The Evolution of Communication Engineering in Iraq

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Abstract*:* This study aims to understand and interpret the evolution of communication engineering in Iraq. Communication strategies varied under the regime of Saddam Hussein, US invasion and modern era. Further, it discusses the current communication market landscape in Iraq. The research outcome focused on different communication modes and challenges faced by them over the period. Added to this, the research found that mobile communication using smart phone has seen exponential growth in Iraq. It was also found that Iraq government is strengthening its radar communication to support their armed forces. This paper is exploratory in nature and needed primary data to support.

Keywords: International collaboration, Last mile access, communication platforms, communication eras, problems of communication engineering, communication engineering in Iraq.

1. Introduction

Communication engineering has seen paradigm developments in recent years due to advancement in technology. The branch of engineering concerned with sending and receiving signals on the electromagnetic waves platform inculcated nuances of artificial intelligence and block chain technology. It is essential to retrospect the growth of communication to forecast the trends. In the ancient times pigeons and Harkars were utilized to provide communication services [1]. Britain was the pioneer in introducing modern communication methods through letter box in 1830.

The growth of communication is divided into four eras. In the prehistoric era, speech bronze articles and metallurgy items were sources of communication [2] Human writing, paper and printing technology made inroad into the communication technology in the pre-industrial era. Further, the industrial revolution brought new perspectives to communications. Electricity, broadcasting and electronics redefined human communications. However, the most advancement came in the digital era. The internet, web and social media penetrated into the hands of 3.8 billion people across the world. The saga of human communication evolution from print in 18th century, evolution of radio in the early 19th century and the advent of television communication after World War II are stepping stones for modern communication. The Disney's OTT platform launch garnered 10 million subscribers on the day 1 showing growing demand for reliable, unique and safe communications.

Communication engineering evolved over the period built on various technologies. Satellites are core strengths of communication engineering development. The antennas, radio wave propagation, and signal processing developments fuelled communication engineering growth [19]. Further, satellite data communication and modulation innovations transformed communication engineering. Added to this, orbital mechanics and satellite electronics made communication faster and cheaper.

Communication systems are modes of information sharing between devices in different places. This information is carried over by electromagnetic carrier waves [20].

The field expanded with the growth of optical communication systems. These systems applied on high carrier frequencies in the near infrared region of the spectrum. This branch of communication engineering based on light wave led to the growth of the Fibre optic communication system in 1980. The fibre optic communication's light wave systems had 100 Mb/second sin the first-generation systems. The limitation of the first-generation light wave system overcame from the innovation of single wave fibres that lifted the bit rate to 1.7 GBPS. The second-generation systems had the serious limitations of optical fibrer loss in the operating wavelength 1.3 µm. Third generation systems were commercially adopted in 1995 with the capacity of 2.5GBPS. The systems worked well in the dispersion shifted fibres. However, the third-generation technologies had a drawback of signal regeneration by using electronic repeaters. Wavelength division multiplexing introduced the revolution of fourth generation systems. These systems are commercially available from 1992.

Radio communications are widely applied in radio and television broadcasting. These technologies are boosting the operational efficiency of cell phones and wireless networking. These radio waves generated while electric charges are subject to accelerations [21]. Eduardo Branly, a French Physicist used radio waves in 1890. However, the word radio emerged in 1904 when the British post office used it while transmitting their telegraphs.

Radars have a significant role in communication engineering. They work on the principle of radiating electromagnetic waves from the system and getting echo from the targeted objects. Radars used for navigation communication, defence communication, space communications, and weather communications [36]

2. Methods

Researchers conducted an exploratory study to unearth the information pertaining to evolution of communication engineering in Iraq. The study divided the communication growth in different eras namely Saddam Hussein leadership, US invasion and Modern eras. Further, researchers formulated objectives on developments and challenges faced for communication engineering evolution in different eras classified. Sources of data included WebPages, books, blogs, articles and journal papers.

3. Results

3.1 History of Communication Engineering in Iraq
3.1.1 Communication Under the Saddam Hussein Leadership

During the Saddam Hussein regime (former president of Iraq) telecom services were provided only to elite members. This was counted to be around 25000. The Saddam Hussein leadership hadn't allowed private players to run the media business. All government news was communicated via the Iraqi News Agency (INA). The Saddam government allowed five newspapers, one TV network, and four radio stations. Communication under this regime was highly regulated.

