in the mobile phone services which explain that 24% of the participants are interested in games service, 16% are interested in Internet service, 16% are interested in MMS service, 16% are interested in text messages(SMS) and 28% are interested in voice service.

Q.21 which of the following Internet services are you interested in?

Statistics

Table 4. 21a.

Internet services participants interested in

N	Valid	932
	Missing	68

Table 4. 21b. Internet services participants interested in

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid					
	cconversation.	56	6.0	6.0	6.0
	Educat	224	24.0	24.0	30.0
	e-mail	316	33.9	33.9	63.9

Enterta inmen.	140	15.0	15.0	79.0
Health	28	3.0	3.0	82.0
eMessa ge	168	18.0	18.0	100.0
Total	932	100.0	100.0	

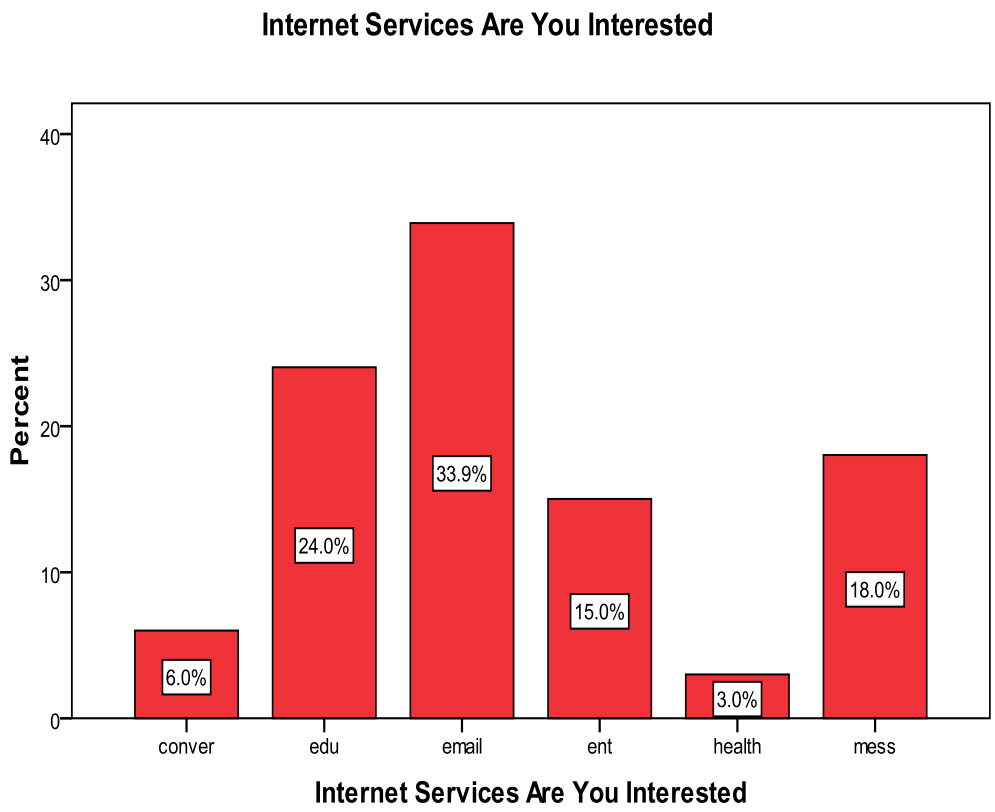


Fig.4.21 shows the Internet services that the participants of the survey are interested in which explain that

6% of the participants are interested in conversation on the Internet, 24% of the participants are interested in education, 33.9% of the participants are using the Internet for sending email, 15% of the participants are using the Internet for entertainment, 3% of the participants are using the Internet for getting health aids, and 18% of the participants are using the Internet for sending messages.

Q.22 how often do you use your mobile phone daily?

Statistics

Table 4. 22a. Period of mobile phone usage

N	Valid	932
	Missing	68

Table 4. 22b. Period for daily mobile phone usage

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-5min	252	27.0	27.0	27.0

5-10min	186	20.0	20.0	47.0
10-15min	252	27.0	27.0	74.0
15-30min	121	13.0	13.0	87.0
more than 30min	121	13.0	13.0	100.0
Total	932	100.0	100.0	

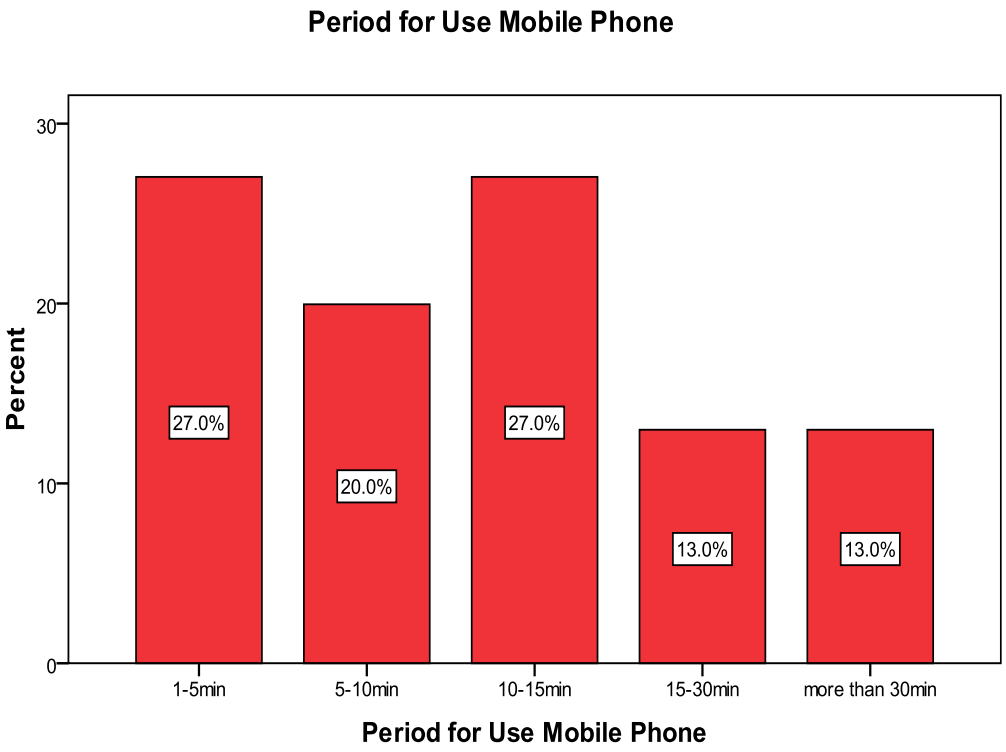


Fig.4.22 shows the daily usage of mobile phone services which explain that 27% of the participants of our survey using the mobile phone from (1 to 5) min/day, 20% of the participants using the mobile phone from (5 to 10)min/day, 27% of the participants using the mobile phone from (10 to 15) min/day, 13% of the participants using

the mobile phone from (15 to 30) min/day and 13% of the participants using the mobile phone more than 30 min/day

Q.23 how often do you use Internet services daily?

