THE PAST, PRESENT AND FUTURE OF BROADCASTING ENGINEERING USING NIGERIA, CANADA, USA, GHANA AND UK AS A CASE STUDY

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Abstract- *Broadcasting engineering has become a major aspect of communication and this can either be via video and audio. In some countries, it is more active than others due to some challenges in the region or governmental policies. The purpose of this paper is to analysis the past, present and future of broadcasting engineering in some selected countries, the movement of broadcasting from analogue to digital and the future plan of using internet protocol (IP) as a means of video and audio broadcasting, several literatures were examined and conclusion was drawn. It was observed that there is a great future for this aspect of engineering based on its past and present state in each of the countries that was examined.*

Keywords: Broadcasting, internet protocol, systems, spectrum.

I. INTRODUCTION

Broadcasting Engineering involves the dissemination of information. In various places there are different methods of broadcasting with respect to the past, present and future. This paper describes the past, present, future of broadcasting engineering in Ghana, USA, UK, Nigeria and Canada

II. PAST, PRESENT AND FUTURE OF BROADCASTING ENGINEERING IN GHANA

A. PAST

Dissemination of information is a crucial part of the cultural and political landscape of any state, in Ghana, the British used radio during world war two to provide military intelligence to the African soldiers in the colonies fighting alongside the allies [1], after the war during the colonization era, they used it for the purpose of propaganda, this was very possible and efficient as there was a monopoly of radio stations, held by the Gold Coast Broadcasting System. The airwaves remain monopolized until 1933 when the privatization of radio stations was considered and finally implemented in the Ghanaian constitution of 1992, where it stated that "There shall be no impediments to the establishment of private press or media; and in particular, there shall be no law requiring any person to obtain a licence as a prerequisite to the establishment or operation of a newspaper, journal or other media for the mass communication or information." [2]

Opening up of the airways although late as the first official license for a private radio station was just given in 1995 to Joy FM and riotous due to the operation of a pirate radio station known as "Radio Eye" which enjoyed less than a day of airtime causing a forceful break of the monopoly of the government, eventually created more jobs, diversity of views and opinions and also served as a veritable tool towards the achievement of true democracy which many African states have suffered from [3]. The Television broadcast was inaugurated in 1965 by the then president Kwame Nkrumah in conjunction with the Sanyo Corporation from Japan. The president stressed during the inaugural speech of the Ghana Television that it's major purpose was to educate the people reflect the societal ideals which the country represents. The first private television stations, TV 3 and Metro TV, began operating in Ghana in 1997 [4].

B. PRESENT

The days of monopoly in broadcast in Ghana are long gone as the penetration of new technology such as Set-Top-Boxes, Digital Broadcasting Techniques and the internet which make it easy for private companies and individuals to venture into the broadcasting space.

Subscription based content and On-Demand services made available through the extensive digitization of broadcast increases the revenue of broadcasting corporations and allows them focus on content production. The advent of diverse revenue generation methods makes the broadcasting industry more lucrative [5].

The National Communications Authority is in charge of frequency assignment in Ghana.

Data from the NCA as at the fourth quarter of 2106 shows that 21 stations are Analogue Terrestrial Television (free on air), 39 Satellite Television Broadcasting (Free-To-Air Direct-Home Single Channel) , 7 Satellite Television Broadcasting (Pay TV Direct-To-Home Bouquet), 8 Satellite Television Broadcasting (Free-To-Air Direct-To-Home Bouquet), 5 Digital Terrestrial Pay Television (Service and Frequency), 11 Digital Terrestrial Free-To-Air Television Programme Channel, 1 Digital Terrestrial Pay Television(Service Only) and 1 Digital Cable Television making a total of 93 television which shows a colossal 4650% growth from the two channels in operating as at 1997.[6]

For radio stations the NCA give the following data on operational radio stations 31 Public radio stations, 5 public (Foreign) radio stations, 79 Community radio stations, 21 Campus radio stations and 345 Commercial radio stations giving a total of 354 radio stations [6].