3.1.2 Communication During the USA Invasion

The tussle between Saddam Hussein and the USA led to the fall of the government. This allowed the rise of the media vehicles in the Iraq market. Uruklink was the first company to provide Internet services in Iraq. Currently 13 players are providing internet services in Iraq. The freedom of speech in 2003 allowed the media industry to open their wings. There were 14 radio stations and 200 newspapers. The BBC report summarized that Najaf city with a population of 300 thousand had 30 newspapers.

Adversaries of the 2003 Iraq war were highly inappropriate for the telecom industry. The Ministry of commerce and the US state department joined hands together to repair switches damaged in the war. L Paul Bremer III the USA ambassador along with Coalition Provisional Authority (CPA) initiated the distribution of telecom licenses.   This facilitated the smooth operations of telecommunication activities in Iraq [5] National communication and media commission of Iraq was established in 2004 to regulate media and communication activities in the country [3]. It formulated the policy that highlighted the incentive for heavy adoption of the internet; creating internet awareness through education and legislations on internet privacy. In the same year coalition provisional authority (COA) issued order no 65 to develop the telecom infrastructure in Iraq in a safe, transparent yet competitive way [6].

3.1.3 Modern Era Communication Industry

Current communication system enticed foreign media majors into the Iraq media landscape. Prominent ones who have a strong foothold in the Iraq media industry are Reuters, Associated press and Xinhua news agency. The rise of online news reduced the sales of newspapers. Further, a notable trend observed was citizen journalism and blogging. However, this space is still male dominated.

Mobile applications are playing a crucial role in the success of defence forces. The country has bought public private partnership. Citizens are now sending messages about suspicious vehicles and persons with ill intent on the government mobile application. Tis has averted many casualties and saved lives [4].

3.2 Iraq communication engineering industry

Iraq is one of the fastest emerging telecom markets. In 2021 November the country had 26 million telecom subscribers with 11 lambda appetite for telecom infrastructure.
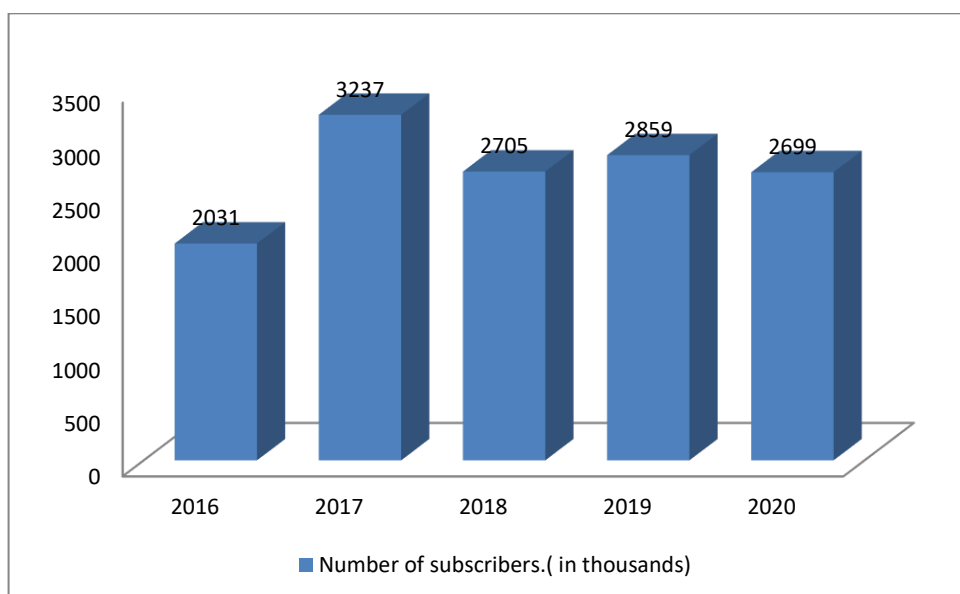

Figure 1. Number Of Fixed Line Subscribers in The Iraq (Source: World Bank)

Major players in the Iraq market are:
1. Zain: The telecom major in Iraq with 97% brand awareness provides 4.5 G services. It has a presence in 18 cities of Iraq. It began the ZY youth program wherein resources are provided for youth to excel in their career.
2. Asia cell: The Company incorporated in the year 11999. It has a strong 13 million subscriber base. It provides services in all 19 states of Iraq. It got the best mobile service provider award at the mobile industry award in 2017. The company suffered heavy losses during the ISIS war
3. Korek telecom: Its Iraq Kurdish telecom services provider since 2011. It has tie up with France telecom to provide uninterrupted telecom services. In 2015 the company launched 3G mobile services in Iraq.

