THE FUTURE OF MOBILE INDUSTRY

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Abstract

This paper discusses the future of mobile industry along with some of the background leading to the emergence of wireless technology. First, it gives an overview of today's telecommunication network and the major differences between fixed wired networks and wireless networks. The discussion then focuses on the challenges facing the wireless industry and the way out through aggressive innovation by employing Wireless Intelligence Network (WIN) technology. The paper also discusses some important trends in wireless industry and the customers expectations which are also part of the challenges for the mobile industry. Finally particular reference is made to the developing nations especially Nigeria in the ongoing trends in mobile communication industry.

Introduction

Telecommunications plays a vital role in international commerce and in industrialized nations, it is an accepted necessity. The telecommunication networks in all countries are linked together to form a global telecommunication network for carrying information of all kinds. The Public Switched Telephone Network (PSTN) was originally developed mainly for carrying voice communication but today carries ever increasing data communication traffic. The Internet uses PSTN circuit to carry its data and the rapid growth ot Internet technology has enhanced the growth of data usage in the PSTN.

Wireless or mobile communication services are commonly influencing the growth of telecommunication. On the other hand, in developing countries, wireless communication enables many customers in the cities to obtain affordable telecommunication services. However, it is a matter of fact that during the last fifteen years mobile communications have been a major contributor to the growth of the telecommunications industry as a whole and one of the most dynamic factor of world's economy [8].

Wireless was the original word for "radio" essentially it meant telegraphy. The term wireless was widely used in early twentieth century but dropped out of usage in many parts of the world and was almost replaced by the word radio before the World War II.[2]

Today however, the term wireless is back in a more sophisticated way. Although, it still means "radio", it now has some specific modern applications.
The contemporary use of the word wireless is in describing enormous cellular telephone industry or mobile industry. After all, cell phones are basically sophisticated two-way radios.

Other technologies that involve wireless systems include wireless Local-Area Networks (LANs); Wide Area Networks (WANs); Personal-Area Networks (PANs); Radio Frequency Indentification (RFID); Infrared wireless devices. The latest wireless technology is Ultra Wide Band (UWB), a technology used in wireless networking, mobile computing and low-cost short-range radar system.[2]

WIRELESS COMMUNICATIONS TODAY

The impact of telecommunication on people's lives has been far reaching and is likely to accelerate as wireless technologies pervade the international societies of both developed and developing nations of the world.

Cellular communication technology is the fastest growing and most demanding telecommunications applications. Today, it represent a continuously increasingly percentage of all the new telephone subscriptions around the world.[8]

As a more recent trend makes clear, wireless communications and Internet technologies are converging giving people ever-increasing freedom to choose their methods of communication. This commonality between the Internet and wireless communication is according to many analysts, driving the growth of the wireless industry both regionally, locally, and globally.

As Dr. Irwin Jacobs Chairman and CEO of Qualcomm put it. "The Internet continue to be the fastest growing technology today. What is perhaps less well-known is that wireless is the second fastest growing technology. The true potential of the wireless industry is now being realized as the cost of service drops and wireless networks become more pervasive. Continuing to drive this wireless trend; consumers will access the Internet through a wireless connection. The ability of the next generation systems to effectively transmit voice and data will bring to fruition the convergence of computing and telephoning and with it a whole new range of capabilities and devices[10].

THE WIRELESS REVOLUTION

How fast is the communications revolution moving? Within the next five years stationery desktop systems will no longer be the tool of choice for accessing the Internet. Mobile devices like smart phones and other type of hand-held devices will enable the net to float free of its traditional fixed-wired and provide users wherever they may be with access to e-mail, sports scores; stock quotes, e-banking, flight status, shopping tips; traffic alerts; driving directions and much more[5]

What is making this phenomenon possible is none other than advanced wireless technologies – technologies that are fuelling an incredible expression of voice, as well as data services in every corner of the world. Motorola estimated that by 2005, the number of wireless devices with Internet access will eventually exceed the number of fixed-wired ones[5] . All these predictions has virtually come to pass or they are on the verge of coming to pass.