The connectedness of the globe also makes It easy to relay information about happenings around the world in real time to the consumers. The advent of video streaming services such as YouTube also have a direct impact on broadcasting as many terrestrial television station now run live broadcasts on YouTube also, this moves television broadcast from the television screen to literally any device connected to the internet, this also plays out on radio services through the implementation of internet radio and audio streaming services such as iTunes.

C. FUTURE

The future of broadcasting in Ghana is rapidly moving away from the traditional radio and television and their respective studios to individual content generation, the penetration of smartphones and social media make everybody wielding one of those becomes miniature television or radio station as they are now enabled by the high speed internet services to upload video and audio content to social media.

Video-On-Demand services such as Netflix tailor the content specifically for each viewer such that no two viewers have the exact same content which was the case in traditional television broadcast. Traditional television and Radio stations in Ghana have to actively leverage the opportunities made available by the rapid penetration of high speed internet or enter oblivion.

III. PAST, PRESENT AND FUTURE OF BROADCASTING ENGINEERING IN USA

A. PAST

All around the world, radio spectrum is cautiously viewed as a public and treasured supply managed by means of authorities' gadgets to make certain it is used within the exceptional manner viable for the people. during the early times of the diverse kinds of communications, there was an argument among the U.S. governments and the broadcasters, which changed into that the authorities will offer loose spectrum and in return, the broadcasters must perform positive public carrier duties. within the middle of the usual regulations, which include demands together with censoring declaration and airing at least one application without cost to all viewers, broadcasters must persist with a single technical transmission popular; which is by means of making all to be had broadcast stations use the identical agreed-upon regulations of behavior for sending and receiving alerts, regulators can promise to that all and sundry who buys a TV that it'll work everywhere inside the usa get hold of all channels, and gained be no longer useful whenever soon. The negative component is that unanimity takes time. As an end result, when inventions of things consisting of color images, digital video, mobile and online services grab customers' interest, the broadcast industry is gradual to comply to standard and adopt them. for instance, it took 22 years within the U.S. for the changeover from an analog to virtual broadcasting standard. The trouble changed into now not simply choosing and perfecting a single standard from a few of the extra than 20 feasible systems proposed in the past due Nineteen Eighties. earlier than the year 2009, there was longer put off which occurred because of the reality that the vintage analog receivers have been not like minded with the brand new digital transmissions. until the year afterwards, while had been broadcasters capable of transmit both analog and virtual alerts on separate radio-frequency (RF) channels, until the remaining person modified his or her tv or with any luck bought a digital-to-analog-converter [7].

B. PRESENT

As of the years 2009-2015, time spent watching TV was at a very high rate. But in the late 21st century; there has been dramatic and permanent changes to the view of point on television. As a result, there has been no other industry been affected compared to broadcasting.

If not for the fact of every American home being tuned up to the broadcasting signal because of the entertainment that is shown; from general statistics, more than 80 percent will have nothing to do with broadcasting. As a result, more families now have Internet connections and mobile phones than their own TV sets. And most of us who do watch television aren't made happy with only the scheduled programs we get over the air. So we buy subscriptions to cable or satellite services, stream movies online and on the YouTube, download games on tablets and smartphones, share them and talk about them on the social media.

The biggest such reallocation happened in the United States in 2009, when the switch to all-digital broadcasting freed up 18 television channels; which is about quarter of the frequencies previously occupied by broadcasters. But mobile operators are still hungry for spectrum, and the broadcast industry is again capable of being hurt. The United States' spectrum law-based agency, the Federal Communications Commission, is now making plans for a new way of trying things to seize more spectrum from broadcasters' hands. But at the same time the Advanced Television Systems Committee (ATSC) in the United States is heading one of the most challenging initiatives. It released in 2009 an improved version that allowed the broadcast for TV signals called the Digital Television (DTV)._As of the moment, the Mobile DTV (MDTV), is the technology starting to take hold in the US, which enables broadcast stations to make available the programming to some cellphones, laptops, and tablets, as well as to television screens in vehicles and trains. All these is just the beginning of the next tech-driven shake-up of broadcast TV.