3.3 Platforms and Modes of Communication in Iraq

According to the survey conducted by Open Signal on Iraq mobile network experience following outcomes are derived:

Table 1: Iraq Mobile Network Experience (Source: Open signal)

Parameters	Asia cell	Zain	Korek
Video quality(0-100 points)	59.9	49.9	48.2
Gaming quality(0-100 points)	38.5	39.2	37.6
Voice app quality(0-100 points)	74.4	75.2	71.8
Download speed in MBPS	22.9	14.4	11.6
Upload speed in MBPS	9	4.4	3.8
% time 4G network availability	73.4	62.6	61.7
4G coverage data (0-10 points)	3.4	3	2.2

These data were derived for 90 days starting from September 2021 to November 2021. The results were based on International Telecommunication Union (ITU)

3.3.1 Satellite for communication

Iraq's satellite ambitions were exhibited during the Saddam Hussein era. It claimed to have two satellites capable of carrying satellites into orbit. The government coded this project as 'Al ta ir' However, the outbreak of gulf war and lack of leadership postponed the government ambitions. The dream of having their own satellite was fulfilled when the team of students launched their first satellite Tigrisat at the University of Rome. In November 2021 the ministry of

communication of Iraq announced the development of satellite with the support of foreign partners for improving the telecom infrastructure [12]

3.3.2 Internet

In the 1990s the world saw a robust growth of internet based communications. Invention of email, messaging and video calling has brought the world much closer than ever before. In 2022 it is expected the world will send 333 billion emails [13]. The trend is not alien to Iraq. Today, Iraq's 75% population uses the internet among 40 million. The internet industry in Iraq is experiencing 2.3% growth between 2020 and 2021(table 2) [14]

Table 2: Internet Users and Growth Rate in Iraq (Source: Datareportal)

Year	Internet users ('000)	Growth rate
2017	136	37
2018	188	2.3
2019	192	2.3
2020	196	2.4
2021	201	2.4
2022	206	NA

Internet connection speed on both cellular and fibre networks have seen robust growth in 2022. The table 3 depicts the change in the median speed and year on year growth

Table 3: Median Internet Speed and Growth in Iraq on Cellular and Fiber Networks (Source: Datareportal)

Internet connection speed (2022)		
Mode	Median connection speed(MBPS)	YoY change %
Cellular	37.25	725
Fiber	19.65	47.6

The internet speed on cellular networks is significantly different from fibre networks. This has resulted in an increase in the mobile users in Iraq. This has directly impacted the internet usage. Table 4 shows the device usage by Iraq population in 2022.

Table 4: Share of Web Traffic (Device Wise In 2022) (Source: Datareportal)

Share of web traffic	
Device	Year on year change %
Mobile	75
laptop	22
Tablet	2
Other devices	0.8

3.3.3 Social Media

Social media emerged as the best medium for peer-to-peer communication. Further, this medium is used for providing customer services by communication companies [39]. Iraq is experiencing unheard of growth in the previous year in the social media usage. The country had a 25 million population i.e., a whopping 65% of the total population surfing on social media. According to Global stats portal Facebook is leading in the social media usage in Iraq (63%) followed by YouTube (27%) in the year 2021[15]. Twitter and Instagram also figured in the chart to show their existence.