WIRELESS INDUSTRY DEFINED

According to National Telecommunication and Information Administration (NTIA), telecommunication refers to "any transmission, emission or reception of signs, signals, writing, images and sounds or intelligence (information) of any nature by wire, radio, optical (visual) or other electromagnetic systems." Telecommunications includes satellite communication (wireless but not cellular), cellular wireless (including infrastructure, phones, and PDA – personal digital assistants – chips) land lines (cable), communications equipment (radio and TV), and Internet networks[10].

The wireless industry focused on these devices and services such as satellites services / carriers / operators; mobile communications, pagers and cellular; and personal communications systems and hand held objects / components.

WIRELESS TECHNOLOGY

Parts of the technology of wireless are those that translate voice into digital transmissions. The primary choices worldwide are Qualcomm's CDMA (Code Division Multiple Access). This technology is well adopted in USA and other parts of the world including Europe and Asia. Then we have TDMA (Time Division Multiple Access; Spread Spectrum (SS) which used TDM as the driving technology. We also have GSM (Global Systems for Mobile Communication), which is the dominant player in Europe and had gained wide popularity world wide in terms of subscribers. Other technologies include Bluetooth – which permits communications at short distance; GPRS (General Pocket Radio Services, GPS (Global Position Systems); WAP (Wireless Application Protocol) and other systems that integrate voice / data / video, Internet, and wireless technologies for numerous consumers products.

THE INFLUENCE OF SAN DIEGO ON THE RAPID GROWTH OF MOBILE INDUSTRY

There is no way we can discuss or write about mobile industry without making reference to San Diego, California, US. San Diego has become a reference point in mobile industry worldwide. The region is widely recognized as the "wireless capital of the world." The implications of San Diego, California, United States cannot be overemphasized. As stated by another industry analyst; "In the wireless war for supremacy, San Diego is emerging as the industry boot camp of innovation."[10]. San Diego innovative market made it home to many of the major player in the wireless industry – Qualcomm – (the company that developed the technology of CDMA); Huges; Nokia, Erricson, Motorola, Kyocera and a host of others.

In San Diego, the wireless industry represents a technological sector within the communication chapter similar to the Silicon Valley. In recent years, San Diego has emerged as an international leader in meeting consumer demand – both for wireless technology and equipment. The region's industry has evolved from its early history from University of California, San Diego (UCSD) research to comprehensive sector with significant support organizations.

Insiders trace the beginning of this industry to Linkabit, a 1968 business venture of Professors at the University of California, San Diego, starting in 1980s, Linlabit spun off Qualcomm, and more than 30 others telecommunication companies including Viasat (Satellite communications firms), Wave Ware (specializing in software and connectivity),

and Leap Wireless (an operator of wireless networks). These in turn fuelled generators of newer companies, creating a vortex of activity that attracted major international companies now located there.[10]

EVOLUTION OF MOBILE TELEPHONE GSM SYSTMES

Cellular communication technology is the fastest growing and most demanding telecommunications applications. Today it represents a continuously increasing percentage of all be new telephone subscriptions around the world. Currently there are more than 300 million cellular subscribers worldwide[8], and recently 80% of those subscribers are located in United States , Europe,and some parts of Asia.

It was predicted that cellular system using digital technology will become the universal method of telecommunication. It has been estimated that some countries may have more mobile phones than fixed wired phones by the year 2000[8]. This estimate has already come to pass in Nigeria because mobile phone has almost entirely replaced fixed-wired telephones[14].

CELLULAR SUBSCRIBER GROWTH WORLDWIDE

The concept of cellular communication service is the use of low – power transmitters where frequencies can be reused within a geographic area. The idea of a cell – based mobile radio service was formulated in the US at the Bell laboratory in the early 1970s.