Statistics

Table. 4. 23a.

Period for daily internet usage

N	Valid	932
	Missing	68

Table. 4. 23b. Period for daily internet usage

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-2 hour	56	6.0	6.0	6.0

2-4 hour	485	52.0	52.0	58.0
4-5 hour	224	24.0	24.0	82.0
more than 5 hour	168	18.0	18.0	100.0
Total	932	100.0	100.0	

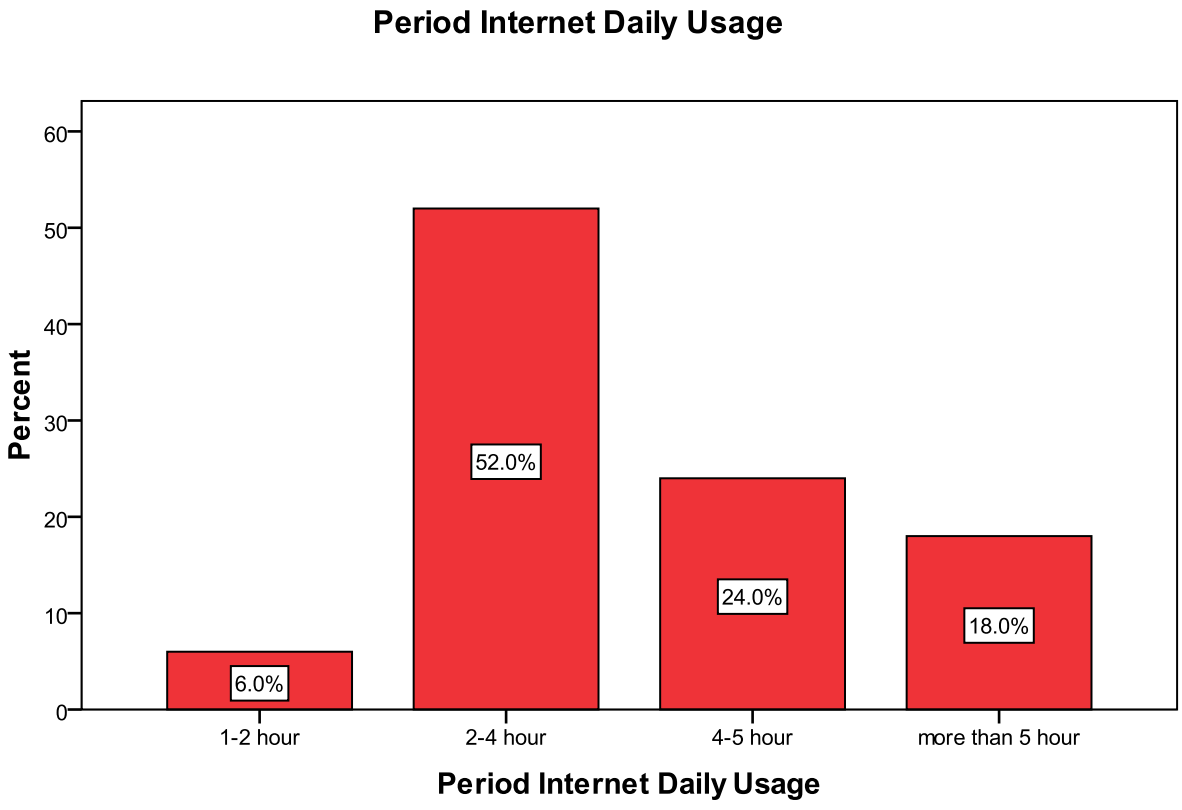


Fig.4.23 shows the daily usage of Internet services which explain that 0% of the participants of our survey are using the Internet services from [0.5 to 1] hour/day ,, 6% of the them are using the Internet services from [1 to 2] hours/day, , 52% of

them are using it from [2 to 4] hours/day, , 24% of the participants are using the Internet services from [4 to 5]hours/day, and 18% of the participants are using the Internet for more than 5 hours/day

Q.24 how are you satisfied with mobile phone services customer support?

Statistics

Table. 4. 24a. participants satisfaction in mobile phone services customer support accumulative

N	Valid	932
	Missing	68

Table. 4. 24b. . participants satisfaction in mobile phone services customer support

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Satisfied	531	57.0	57.0	57.0
	Disappoi	336	36.0	36.0	93.0

	very sat	65	7.0	7.0	100.0
	Total	932	100.0	100.0	

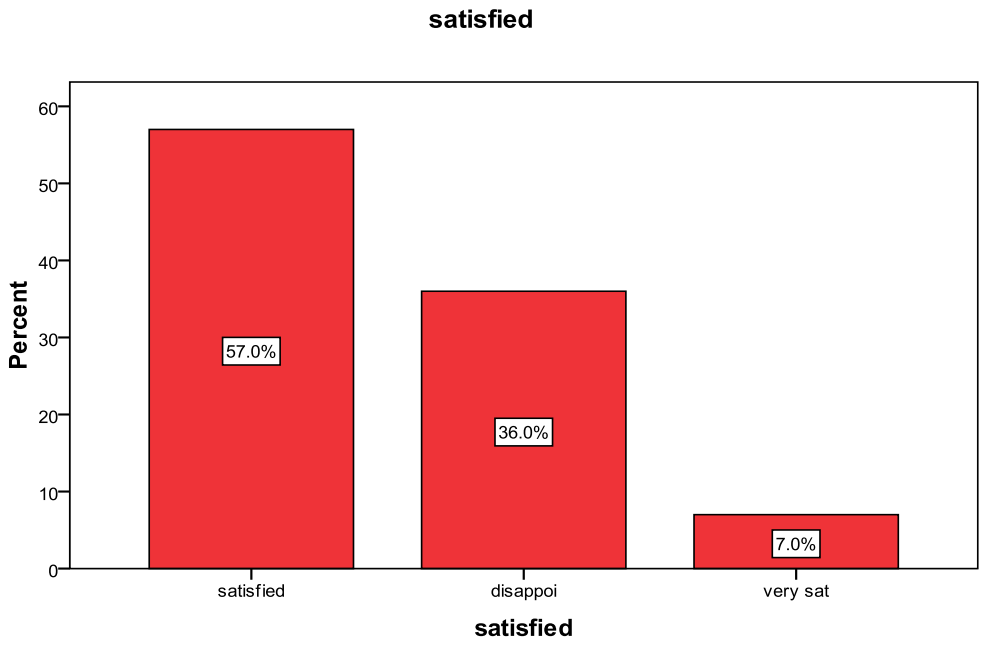


Fig.4.24 shows the participants satisfaction in mobile phone services consumer support which represent that 57% of participants are satisfied in the consumer services, 36% are disappointed the consumer services supports and 7% are very satisfied.