3.3.4 Wearable technology

The mode of communication is influenced by technology. Devices wore on the skin of an individual are called wearable devices. Smart watches, fitness tracers and smart glasses are a few examples of wearable devices. This technology is not new to the world Sony transistors released in the year 1955 is the first example of wearable devices {35}. Digital watches, once a gadget for the elite class, have become a necessity for the masses.
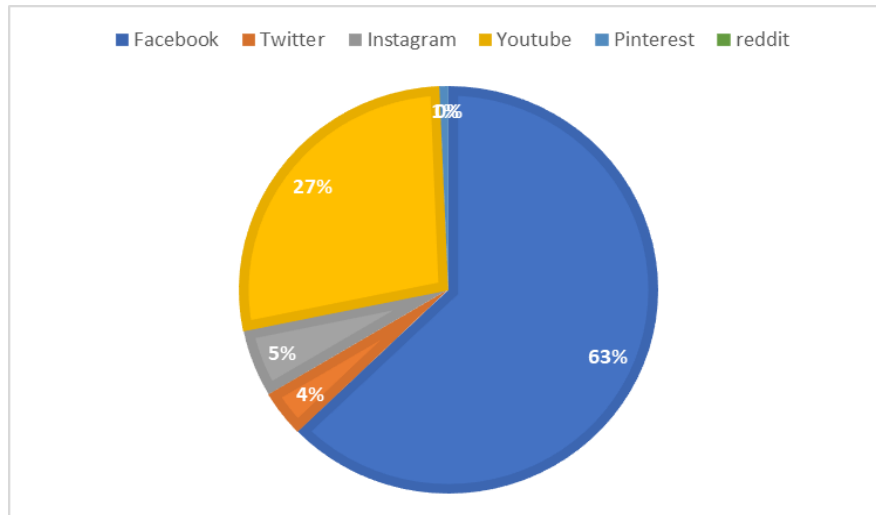
Figure 2: Market Share of Social Networking Sites in Iraq. (Source: Global stats)

3.3.5 Augmented reality

Communication has crossed all barricades and entered into the real; space in virtual mode. Augmented reality is enhancing user experiences. Brands are telling their stories on augmented reality and companies are pitching their sales using this medium. Iraq is also opening itself to the world of AR. In research conducted on AR usage for learning students had shown greater interest in suing them. However, teachers are not aware about technologies and were reluctant to use even during the pandemic [34]

3.3.6 Radio

The first radio station in Iraq was radio Baghdad began its operation in 1936. After the Iraq invasion by the USA, the numbers of stations have grown exponentially. The list of 10 major players in the Iraq radio industry is given below:

Table 5: Major Players in The Iraq Radio Industry (Source: Primary Data)

1.	Radio Dijla
2.	Babylon FM
3.	Radio Sawa Iraq
4.	Sumer FM
5.	Vin Radio
6.	Radio Al Rasheed
7.	UR FM
8.	Radio Firat Fm
9.	Radio Ashur
10.	Iraq Hurr

3.3.7 Radar

French radar manufacturer Thales agreed for supply of four radars to Iraq to improve their air defence systems [38]. The GM403 radars supplied by the Thales will also help in the security communications. The agreement between the Iraq government and Thales included the intensive training of military officers.

3.3.8 Television

Iraq was the first country in the Middle East to have the television channel in 1950. Though during the US invasion of Iraq state media collapsed CMC intervention and communication industry growth witnessed in 47 TV channels. No other country in the Middle East has so many channels. In august 2014, LANA TV began offering regional content using Iraq dialect. Today, American content is offered in Iraq TVs. This technology is influencing American culture on Iraq youths.

4. Discussions

4.1. Regional Imbalances

Iraq's 18 cities are integrated in the national communication plan. However, the Kurdistan region enjoys the LTE services. In other regions of Iraq 3 G based GSM operations are functional. Contrary to this, the situation in rural Iraq is pathetic. Even today rural Iraq is using 2G spectrum with low internet speeds [18].

4.2. Regulatory hurdles

A telecom company wishes to operate in Iraq has to submit 25 % of their shares on Iraq stock exchange. France telecom and Agility have to clear these roadblocks before providing services. Another notable regulatory hurdle is Ministry of Communication control over the optical fibre network. This is not allowing free participation of private players in the optical network. The spectrum allocation is completely under the ministry. Unethical practices are adopted by a few internet service providers to gain the required spectrum. A few ISP providers sold the remaining bandwidth to other players in the competitive arena [18].