The Nordic countries were the first to introduce cellular services for commercial use with the introduction of the Nordic mobile telephone (NMT) in 1981. However cellular services or cellular systems began in the United States with the release of the Advanced Mobile Phone Service (AMPS) system in 1983. Later, the AMPS standard was adopted by Asia, later America and the countries located along the Pacific Oceans, creating the largest potential market in the world of cellular[8]

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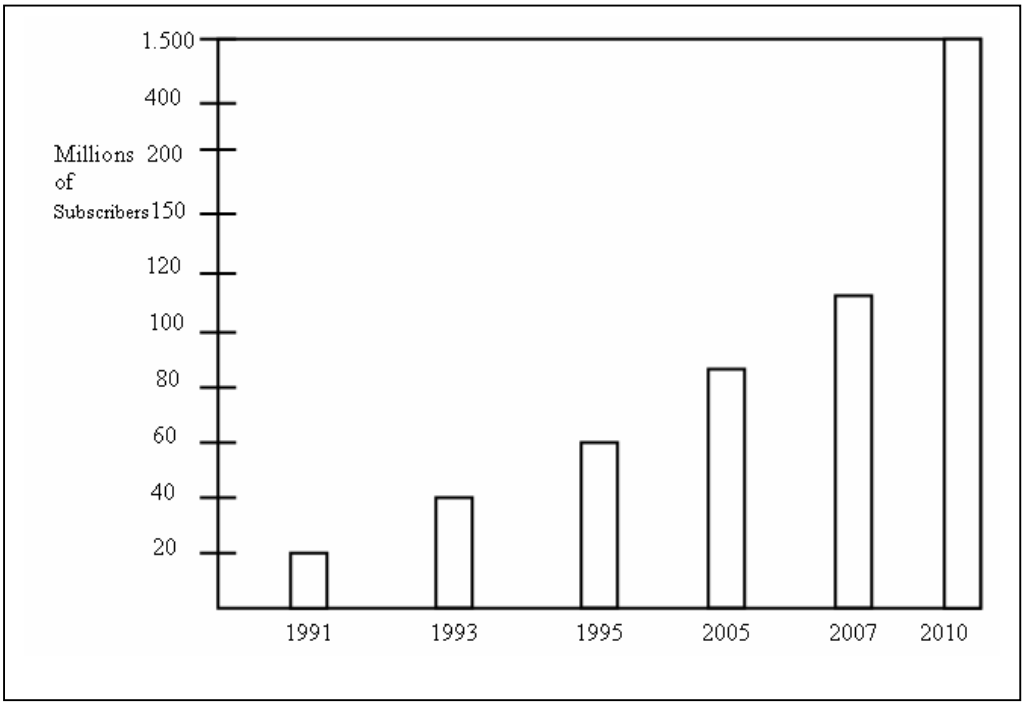

Cellular Subscribers Growth Worldwide

ANALOG MOBILE PHONES

In the early 1980, most mobile phones systems were analog rather than digital, like today's newer system. One challenge facing analog system was inability to handle the growing capacity needs in a cost-efficient manner. As a result, digital technology was welcomed.

The advantages of digital system over analog systems include ease of signaling, lower levels of interference, integration of transmission and switching, and increased ability to meet capacity demands.

OVERVIEW AND DEVELOPMENT OF WORLDWIDE MOBILE TELEPHONE SYSTEMS

YEAR	MOBILE SYSTMS
1981	Nordic Mobile Telephone NMT 450
1983	American Mobile Phone System AMPS
1985	Total Access Communication System (TACS) British
1986	Nordic Mobile Telephone (NMT) 900
1991	GSM
1992	Digital cellular system (DCS) 1800
1994	Personal Digital Cellular (PDC)
1998	PCS 1900 – Canada
1996	PCS United States

Table 1: Overview of mobile telephone worldwide Source: IEC2000

GSM STANDARDISATION

As the cellular communication technology was been evolved, various systems have been developed without the standardized specification. This presented many problems directly related to compatibility and inter-operability, especially with the development of digital radio technology. The GSM standard was intended to address these problems.

From 1982 to 1985, discussions were held to decide between building an analog or digital systems. After a series of field test, a digital system was adopted for GSM. The next task was to decide between narrow or broad band solutions. Therefore in May 1987, the Narrow Band Time division multiple access (TDMA) was adopted[8]. A summary of GSM milestone is given on table 2. bolow.