Q.25 Please state what would increase your usage of mobile phone?

Statistics

Table. 4. 25a. Factors that increase mobile phone service usage accumulative.

N	Valid	932
	Missing	68

Table. 4. 25b. Factors that increase mobile phone

service usage

	Factors that increase mobile phone service usage	Frequency	Percent	Valid Percent	Cumulative Percent

Valid	additional features for same price	149	16.0	16.0	16.0
	decrease price	391	42.0	42.0	58.0
	quality service	391	42.0	42.0	100.0
	Total	932	100.0	100.0	

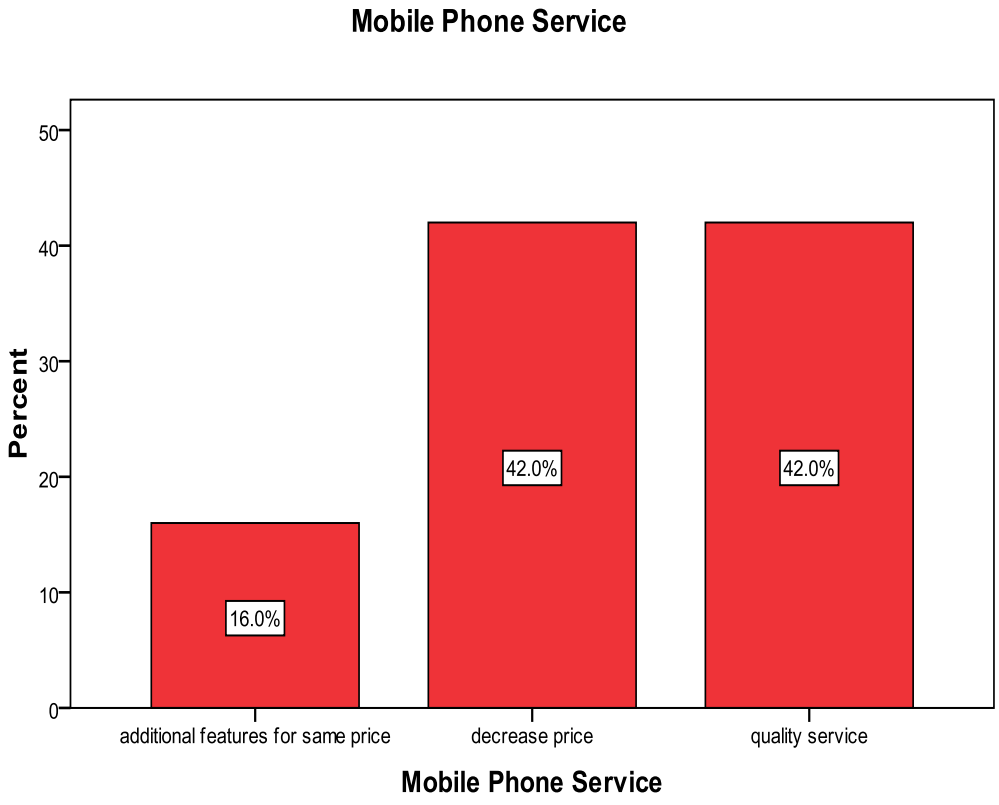


Fig.4.25 Shows the parameters that increase the usage of the mobile phone as follow: 42% of the participants of our survey stated that decreasing the mobile phone services price will increase the mobile phone usage, 42% of the participants of our survey stated that improving the quality of mobile phone services will increase the mobile phone usage, and 16% of the participants of our survey stated that additional features will increase the mobile phone usage.

4.3 Factors influencing the Mobile Communication Usage

The independent variables represent the factors influencing the mobile communication services usage and the relation among these factors are tested as follows:

4.3.1 Reliability

Pearson correlation coefficient has been used for determining the internal consistency of items. Internal consistency "describe the condition in which there is a high degree of interrelatedness among items". Basically the reliability analysis determines the extent to which the items in the questionnaire are related to each other, and gives an overall index of the repeatability or internal consistency of the scale as a whole. Reliability is having similar answers from participants asked the same questions at different times or by different researchers.

Statistical Package for Social Science, known as SPSS software is used to derive the statistical results

4.3.2 Correlations

Table 4.3.2 Pearson Correlation among Items

		Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16
SUM	Pearson Correlation	.079*	.586**	.450**	.470**	.654**	.414**	.193**	.389**	.131**	.495**	-.465**
	Sig. (2-tailed)	.016	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	932	932	932	932	932	932	932	932	932	932	932

Correlations

		Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25
SUM	Pearson Correlation	-.078-*	-.019-	-.244-**	.024	.435**	.195**	-.498-**	.336**	.288**
	Sig. (2-tailed)	.017	.563	.000	.458	.000	.000	.000	.000	.000
	N	932	932	932	932	932	932	932	932	932

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

For the **validation** fifteen copies of the questionnaire were distributed to the experts and academics in Department of Statistics in College of Administration and economic and Technical

Administration Institute in the University of Baghdad all answers confirm that the questionnaire is comprehensive and precise and suitable for statistical analysis.

4.4 Data Analysis

One of the objectives of the research is to identify factors that influence the use of the Mobile communication services. In other words what factors make one participant uses of the mobile communications high that means expenditure high this gives good indication to the investor or mobile communication operators to choose the place and the kind of industry for investment in mobile communication region , while another is low. To find a relationship between the independent variables and the dependent variable, the Spearman Correlation technique to measure the degree of correlation between two rank order variables was adopted as suggested by several statisticians and asserted that "of all the statistics based on ranks, the Spearman rank-order correlation coefficient was the earliest to be developed and is perhaps the best known today". The Spearman rank correlation is often used to describe the relationship between two ordinal variables.