4.3. Last mile access.

Iraq is facing peculiar problem. The internet service providers in the country are depending on free licensed service providers. FastIraq, an optical communication provider in the Iraq since 2009 joined the hands with Epsilon. Both companies are connecting Iraq customers to neighbouring countries such as Jordan, Turkey and Kuwait. They also implemented sub marine cable system at Al faw cable landing station. These efforts helped both parties to offer seamless access to small businesses in Iraq with European countries. Epsilon offered local access of FastIraq to global hubs such as London and Frankfurt. This move negated the need of huge infrastructure and connectivity requirements of FastIraq. However, implementation of such huge infrastructure needed local talent which is scarce in the Iraq [23]. This has not augured well for quality control in communication engineering.

4.4. International collaborations.

Telecom major like Asia cell tied up with the Chinese company Huawei to provide telecom equipments at the affordable cost. This initiative provided telecom infrastructure equipment manufacturers and helping companies to penetrate into the market. The growing demand also bought Nokia and Asia cell together. Nokia agreed to develop wireless microwave pocket radio that can handle higher internet demand [17]. However, a few international suppliers adopted unethical ways to improve the business. The international consortium of investigative journalists revealed that Ericsson paid money to ISIS to smuggle their equipment into Iraq. Ericsson used the local middlemen and its strategic partner Korek telecom to send gifts to terrorist outputs.

4.5. Foreign Direct Investment

Terrorism and infighting in the country has negative influence of foreign direct investment [28]. Iraq reported negative FDI net inflow at -1.767% in 2020[33]. Added to the woes, Iraq government intervention in the telecom operator Korek and foreign partner not augur well [7]. This intervention has sent negative vibes to genuine investors' in the USA and European countries.

4.6. E-governance

Communication industry plays a vital role in communicating and offering government services to the public [9]. Countries providing a better e-governance are considered as most public friendly. The e-government index published by the United Nations placed Iraq in the 143 position. It shows the sorry state of e-governance [10]. Research also showed that e-governance on websites, social media and blogs by the Iraq government had serious limitations of connectivity. Another research on e-governance in Iraq pointed out that lack of proper legislations is the major bone of contention for the effectiveness of e-governance in Iraq [25]. Yet another study on e-governance failure in Iraq highlighted the lack of citizen participation [26]. Lack of security equipments and citizen's trust also cited as the limitations of e-governance in Iraq [27]

4.7. Telecom infrastructure.

Iraq's telecom infrastructure studied four areas namely Dense Wavelength Divisional Multiplexing (DWDM), Microwave Radio Network (MRN), Public switched telephone networks (PSTN) and Local Access Network (LAN). IQ networks, an ISP provider in Iraq tied up with Menera networks to build DMDM network [31].DIL technology laid a 300 km fibre network to provide 100 GBPS internet. Due to this infrastructure DIL has the capability to provide IP network deployment and IP security management [32]. Any telecom infrastructure imports requirement in Iraq should get the permission of the communication and media commission (CMC). Procurement organization should fill in the detailed application form to get cleared for imports.

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Asia centre, a leading telecom company in Iraq established 13 data centres crucial for the communication industry. These data centres increased the geo fencing of Asia cell to Iraq's 90% area and were able to provide better internet services [29]. IFC, a subsidiary of the World Bank, is helping Zain telecom by providing financial assistance. It provided $ 290 million support to build the 3G infrastructure. Similarly, DEG group offered similar assistance to Atheer telecom in Iraq to build 3G infrastructures [30].

5. Conclusions

Communication technologies spread their wings in all parts of Iraq. However, uprising of terror groups and their effort to dismantle telecommunication network is posing challenges to telecom operators. Another notable development is telecom companies in Iraq noticed the need of their own satellite to provide effective services. They are encouraging researchers to develop their own satellites. Further, Iraq is still the prepaid market for telecom operators. Apart from this, the revenue generated from the B2C segment is very low. Thus most of the telecom operators are glancing towards the enterprise market to provide business solutions.

Another interesting fact found that mobile internet user base and data usage by them has experienced robust growth. They are also experimenting with wearable devices and augmented realty.

Researchers observed that financial recovery is at the snail pace in the post pandemic era. Most Iraq based communication researches were customer centric. They concentrated on customer satisfaction towards service offered by various telecom players. The current research by investigators has a serious limitation of research of communication engineering by local companies. The growing demand for international connectivity and speeder network should be facilitated by academic research.

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