YEAR	MILESTONE
1982	GSM formed established
1986	Field test were carried out
1987	TDMA -------- as access method
1988	Memorandum of Understanding signed
1989	Validation of GSM System
1990	Preparation system
1991	Commercial system start – up
1992	Coverage of large cities/airport
1993	Coverage of ---
1995	Coverage of rural areas

Table 2: GSM Mile Stone Source: IEC2000

OVERVIEW OF MOBILE PHONE SYSTEMS

Today, there are large number of mobile phones available in the telecommunications market. Whilst not all are in use today, some of the older systems have been superseded and some of the newer systems have not all been rolled out yet, nevertheless many different names and technologies are talked about. The table below gives a summary of the main systems that have been used, are being used or are due for introduction.

Table3.

Cellphone System	Generation	Channel Spacing	Access Method	Comments
AMPS	1G	30 kHz	FDMA	Advanced Mobile Phone System, this analogue first developed and used in the USA
NAMPS	1G	10 kHz	FDMA	Narrow band version of AMPS chiefly used in the USA and Israel based on a 10 kHz channel spacing.
TAC	1G	25 kHz	FDMA	Analogue system originally in the UK. Based around 900 MHz, this system spread world wide. After the system was first introduced, further channels were allocated to reduce congestion, in a standard known as Extended TACS or ETACS.
NMT	1G	12.5 kHz	FDMA	Nordic Mobile Telephone. This analogue system was the first system to be widely used commercially being launched in 1979. It was used initially on 450 MHz and later at 900 MHz. It was used chiefly in Scandinavia but it was adopted by up to 30 other countries including Oman.
NTT	1G	25 kHz	FDMA	Nippon Telegraph and Telephone. The system used in Japan, using a 900 MHz frequency band, and 55 MHz transmit receive spacing. (A high capacity version is known as HICAP).
C450	1G	20 kHz	FDMA	The system adopted in West Germany (East Germany was separate at this time). It used a band in the region of 450 MHz along with a 10 MHz receive / transmit spacing.
GSM	2G	200 kHz	TDMA	Originally called Groupe Speciale Mobile, the initials later stood for Global System for Mobile Communications. It was developed in Europe and first introduced in 1991. The service is normally based around 900 MHz although some 850 MHz allocations exist in the USA.
DCS 1800	2G	200 kHz	TDMA	1800 MHz derivation of GSM and is also known as GSM 1800.
PCS 1900	2G	200 kHz	TDMA	1900 MHz derivation of GSM and is also known as GSM 1900.

TDMA	2G	30 kHz	TDMA	Although it was originally known as US Digital Cellular (USDC) and was introduced in 1991. It is sometimes called North America Digital Cellular and also known by its standard number IS54 that was later updated to standard IS136. It is a 2G digital system that was designed to operate alongside the AMPS system.
PDC	2G	25 kHz	TDMA	Pacific or Personal Digital Cellular. The system found only in Japan where it has gained very widespread use. It has many similarities with IS54 although it uses a different speech coder and a 25 kHz bandwidth.
GPRS	2.5G	200 kHz	TDMA	General Packet Radio Service. A data service that can be layered onto GSM. It uses packet switching instead of circuit switching to provide the required performance. Data rates of up to 115 kbps attainable.
EDGE	2.5 / 3G	200 kHz	TDMA	Enhanced Data rates for GSM Evolution. The system uses s different form of modulation (8PSK) and packet switching, which is overlayed on top of GSM to provide the enhanced performance. Systems using the EDGE system may also be known as EGPRS systems.
CdmaOne	2G	1.25 MHz	CDMA	This is the brand name for the system with the standard reference IS95. It was the first CDMA system to gain widespread use. The initial specification for the system was IS95A, but its performance was later upgraded under IS95B, which the cdmaOne specification actually uses, Apart from voice it also carries data at rates up to 14.4 kbps for IS95A and under IS95B data rate of up to 115 kbps are supported.
CDMA2000 1X	2.5G	1.25 MHz	CDMA	This system supports both voice and data capabilities within a standard 1.25 MHz CDMA channel CDMA2000 builds on cdmaOne to provide an evolution path to 3G. The system doubles the voice capacity of cdmaOne systems and also supports high-speed data services. Peak data rates of 153 kbps are currently achievable with figure of 307 kbps quoted for the future, and 614 kbps when two channels are used.
CDMA2000 1xEV-DO	3G	1.25 MHz	CDMA	The ED-DO stands for Evolution Data Only. This is an evolution of CDMA2000 that is designed for data only use and its specification is IS856. It provides peak data rate capability of over 2.45 Mbps on the forward or downlink, i.e. from the base station to the user. The aim of the system is to deliver a low cost per megabyte capability along with an always on connection costed on the data downloaded rather than connection time.
CDMA2000 EV-DV	3G	1.25 MHz	CDMA	This stands for Evolution Data and Voice. It is an evolution of CDMA2000 that can simultaneously transmit voice and data. The peak data rate is 3.1 Mbps on the forward link. The reverse link is very similar to CDMA2000 and is limited to 384 kbps.
UMTS	3G	5 MHz	CDMA/ TDMA	Universal Mobile Telecommunication System. Uses Wideband CDMA(W-CDMA) with one 5 MHz wide