The Spearman Correlation coefficients range in value from -1 (a perfect negative relationship) to +1 (a perfect positive relationship). A value of 0 indicates no relationship. A correlation coefficient is a numerical summary which measures the degree of correlation between two variables. Factors with >0.4 correlation coefficient and at 0.05 significance level or lower (better) are only considered in this work. Statisticians considered factors that have 0.4 or less correlation coefficient as a low correlation. According to the references in the research significance level means that there is always some possibility that an apparent correlation coefficient could have arisen by fluctuations in the random sampling. Therefore, statisticians suggest it is important for the researcher to decide how low the probability is (a value). Most statisticians use a significance

level of 5% as the criterion. However, values as low as 1% or 0.1% might be needed if the consequences of the test could be very costly or crucial, especially in medicine. Table below shows the meaning of different values of the correlation coefficient.[75]

Table 4.4 Correlation Coefficients Rating

Correlation Coefficients	Meaning
0.00 to 0.19	A very low correlation
0.20 to 0.39	A low correlation
0.40 to 0.69	A modest correlation
0.70 to 0.80	A high correlation
0.90 to 1.00	A very high correlation

4.5 Regression Analysis:

From the correlation analysis the conclusion is that most of the factors are correlated to the mobile communication services usage discussed in this research. However, correlation does not have the ability to explain how much of the level of the mobile communication services usage (expenditure) is explained by the factors investigated in this research. In order to address this question, regression analysis technique was carried out. " Regression analysis is a general statistical technique used to analyze the relationship between a single dependent variable and several independent variables".

The results of regression analysis are generally used for two purposes:

- To understand the direction and the strength of an independent variable's effect on the dependent variable. This means the ability to explain a dependency of one variable on the other.
- To make future predictions of the dependent variable with the set of independent variables.

Basically regression analysis technique is used when the researcher wants to determine what variables contribute to the explanation of the dependent variable and to what degree as shown in tables below. According to [49,50] regression analysis is the most widely used and versatile dependence technique, applicable in every facet of business decision making". [50, 77]

Table 4.5.1 Variables Entered/Removed

Model	Variables Entered	Variables Removed	Method
1	Q6b	.	Enter

a. Dependent Variable: Q11

b. All requested variables entered.

Table 4.5.2 Correlation between Dependent (Q11) and Independent Variable (Q6)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.256a	.066	.065	1.21530

a. Predictors: (Constant), Q6

Table 4.5.3 Analysis of Variance (ANOVA)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	96.546	1	96.546	65.368	.000b
	Residual	1373.569	930	1.477		
	Total	1470.115	931			

a. Dependent Variable: Q11

b. Predictors: (Constant), Q6

Table 4.5.4 T-Test

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.941	.078		50.788	.000
	Q6	-.230-	.028	-.256-	-8.085-	.000

Regression

Table 4.5.5 Variables Entered/Removed

Model	Variables Entered	Variables Removed	Method
1	Q9b	.	Enter

a. Dependent Variable: Q11

b. All requested variables entered.

Table 4.5.6 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.614a	.377	.377	.99222

a. Predictors: (Constant), Q9

Table 4.5.7 ANOVAa

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	554.529	1	554.529	563.259	.000b
	Residual	915.586	930	.985		
	Total	1470.115	931			

a. Dependent Variable: Q11

b. Predictors: (Constant), Q9

Table 4.5.8 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.962	.108		8.916	.000
	Q9	1.557	.066	.614	23.733	.000

Regression

Table 4.5.9 Variables Entered/Removed

Model	Variables Entered	Variables Removed	Method
1	Q10b	.	Enter

a. Dependent Variable: Q11

b. All requested variables entered.

Table 4.5.10 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.262a	.069	.068	1.21340

a. Predictors: (Constant), Q10

Table 4.5.11 ANOVAa

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	100.842	1	100.842	68.491	.000b
	Residual	1369.273	930	1.472		
	Total	1470.115	931			

a. Dependent Variable: Q11

b. Predictors: (Constant), Q10

Table 4.5.12 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.935	.069		42.483	.000
	Q10	.212	.026	.262	8.276	.000

Regression

Table 4.5.13 Variables Entered/Removeda

Model	Variables Entered	Variables Removed	Method
1	Q12b	.	Enter

a. Dependent Variable: Q11

b. All requested variables entered.

Table 4.5.14 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.197a	.039	.038	1.23256

a. Predictors: (Constant), Q12

Table 4.5.15 ANOVAa

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	57.259	1	57.259	37.691	.000b
	Residual	1412.855	930	1.519		
	Total	1470.115	931			

a. Dependent Variable: Q11

b. Predictors: (Constant), Q12

Table 4.5.16 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.230	.141		30.048	.000
	Q12	-.230-	.038	-.197-	-6.139-	.000

Regression

Table 4.5.17 Variables Entered/Removed

Model	Variables Entered	Variables Removed	Method
1	Q19b	.	Enter

a. Dependent Variable: Q11

b. All requested variables entered.

Table 4.5.18 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.379a	.144	.143	1.16325

a. Predictors: (Constant), Q19

Table 4.5.19 ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	211.675	1	211.675	156.430	.000b
	Residual	1258.440	930	1.353		

	Total	1470.115	931			

a. Dependent Variable: Q11

b. Predictors: (Constant), Q19

Table 4.5.20 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.750	.114		41.555	.000
	Q19	-1.013-	.081	-.379-	-12.507-	.000

Regression

Table 4.5.21 Variables Entered/Remove

Model	Variables Entered	Variables Removed	Method
1	Q22b	.	Enter

a. Dependent Variable: Q11

b. All requested variables entered.

Table 4.5.22 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.190a	.036	.035	1.23447

a. Predictors: (Constant), Q22

Table 4.5.23 ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	52.868	1	52.868	34.692	.000b
	Residual	1417.246	930	1.524		
	Total	1470.115	931			

a. Dependent Variable: Q11

b. Predictors: (Constant), Q22

Table 4.5.24 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.931	.090		32.692	.000

Q22	.180	.031	.190	5.890	.000

Regression

Table 4.5.25 Variables Entered/Removeda

Model	Variables Entered	Variables Removed	Method
1	Q24b	.	Enter

a. Dependent Variable: Q11

b. All requested variables entered.

Table 4.5.26 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate

1	.142a	.020	.019	1.24449

a. Predictors: (Constant), Q24

Table 4.5.27 ANOVAa

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	29.783	1	29.783	19.231	.000b
	Residual	1440.331	930	1.549		
	Total	1470.115	931			

a. Dependent Variable: Q11

b. Predictors: (Constant), Q24

Table 4.5.28 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.706	.164		16.502	.000
	Q24	.304	.069	.142	4.385	.000

DEPENDENT Q11

/METHOD=ENTER Q6 Q9 Q10 Q12 Q19 Q22 Q24.

Regression

Table 4.5.29 Variables Entered/Removed

Model	Variables Entered	Variables Removed	Method
1	Q24, Q6, Q12, Q10, Q22, Q19, Q9b	.	Enter

a. Dependent Variable: Q11

b. All requested variables entered.