				channel for both voice and data, providing data speeds up to 2 Mbps.
TD-SCDMA	3G	1.6 MHz	CDMA	Time Division Synchronous CDMA. A system developed in China to establish their position on the cellular telecommunications arena. It uses the same bands for transmit and receive allowing different time slots for base stations and mobiles to communicate. Unlike other 3G systems it uses only a time division duplex (TDD) system..

Table 3: Extracted from Radio-Electronic.Com.

NEED FOR WIRELESS COMMUNICATION

One of the reasons why wireless communication started to develop is mobility –co-ordination. Looking broadly at the way which mobility has been co-ordinated in human communication and interactions, one can see three general phases.
Phase one covers the period before the advent of telegraph, telecommunication regarding mobility could only be delivered by being visible i.e. the speed of the message was the speed of physical transport.[2] .

With the development of Telecommunication, which is the second phase, the speed of the messages that could potentially cause travel were able to move at many times the speed of physical travel. Thus one could send a message to a remote person without the need for a physical messenger. (de Sola, 1980).

The limitation of this systems is that in order for the message to come through, the person sending a message need access to a sending device at a fixed a location, and also needs to know the physical location of the person who is receiving the message, for example in a telephone number. This is the fixed – wired systems technology.

We are mow experiencing the third phase. This has removed the inconvenienced condition of fixed location for the sending and receiving equipment. For example, a person interested in sending a message is within some very broad boundaries, free to choose where he will initiate the communication. In addition, there is no need to know the location of the person to whom he wishes to speak.

The development of mobile telephone thus incorporates various degrees of freedom on time and location in that one does not necessarily need to agree on absolute point in time but rather can to some degree negotiate over where and when to meet. Hence the quick switching over to mobile communications worldwide.

TODAY'S TELECOMMUNICATION NETWORK

Today's network can be grouped into two major parts:
Fixed-wired which is the old network that has been in place for some time(and the technology is fully understood to the extent that most of its limitations have been identified), and the wireless communication system side. Looking at the attatched diagram,the typical fixed-wired central office(CO) contain all the the intelligence and the

automatic systems that can handle calls, including the service- logic,call control, and call switching functions.
The logic systems and control were incorporated for easy upgradability; rather than upgrading each of the COs in the service areas which is more expensive and time consuming.

The fixed-wire system, which basically includes a network elements platform called the service control point (SCP) that handles the service logic, an intelligent peripheral (IP) provides specialized resources as text-to-speech, voice recognition and voice announcement, which are used during processing call.

The fixed-wired system with its distributed intelligence has many features. However, the biggest limitation of fixed-wired system is its limited support for mobility. Wireless networks began to develop because of the critical need for mobility. Advanced automation or intelligence had to be put into a central location in the network in order to provide mobile communication services that allows a customer based in Enugu in Eastern part of Nigeria to switch on his phone to get the package of services when in a different city like say Lagos or Minna in Nigeria.

Wireless networks are inherently rich in mobility management but generally poor in supporting features when compared to fixed-wired networks. In mobile communication systems all the features in wireless networks are provided by the Wireless Central Office also called the Mobile Switching Centre (MSC), which is potentially working in conjunction with the Visitor Location Register (CLR) and the Home Location Register (HLR).

From the diagram, one can observe that the wireless side and the fixed-wired have some common elements such as PSTN that carries
voice traffic between the two and the signaling system using Spread Spectrum technology (SS7). This carries the signaling messages between the elements.
However,the fixed-wired system uses IN application protocol(INAP) in processing a call, while the wireless uses cellular intersystem operations protocol IS41 for its Mobile Application Part (MAP) protocol
This arrangement enables the two networks to interoperate and able to communicate during a call set up[3].

CHALLENGES FACING THE WIRELESS INDUSTRY

Most of the expectations of the users and other expected innovations in the industry are seen as challenges by the industry. However, one of the biggest challenge facing the wireless industry is related to technology or technological innovation, that is how to achieve a seamless operations and synchronization regardless of whether the customers use wireless or fixed-wired network. The challenge is how to incorporate Intelligence Network (IN) technology of the fixed-wired system(e.g Service Contol Points) and the other intelligent peripherals into the wireless network in order to generate enhanced wireless services while still maintaing its mobility functionality[3] .

By the time they overcome this challenges, it will enable customers to receive services with the same look and feel in one seamless and smooth operation regardless of whether they use wireless or fixed-wired network. Similarly, it would enable wireless services providers to offer services with less effort and lower deployment costs.

Other challenges are also part of the customers' expectation which includes:
Wider coverage, higher mobility anywhere anytime; better quality of service in the areas of voice quality; noise control; noise reduction; blocked or dropped calls; low tariff.
I believe these challenges are not insurmountable. In fact the transition in mobile phones technology from 1G to 2G to 3G to 3G+ were as a result of limitations and challenges the telecommunication industry are continuously facing.The innovations are due to a need for a better services at higher data rates.

IMPORTANT TRENDS IN THE WIRELESS INDUSTRIES

Big challenges are drivers of change within a particular industry. There are some mega trends in the mobile industry today and these trends are having significant effect on the wireless communication business.

INCREASING DEMAND

The first wireless mega trend is in the area of customer demand, i.e. increasing customer demand. The acceptance of wireless service and phones has been phenomenal. The demand is far beyond expectation even in the developing nations. Communication has become inevitable for individuals, families, associates, and business organization worldwide. Therefore customers' expectations are increasing, as is demand for services.

STIFF COMPETITION

The second mega trend is keen competition. In every market around the world, wireless competition is increasing. All over the world including the emerging economies, there are stiff competitions among various mobile communication companies. A growing number of equipment suppliers are emerging from all the developed nations especially, USA, Europe and some parts of Asia to serve the ever expanding market. The intensifying competition has also driven the cost of services downwards to the benefit of the customers.[.]

DECREASING REGULATION / DE-REGULATION

Decreasing regulation is the third mega trend. In many nations of the world, de-regulation is a major factor in the growth and the development of telecommunication. Most of the monopolistic Telecommunication Acts are being repealed and replaced with more liberal ones that allow healthy competition within the industry. The de-regulations also opened-up the industry to good investors especially in the developing nations like Nigeria.

It was after the de-regulation that more Nigerians began to have access to Telecommunication facilities. The benefit of deregulation cannot be overemphasized. It also help to boost the economies of the Telecommunications industries worldwide. The world Trade Organization (WTO) trade agreement of 1997 [7]is a landmark agreement that breaks the barriers and many other countries follow suite.

DIGITIZATION

A fourth important trend is digitization. In reality, it was the choice of digital transmission that gave birth to wireless system technology . Because of continuous investment in digital technology research, new digital systems and digital transactions have been deployed rapidly in hundreds of markets for example the three basic.
second generation (2G) digital cell phone systems are in wide use today. Two of them use Time Division Multiplexing (TDM) and the third uses Spread Spectrum (SS). The TDM systems are the GSM and the IS-136 standard for TDMA (time division multiple Access). The SS system is code division multiple access. All these systems are based on digital technology. Various communication network circuit design configuration and interfacing have become possible after the development of Analogue–Digital Converter (ADC) and Digital – to – Analogue Converter (DAC) modules, components and systems.