Table 4.5.30 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.688a	.473	.469	.91550

a. Predictors: (Constant), Q24, Q6, Q12, Q10, Q22, Q19, Q9

Table 4.5.31 ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	695.669	7	99.381	118.573	.000b
	Residual	774.446	924	.838		
	Total	1470.115	931			

a. Dependent Variable: Q11

b. Predictors: (Constant), Q24, Q6, Q12, Q10, Q22, Q19, Q9

Table 4.5.32 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.703	.268		13.798	.000
	Q6	-.123-	.023	-.137-	-5.470-	.000
	Q9	1.372	.075	.541	18.267	.000
	Q10	.001	.023	.002	.061	.951
	Q12	-.173-	.029	-.148-	-5.947-	.000
	Q19	-.675-	.073	-.253-	-9.225-	.000
	Q22	-.010-	.025	-.010-	-.396-	.692
	Q24	-.271-	.056	-.127-	-4.808-	.000

4.6 Regression Model of Mobile phone services:

Note: The equation of regression represent the relation between the dependent variable Y (Expenditure on mobile communications services which is represented by the question 11 of the questionnaire) and the independent variables such as (age, gender, academic standing, money paid for mobile phone handset, interesting in mobile phone having ability to play movies, maximum price paid for mobile phone that have ability to play movies, the rating of mobile phone service quality, problems during the usage of internet on mobile phone handset, daily usage of mobile phone services, and the satisfaction in mobile phone customer support) which are explained by the questions, 6, 9, 10, 12, 19, 22, and 24 of the questionnaire was obtained from SPSS program, as the results shown below:

First. The analysis of the questionnaire based on the regression model,

$$Y = B0 + B1X1 + B2X2 + ...+ BkXk$$

The regression model that concluded from the available data of Iraqi mobile phone services is:

$$Y = 3.703 - 0.123X6 + 1.372\ X9 + 0.001X10 - 0.173X12 – 0.675X19 - 0.010\ X22 - 0.271X24.$$

X6: Money paid for mobile phone handset.
X9: Interesting in a mobile phone that have an ability to play movies.
X10: Maximum price paid for the mobile phone that have an ability to play movies.
X12: Assessment of the mobile phone service quality.
X19: Assessment of internet services on mobile phone handsets.
X22: Daily usage of mobile phone services.
X24: Assessment of the mobile phone services customer support.

From the former regression model, it is clear that:
•B0 is equal to 3.703

•The regression coefficients are:

•B6 is equal to - 0.123

•B9 is equal to +1.372

•B10 is equal to + 0.001

•B12 is equal to - 0.173

•B19 is equal to – 0.675

•B22 is equal to - 0.010

•B24 is equal to - 0.271

4.7 Statistical Analysis of the Model:

The analysis of the regression model is explained as follows:

4.7.1Correlation; means finding the correlation between the dependent variable and the following independent variables:

Table 4.7.1 Correlation Coefficients

Correlations

		Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16
SUM	Pearson Correlation	.079**	.586**	.450**	.470**	.654**	.414**	.193**	.389**	.131**	.495**	-.465**
	Sig. (2-tailed)	.016	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	932	932	932	932	932	932	932	932	932	932	932

Correlations

		Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25
SUM	Pearson Correlation	-.078-*	-.019-	-.244-**	.024	.435**	.195**	-.498-**	.336**	.288**
	Sig. (2-tailed)	.017	.563	.000	.458	.000	.000	.000	.000	.000
	N	932	932	932	932	932	932	932	932	932

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Y = 3.703 - 0.123X6 + 1.372 X9 + 0.001X10 - 0.173X12 – 0.675X19 - 0.010 X22 - 0.271X24.

Where the above equation represents the mathematical model in which the dependent variable represented by the letter (Y) is the expenditure on mobile communication services and the independent variables are; X6, X9, X10, X12, X19, X22, X24 which represent the factors that effect on the expenditure where the subscripts of the letters from 1 to 24 related to the questions of the questionnaire.

The equation of spending on Mobile Services, explains that the coefficient of determination equal to (52.3%), and this means that the independent variables (x1, x2, x4, x6, x9, x10, x12, X19, x22, x24) represents (52.3%) of the changes that occur in the dependent variable.

The regression model explain that:

1 - The fixed limit B0 equals 3.703

2 - The regression coefficients

• B6 equal to - 0.123
• B9 equal to + 1.372
• B10 equal to + 0.001
•B12 equal to - 0.173
•B19 equal to – 0.675
•B22 equal to - 0.010
• B24 equals - 0.271

4.7.2 Total Significance of the Model:

1.Total significance of regression:

- Means that the test of the form of the relationship between the dependent variable and the explanatory (independent) variables in the regression model using the F test. The total significance test means the answer on the following question: Is the proposed format (linear model) is a model acceptable to represent the relationship between the dependent variable and the independent variables? So that in the case of exile, the researcher would have to try to find another model that could provide a better description of the relationship between the variables, by proposing (non-linear model) to represent the relationship.

As the acceptance of the proposed model has meaning: that at least one of the regression coefficient of the model differ from zero i.e. (significance).

DEPENDENT Q11

Table 4.7.2 METHOD=ENTER Q6 Q9 Q10 Q12 Q19 Q22 Q24.

Model	Variables Entered	Variables Removed	Method
1	Q24, Q6, Q12, Q10, Q22, Q19, Q9b	.	Enter

a. Dependent Variable: Q11

b. All requested variables entered.

Table 4.7.3 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.688a	.473	.469	.91550

a. Predictors: (Constant), Q24, Q6, Q12, Q10, Q22, Q19, Q9

Statistical hypotheses

H0: regression model is not significant.

H1: regression model is significant

To test the hypotheses ANOVA analysis of variance was used as shown in table below

Table 4.7.4 ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	695.669	7	99.381	118.573	.000b
	Residual	774.446	924	.838		
	Total	1470.115	931			

a. Dependent Variable: Q11

b. Predictors: (Constant), Q24, Q6, Q12, Q10, Q22, Q19, Q9

The table of variance analysis explain that the value of probability P-value equal to zero. The lowest level of significance specified 5% and thus reject the null hypothesis H0 which explain that the regression model was not significant, and we accept the alternative hypothesis H1 which explain that the regression model is significant namely that at least one of the regression coefficients not equal zero.

Table 4.7.5 Variables Entered/Removed

Model	Variables Entered	Variables Removed	Method
1	Q6b	.	Enter

a. Dependent Variable: Q11

b. All requested variables entered.

Table 4.7.6 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.256a	.066	.065	1.21530

a. Predictors: (Constant), Q6

Table 4.7.7 ANOVAa

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	96.546	1	96.546	65.368	.000b
	Residual	1373.569	930	1.477		
	Total	1470.115	931			

a. Dependent Variable: Q11

b. Predictors: (Constant), Q6

Table 4.7.8 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.941	.078		50.788	.000
	Q6	-.230-	.028	-.256-	-8.085-	.000

Regression

Table 4.7.9 Variables Entered/Removeda

Model	Variables Entered	Variables Removed	Method
1	Q9b	.	Enter

a. Dependent Variable: Q11

b. All requested variables entered.

Table 4.7.10 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.614a	.377	.377	.99222

a. Predictors: (Constant), Q9

Table 4.7.11 ANOVAa

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	554.529	1	554.529	563.259	.000b
	Residual	915.586	930	.985		

	Total	1470.115	931			

a. Dependent Variable: Q11

b. Predictors: (Constant), Q9

Table 2.7.12 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.962	.108		8.916	.000
	Q9	1.557	.066	.614	23.733	.000

Regression

Table 4.7.13 Variables Entered/Removeda

Model	Variables Entered	Variables Removed	Method
1	Q10b	.	Enter

a. Dependent Variable: Q11

b. All requested variables entered.

Table 4.7.14 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.262a	.069	.068	1.21340

a. Predictors: (Constant), Q10

Table 4.7.15 ANOVAa

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	100.842	1	100.842	68.491	.000b
	Residual	1369.273	930	1.472		
	Total	1470.115	931			

a. Dependent Variable: Q11

b. Predictors: (Constant), Q10

Table 4.7.16 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.935	.069		42.483	.000
	Q10	.212	.026	.262	8.276	.000

Regression

Table 4.7.17 Variables Entered/Removed

Model	Variables Entered	Variables Removed	Method
1	Q12b	.	Enter

a. Dependent Variable: Q11

b. All requested variables entered.

Table 4.7.18 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.197a	.039	.038	1.23256

a. Predictors: (Constant), Q12

Table 4.7.19 ANOVAa

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	57.259	1	57.259	37.691	.000b
	Residual	1412.855	930	1.519		
	Total	1470.115	931			

a. Dependent Variable: Q11

b. Predictors: (Constant), Q12

Table 4.7.20 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.230	.141		30.048	.000

Q12	-.230-	.038	-.197-	-6.139-	.000

Regression

Table 4.7.21 Variables Entered/Removed

Model	Variables Entered	Variables Removed	Method
1	Q19b	.	Enter

a. Dependent Variable: Q11

b. All requested variables entered.

Table 4.7.22 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.379a	.144	.143	1.16325

a. Predictors: (Constant), Q19

Table 4.7.23 ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	211.675	1	211.675	156.430	.000b
	Residual	1258.440	930	1.353		
	Total	1470.115	931			

a. Dependent Variable: Q11

b. Predictors: (Constant), Q19

Table 4.7.24 Coefficients

Model	Unstandardized Coefficients	Standardized Coefficients	t	Sig.

		B	Std. Error	Beta		
1	(Constant)	4.750	.114		41.555	.000
	Q19	-1.013-	.081	-.379-	-12.507-	.000

Regression

Table 4.7.25 Variables Entered/Removed

Model	Variables Entered	Variables Removed	Method
1	Q22b	.	Enter

a. Dependent Variable: Q11

b. All requested variables entered.

Table 4.7.26 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.190a	.036	.035	1.23447

a. Predictors: (Constant), Q22

Table 4.7.27 ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	52.868	1	52.868	34.692	.000b

	Residual	1417.246	930	1.524		
	Total	1470.115	931			

a. Dependent Variable: Q11

b. Predictors: (Constant), Q22

Table 4.7.28 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.931	.090		32.692	.000
	Q22	.180	.031	.190	5.890	.000

Regression

Table 4.7.29 Variables Entered/Removed

Model	Variables Entered	Variables Removed	Method
1	Q24b	.	Enter

a. Dependent Variable: Q11

b. All requested variables entered.

Table 4.7.30 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.142a	.020	.019	1.24449

a. Predictors: (Constant), Q24

Table 4.7.31 ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	29.783	1	29.783	19.231	.000b
	Residual	1440.331	930	1.549		
	Total	1470.115	931			

a. Dependent Variable: Q11

b. Predictors: (Constant), Q24

Table 4.7.32 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.706	.164		16.502	.000
	Q24	.304	.069	.142	4.385	.000

4.7.3 Partial significance of the model:

The- partial significance of regression: means that the test of significance of regression coefficient for each variable of explanatory variables alone, in addition to the regression constant through the t-test .

For fixed term to reduce (B0)

H0: B0 = 0

H1: B0 ≠ 0

For (B1)

H0: B1 = 0

H1: B1 ≠ 0

For (B2)

H0: B2 = 0

H1: B2 ≠ 0

For (B4)

H0: B4= 0

H1: B4 ≠ 0

For (B6)

H0: B6 = 0

H1: B6 ≠ 0

For (B9)

H0: B9= 0

H1: B9 ≠ 0

For (B10)

H0: B10 = 0

H1: B10 ≠ 0

For (B12)

H0: B12 = 0

H1: B12 ≠ 0

For (B19)

H0: B19 = 0

H1: B19 ≠ 0

For (B22)

H0: B22 = 0

H1: B22 ≠ 0

For (B24)

H0: B24=0

H1: B24 ≠0

Table 4.7.33 significance of multiple regression coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	3.703	.268		13.798	.000
Q6	-.123-	.023	-.137-	-5.470-	.000
Q9	1.372	.075	.541	18.267	.000
Q10	.001	.023	.002	.061	.951

Q12	-.173-	.029	-.148-	-5.947-	.000
Q19	-.675-	.073	-.253-	-9.225-	.000
Q22	-.010-	.025	-.010-	-.396-	.692
Q24	-.271-	.056	-.127-	-4.808-	.000

multiple regression coefficients, transaction value of the regression coefficients value innumerable, t-test, P-value.

4.8 Comment

The regression equation of spending on mobile communication services explain that the coefficient of determination equal to (47.3%), and this means that the independent variables (x6, x9, x10, x12, X19, x22, x24) explain (47.3%) of the changes that occur in the dependent variable.

For the constant term B0 and the regression coefficients B6, Band B9, B12, B19, B24 it is found that the P_ values are equal to zero, which is less than the specified level of significance which is equal to (5%), therefore the hypothesis that consider the values of the constant term (B0), and the regression coefficients (B6, B9, B12, B19 and B24) in the regression model is significant accepted, as well as for the regression coefficient B10 the P-value is equal to (0.950) which is less than the specified level of significance (5%), therefore reject the hypothesis said that B10 in the regression model was insignificant. For the regression coefficients (B22), it's found that the P-values equal to (0.692),which is larger than the specified level of significance (5%) and thus accept the null hypothesis which said that the regression coefficients B22 in the regression model is insignificant.