INTERNET REVOLUTION

Internet revolution is the fifth mega trend in wireless communication. The Internet technology has created a global information infrastructure largely outside of government regulatory boundaries. It is not surprising that it has grown so quickly. Therefore one of the expectation from the mobile industry is to exploit the huge technological opportunities in the Internet and use it to bring commerce, entertainment and information research at the touch of a button.[4] .
These innovations will revolutionize the mobile industry as people come to expect access to those services from a mobile or remote location. The Internet is the fastest growing service, faster than cellular telephones or Personal Computers (PCs)[5]
There are other mega trends like minute migration, the broadband revolution, the information technology revolution,etc, diversifying subscribers' equipment for example using various configurations and equipment adapters.

CUSTOMERS EXPECTATIONS

There are many ways through which innovation can take place in any industry or product. It may be customers driven, it may be technological driven. This brings us to the issue of customers' expectation from the mobile industry. In fact, the future of any organization producing product or delivering services is tied to the organization meeting its customers expectations. Therefore, the future of mobile industry is tied to how effectively the industry can meet its customer's expectations. Most of the expectations of the customers of mobile or wireless industry are also challenges to the industry. Some of the expectations include:

1. Seamless operation regardless of whether the customer is using wireless or fixed wired network.
2. The industry should be aware that levels of service that were acceptable in 1980s are no longer acceptable to today's users they need to brace up for more stringent demand and be ready to deliver quality services.
3. Customers expect wider coverage and higher mobility anywhere anytime.
4. Customers expect higher speed of processing.
5. Customers expect longer battery life for the mobile phones and other hand-held devices.

6. Customer expects minimum energy consumption.
7. Customers expects clear video picture with distinct colour i.e. higher level matrix of pixels.
8. More friendly instruction or user manuals for the equipment and devices.
9. More features and functionality.
10. Faster call set up, privacy and ease of use.
11. Smart messaging and numerical paging.
12. Increased connection between people, computers and information. Not only people speaking to people, but people are speaking with machines; machines are also speaking with machines, and information data bases are showing information.
13. Lower tariff.
14. Reduced cost/bandwidth

For example, in the nearest future, I should be able to call my colleague in the office on his PBX phone using my mobile phone.
In medicine, there are many opportunities in wireless communication for innovation to enhance health care delivery. These are areas for development for the wireless industry.

TELECOMMUNICATIONS INDUSTRY STATUS IN NIGERIA

Telecommunication Industry development in Nigeria has been static (just like in some developing countries) until recently when the Federal Government decided to de-regulate the sector and this has enabled many Nigerians to enjoy Telecommunication facilities.

Before the era of de-regulation, Telecommunication Infrastructures were owed and controlled solely by the Federal Government. At that period, only about 15% of the entire population had access to telephone facilities[14] and the communication Networks were predominanatly fixed wired.

IMPACT OF DEREGULATION

Almost immediately after the de-regulation, investors started to invest in the telecommunication industry; within three years of De-regulation, several operating licenses were issued to interested investors and within a short period, few private communication companies have sprung up, both local and foreign and established Telecommunication networks and facilities in major cities in Nigeria. Even though there are few compared to the total population, it was much better than when the Industry was monopolised by the Federal Government.

MOBILE COMMUNICATION INDUSTRY IN NIGERIA

In many developing countries, established communication infrastructure were seriously, lacking, therefore the available telecommunication companies are flocking to wireless communication,thereby leap - frogging over fixed wired technologies. In Nigeria, among the privately owned Telecommunications companies, four of them are in mobile communication Business. They are: MTN; Globacom; Celtel and M-tel; all the four company have infrastructures to support 2G and 2.5G digital cellular phones. Just like the developed countries, wireless communication industry is the fastest growing business in Nigeria to day[15].

In Nigeria, there about 30 Million cellular phone subscribers, going by the statistics released by the mobile communication companies on their subscribers[13] .

This translate to about 20% of the entire population that now have access to telephone facilities within five years of their inception. This is a very big improvement when you compare it with almost fifty years of Telecommunications Industry in Nigeria and with only 15% of the population having access to the telephone facilities.