4.9 The Relation between the Research Questions and the Objectives

The relation between the research question and the objectives is explained by the as follows:

To predict the extent to which the independent variables (age, gender, academic standing, money paid for mobile phone handset, interesting in mobile phone having ability to play movies, maximum price paid for mobile phone that have ability to play movies, the rating of mobile phone service quality, problems during the usage of internet on mobile phone handset, daily usage of mobile phone services, and the satisfaction in mobile phone customer support) are instrumental in predicting the expenditure on the mobile phone services. The independent variables of the regression model play a vital role in marketing as they make a significant contribution in investor decision making process of mobile communication services and industry, the information on independent variable is accessible and inexpensive to reach.

As a result of the research the regression model

$$Y = 3.703 - 0.123X6 + 1.372\ X9 + 0.001X10 - 0.173X12 – 0.675X19 - 0.010\ X22 - 0.271X24.$$

was conducted to predict or confirm the following objectives;

The best country for investment in mobile communication services and internet services.

Increase the revenues from the mobile communications services due to the increased number of the subscribers and the development of mobile communications industry.

Examine the worldwide mobile communications markets for network consulting, network implementation, network product support and managed network services.

Act as a tool for communications industries by producing new devices according to the market requirements

Give the designers valuable information to complete their jobs with high accuracy

4.10 Regression Model of Internet services:

Note: The equation of regression represent the relation between the dependent variable Y (Expenditure on Internet services which is represented by the question 13 of the questionnaire) and the independent variables such as (age, gender, academic standing, assessment of internet services of your internet service provider , the problems that facing the internet users, the problems during the usage of internet service on the mobile phone, the internet services you interested in and the daily usage of internet services) which are explained by the questions 1, 2, 4, 14, 18, 19, 21 and 23 of the questionnaire were obtained from SPSS program, as the results shown below:

First. The analysis of the questionnaire based on the regression model,

$$Y = B0 + B1X1 + B2X2 + ...+ BkXk$$

The regression model that concluded from the available data of Iraqi Internet services is:

$$Y = 3.647 + 0.527\ X1 - 0.180\ X2 - 0.265X4 - 0.120\ X14 - 0.155\ X21 - 0.302\ X23 .$$

Where:

X1: Age of the participant
X2: Gender of the participant
X4: Academic standing of the participant
X14: The assessment of internet service quality of the service provider.
X18: The problems facing the internet users.
X19: Assessment of internet services on mobile phone handsets.
X21: The internet services you interested in .
X23: Daily usage of Internet services.

From the former regression model, it is clear that:
•B0 is equal to 2
•The regression coefficients are:

•B1 is equal to 0.527

•B2 is equal to 0.180

•B4 is equal to n- 0.265

•B14 is equal to - 0.120

•B21 is equal to – 0.155

•B23 is equal to – 0.302

. The equation of spending on Internet services, interpret

that the coefficient of determination equal to (54.2%) and this means that the independent variables (x1, x2, X3, X14, X18, X19, X21, x23) explain (54.2%) of the changes that occur in the dependent variable (Y).

4.11 Statistical Analysis:

The analysis of the regression model is explained as follows:

4.11.1 Correlation; means finding the relation between the dependent variable and the following independent variables:

Where the above equation represents the mathematical model in which the dependent variable represented by the letter (Y) is the expenditure on Internet communication services and the independent variables are; X1, X2, X4, X14, X21, X23, which represent the factors that affect on the expenditure where the subscripts of the letters from 1 to 23 related to the questions of the questionnaire.

Table 4.11.1 Correlation Coefficients

Variable	Value of correlation coefficient	P-Value	Decision
X1	-0.459	0	Significant
X2	-0.328	0	Significant
X4	0.260	0	Significant
X14	-0.136	0	Significant
X18	0.058	0.076	Insignificant
X19	0.019	0.554	Insignificant
X21	-0.200	0	Significant
X23	-0.349	0	Significant

Y =3.647 + 0.527 X1 - 0.180 X2 - 0.265X4 - 0.120 X14 - 0.155 X21- 0.302 X23 .

The regression model explain that:

1 - The fixed limit B0 equals 3.647

2 - The regression coefficients

• B1 equal to 0.527

• B2 equal to - 0.180

• B4 equal to -0.265

• B14 equal to -0.120

• B21 equal to - 0.155

•B23 equal to -0.302

4.11.2 Total Significance of the Model:

1. Total significance of regression:

- Means that the test of the form of the relationship between the dependent variable and the explanatory (independent) variables in the regression model using the F test. The total significance test means the answer on the following question: Is the proposed format (linear model) is a model acceptable to represent the relationship between the dependent variable and the independent variables? So that in the case of exile, the researcher would have to try to find another model that could provide a better description of the relationship between the variables, by proposing (non-linear model) to represent the relationship.

As the acceptance of the proposed model has meaning: that at least one of the regression coefficient of the model differ from zero i.e. (significance).

Table 4.11.2 ANOVA

Statistical hypotheses H0:

Source	df	Ss	Mss	F	P-value
Regression	6	399.918	66.635	61.334	0
Error	925	1055.216	1.087		
Total	931	1405.133			

regression model is not significant.

H1: regression model is significant

To test the hypotheses ANOVA analysis of variance was used as shown in table below

The table of variance analysis explain that the value of probability P-value equal to zero which is less than the level of significance specified 5% and thus reject the null hypothesis H0 which explain that the regression model was not significant, and we accept the alternative hypothesis H1 which explain that the regression model is significant namely that at least one of the regression coefficients not equal zero.

4.11.3 Partial significance of the model:

The partial significance of regression: means that the test of significance of regression coefficient for each variable of explanatory variables alone, in addition to the regression constant through the t-test .

For fixed term to reduce (B0)

H0: $B0 = 0$

H1: $B0 \neq 0$

For (B1)

H0: $B1 = 0$

H1: $B1 \neq 0$

For (B2)

H0: $B2 = 0$

H1: $B2 \neq 0$

For (B4)

H0: $B4 = 0$

H1: $B4 \neq 0$

For (B14)

H0: B14 = 0

H1: B14 ≠ 0

For (B)

H0: B18= 0

H1: B18 ≠ 0

For (B23)

H0: B23 = 0

H1: B23 ≠ 0

Table 4.11.3 Partial Significance of Multiple Regression Coefficients

Coefficients	Values of Regression coefficients	T-Test Values	P-Values
B0	3.647	6.219	0
B1	0.527	6.889	0
B2	- 0.180	- 1.473	0.141
B4	-0.265	- 2.841	0.005
B14	-0.120	- 2.193	0.029
B21	-.0.155	-6.925	0.000
B23	-0.302	- 2.636	0.009

multiple regression coefficients, transaction value of the regression coefficients value innumerable, t-test, P-value.