THE FUTURE OF MOBILE INDUSTRY IN NIGERIA

As I have said earlier, the future of wireless industry or mobile Industry in Nigeria is strongly tied to meeting the expectations of the customers. In Nigeria today almost every Telecommunications subscriber has switched over to wireless networks because of the opportunity of high mobility. There is continuous demand for communication service, the wireless Industry is growing at exponential rate. Therefore the following are the expectations of the users including the potential subscribers.

1. Better Quality Of Service.
2. Lower Tariff Is Also Expected
   In US, Europe and other parts of the world, as the subscribers increase in population, the cost of services drops proportionately[5]. But in Nigeria , it has not been so, despite the fact that most of the mobile communication companies have broken-even. Their tariffs are still very very high. The future of the industry depends on how well they can meet all these expectations.
3. Seamless Connectivity And Better Interoperability Among The Wireless Networks.
   It is not uncommon to see some Nigerians in big cities carrying two or three mobile phones at the same time. This is because inter - connectivity between different networks is still very poor for example if a customer is on MTN network and he wants to call on a person who is on another network different from MTN, the call may take one minute or two minutes to go through. These are areas of challenges to the Industry and they must be addressed as soon as possible for the sake of the future of the Industry.

4. Expectations In The Areas Of Research And Development
   In the area of research and development, the mobile Industry in Nigeria is not doing enough; it is expected that the mobile industry should take keen interests in research and development. The industry should actively support and encourage research in to new areas in wireless communication networks e.g Intelligient Networks(IN); Satelite Telephony Technology and a host of others. This can be done by collaborating with some Universities and polytechnics to engage in progressive and productive research directed at addressing the challenges facing the industry especially in the energy and power supply system and other essential infrastructures that are vital to the growth of Telecommunications in Nigeria.

5. Expectations In The Areas Of Training And Technology Transfer.

Because the future of the Industry depends on the qualities of their staff: engineers, technicians,managers, administators etc.For example,the London Sunday Times reported how the founder of the 'Source',Daniel Mitchell developed and grew his business from zero to sales of 35Millon Pound. Mitchell argues that "success is about customers, but it is also about the people you employ" (London Sunday Times,2004)[11]..

It is expected that the Industry should invest heavily on staff development programmes and look in-wards for the recruitment of young and dynamic ones. The industry should encourage students in the higher institution by taking them for industrial attachment from time to time. In Nigeria, the mobile communications have not been doing this.

6. Other Expectations

These include the convergence between the wireless networks and the internet technology innovation to enhance the quality of their services and also to bring down the cost of their services.

Customers and the society at large expect that the government should urgently address the issue of Energy and power system. This will allow the mobile industry to conserve some resources thereby bringing down their tariff.

CHALLENGES FACING WIRELESS INDUSTRY IN NIGERIA

The biggest challenge facing the mobile industry in Nigeria is Energy especially issue of electric power supply. As at today, the companies within the industry generate their own power through standby generators located in each of their base stations.

This is considered outrageous and makes the whole operations and services very expensive.

Other challenges include poor telecommunication infrastructure and inadequate skilled man power. Most of the customers expectations are also challenges to the industry.

CONCLUSION.

Writing about the future of Mobile Industry, this paper had attempted to discuss the reasons while mobile communications was widely accepted.The paper identify some of the emerging technologies that were developed in response to the demand of wireless communication

The paper also touched on some of the challenges facing the engineers and professional in the industry and how these challenges could be combated through technological innovation coupled with extensive research and development.

In the paper , we identified some very challenging and important trends in wireless communication and how are affecting the industry…..

In conclusion, we believe that

the future of wireless industry world wide will deliver better and quality services to its numerous customers through keen competition among the the telecommunications companies. The future will also witness a lot of innovation through dedicated research in advanced automations and Intelligent Networks in other to improve their services and also to make the service more affordable to its Millions of potential customers especially in the developing Nations of the world

Future of Mobile Industry will be technology and market driven such that there will be convergence of internet engineering, wireless communication networks and Mobile Computing..

The future is also very promising economically as the customers will continue to demand for communication services world wide especially wireless communication services..

However among the numerous wireless communications companies, it is those that could invest in productive research leading to innovations that will respond to the expectations of their customers that will eventually survive the imminent competitions.

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