4.12 Comment

For the constant term B0 and the regression coefficients B1 and B21 , it is found that the P_ values are equal to zero, which is less than the specified level of significance which is equal to

(5%), therefore the hypothesis that consider the values of the constant term (B0), and the regression coefficients (B1 and B21) in the regression model is significant accepted, as well as for the regression coefficient B4, B14 and B23 the P-values are less than the specified level of significance (5%), therefore reject the hypothesis said that B2, B14 , B23 in the regression model are insignificant. For the regression coefficients (B2), it's found that the P-values equal to (0.141) which is larger than the specified level of significance (5%) and thus accept the null hypothesis which said that the regression coefficients B2 in the regression model is insignificant.

4.13 The Relation between the Research Questions and Objectives

The relation between the research question and the objectives is explained as follows:

To predict the extent to which the independent variables (age, gender, academic standing, assessment of internet services of your internet service provider , the problems that facing the internet users, the problems during the usage of internet service on the mobile phone, the internet services you interested in and the daily usage of internet services) are instrumental in predicting the expenditure on the internet services. The independent variables of the regression model play a vital role in marketing as they make a significant contribution in investor decision making process of Internet communication services and industry, the information on independent variable is accessible and inexpensive to reach.

As a result of the research the regression model

$$Y= 3.647+.527x1-.180\ x2-.265\ x4\ -.120x14-0.155\ x21-.302x23$$

was conducted to predict or confirm the following objectives;

The best country for investment of internet services.

Increase the revenues from the Internet services due to the increased number of the subscribers and the development of Internet industry.

Examine the worldwide mobile communications markets for network consulting, network implementation, network product support and managed network services.

Act as a tool for communications industries by producing new devices according to the market requirements

Give the designers valuable information to complete their jobs with high accuracy

CHAPTER FIVE

CONCLUSION AND FUTURE WORK

5.1 CONCLUSIONS:

1. The contribution to the knowledge is the mathematical model, i.e the regression equation that obtained from the analysis of the questionnaire using SPSS program is:

Y = 3.703 - 0.123X6 + 1.372 X9 + 0.001X10 - 0.173X12 – 0.675X19 - 0.010 X22 - 0.271X24.

This equation represents the relation between the dependent variable Y (Expenditure on mobile communications services which is represented by the question 11 of the questionnaire) and the independent variables such as **(**money paid for mobile phone handset, interesting in mobile phone having ability to play movies, maximum price paid for mobile phone that have ability to play movies, the rating of mobile phone service quality, problems during the usage of internet on mobile phone handset, daily usage of mobile phone services, and the satisfaction in mobile phone customer support) which are explained by the questions (6, 9, 10, 12, 19, 22, and 24) of the questionnaire.

Regression analysis is one of the most tools used in market research, its analysis enable market researchers to analyze the relation between independent and dependent variables. In marketing applications, dependent variable is usually the outcome that we care about, while the independent variables are the instruments that we have to achieve those outcomes with. Regression analysis can also provide insights that few other techniques.

The key benefits of using regression analysis are:

- Indicate if independent variables have a significant relationship with a dependent variable.
- Indicate the relative strength of different independent variables' effects on a dependent variable.

2. The research explains the consistent relation between the mobile communication marketing and the development of mobile communications technology, so the new products and services meet the requirements of the customer which exploit innovation technology that causes a change in the architecture that consist of business and technology.

From studying the annual mobile communication market reports for the last four years since 2008 of USA, UK, AUSTRALIA, INDIA, EGYPT, SYRIA and IRAQ the conclusions are the developed countries interested in mobile communication industry because their markets are saturated, [i.e. in USA, UK, & Australia] the mobile penetration rates about to reach or reached 100%, so the opportunities to generate further growth will be limited and the mobile voice service revenue is declining in the next few years. While in developing countries the operators are interested in developing the mobile communication services, for example Middle East mobile communication market is characterized by high penetration rates and continuing subscriber's growth rate in most countries.

3. Iraq is one of the least developed mobile communications market with high growth rates, and the success of communications sector depends mainly on the security situation, for example the military jamming as security forces try to prevent militants from detonating bombs affect the quality of service of mobile communications, but in the north of Iraq the mobile communications services is better because it was safer than the rest. All Iraqi mobile communications operators planned to spend millions of dollars to expand their mobile communications networks to increase the coverage and improve the mobile communications services, for example Zain mobile services operator is planning to spend $100 million in north of Iraq in Kurdistan to improve its services there, Korek planned to spend $245 million to expand its network outside Kurdistan. In

Iraq Internet services is poor because of the fiber optic backbone and the fixed line infrastructure are destroyed at the USA war on Iraq.

4.Syria has the most regulated mobile communications sector in the Middle East and one of the least developed market. So Syria is a mobile market with a great potential for expansion but requires much market liberalization to achieve that potential.

5.The cellular telecommunications industry as a whole is expected to continue to grow which is good news for all who are working in the wireless services domain. In telecommunications sector, cable companies began to build advanced infrastructures which have ability to give triple services [VoIP, broadband Internet and digital TV] on the same cable. Mobile broadband is a new growth area and it looks like it will continue to be so for the next years which compensate the declining in the voice revenues.

6.The developing countries such as India, Egypt, Syria and Iraq are important markets for mobile communications investment due to their large populations`.

7.The criteria of measuring the performance of the mobile communication services globally are;(network performance, customer service quality, brand image, range of services, service plans, range of phones, accuracy of billing and payment, value for money and entertainment features).

8.The research explain that the mobile communications services depend on the requirements of consumers (which means that mobile services available to the consumer anytime anywhere with high transmission speed and low cost), which have done by using advanced technologies such as Orthogonal Frequency Division Multiplexing (OFDM), MIMO, WiMAX, that allow the internet and mobile services providers to offer broadband services in a hundred of Mbps, with high quality voice, video & multimedia over internet.

9.The key telecommunications information which is necessary for the scientific research are:

Mobile application and content developments

Average Revenue per User (ARPU)

Telecoms operators Internet and broadband development.

Government policies affecting the telecoms industry, market liberalization

And regulatory issues, privatization acquisitions, new licences and competition

5.2 The Future Work

This study can be extended further to examine, develop and test a model on the basis of characteristics of mobile users. The quantitative model suggested in this study can subsequently be improved to take care of more variables. The mathematical model can be compiled with other models to come up with the most effective model for predicting mobile service preferences based on profiling of mobile users. The study can be extended further so as to include other mobile service dimensions of interest, like preferences concerning value added services rendered by the mobile service operators and providers. Similar or improved versions of a similar study can be replicated in other countries of the world to provide for a generalized acceptable quantitative model for predicting consumer choice of service preferences based on consumer profiling. From a broader perspective, this study can provide some valuable insights to other studies concerning mobile and IT enabled services. The mobile communication networks planning based on the requirements of mobile communication services

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