C. FUTURE

Very soon, the ATSC is growing in addition enhancements to DTV, collectively referred to as ATSC 2.0. and in addition to of the ATSC 3.0. those new standards will deliver to broadcasting all the features the newspapers, websites and other customers have come to count on from their TVs, mobile devices, and so on.

From the ATSC 2.0, more recent purchasers will want to stack away announces domestically for playback while known as for. it will additionally permit visitors enroll in more unfastened or paid broadcast channels and individualize the look of their shows in addition to the programs and commercial they receive. ATSC 2.0 will take advantage of net-linked TVs through allowing broadcasters to are available in together as a way to combine different things to supply online content, together with vote casting systems or social networking services, into the suggests introduced over the air.

Industry knowledge or the availability of ATSC 3.0 is not yet widespread. More than three-quarter of respondents have not heard of ATSC 3.0 or only know about its basic things. According to the ATSC 3.0, enhancing broadcast quality is the least important benefit, which is very surprising, mind blowing and significant. As a result, other benefits are offering ad campaigns that reach viewers on mobile and digital campaigns, serving of ads continuously to selected IP addresses or households and separate areas in a broadcast market, directly connecting consumer activity to viewing an advertisement and finally offering a reliable broadcast signal that reaches viewers on the mobile devices [8].

IV. PAST, PRESENT AND FUTURE OF BROADCASTING ENGINEERING IN UK

A. PAST

in the early years, broadcasting stations started on lengthy wave, medium wave and brief wave bands. later on it used very high frequencies and extremely-excessive frequencies (VHF and UHF). In uk, from as early as 1890 there was a machine in which broadcasting applications (i.e. information, tune, live theatre, tune hall, fiction readings, non-secular announces, and so on.) were available for private viewings in homes and different places via conventional smartphone strains. As early as 1895 up until stop of 1926, the system used for broadcast viewing was called Electrophone. the primary organization broadcasting become the Marconi's manufacturing facility (owned by using the Italian, Guglielmo Marconi) In Chemlsford, Britain in 1920. in a while a consortium of broadcasting manufacturers shaped the British Broadcasting corporation (BBC) although they had been now not taken into consideration a completely commercial station [9]. by means of late 1923, six broadcasting stations were broadcasting inside the UK: London's 2LO, Manchester's 2ZY, and stations in Birmingham, Cardiff, Newcastle, and Glasgow. In 1926, the consortium of broadcasting manufacturers dissolved and have become British Broadcasting enterprise, a non-commercial company. The British government appointed the first governors and Lord Reith took the role as the First supervisor and Director trendy of the British Broadcasting corporation. as the first manager, Lord Reith promoted the philosophy of public provider broadcasting, the moral benefits of education and of uplifting leisure, eschewing

commercial have an impact on and maintaining a maximum of independence from political control [10]

B. PRESENT

In the United Kingdom, usage of Very High Frequency (VHF) band for television broadcast has been shut down entirely. The British 405-line system A, suppressed the upper sideband instead of suppressing the lower sideband as other line systems do. The system A was tested across three colour systems and the equipment for production was ready to be built, but then the British government decided to harmonize it with the rest of Europe on a 625-line video standard which was implemented in Britain as PAL-I on Ultra High Frequency (UHF) band only which caused the system to fail.

The usage of the first Digital Audio Broadcasting (DAB) network in the United Kingdom hailed a new dawn for broadcasting. It presented as a replacement technology for Amplitude and Frequency Modulation (AM and FM). More recently, variation on the system includes development of digital multimedia broadcasting system (DMB), and a revised and upgraded DAB+ specification using the AAC+ audio codec rather than the original MPEG Layer II, which now provides broadcasting with more capacity and better reliability. From the United Kingdom media policy perspective, the focus of attention has more often been on the cinema and television sector rather than radio. According to Liz Forgan, managing director BBC, described the DAB network as a 'historic moment' marking the 'dawn of a third age of radio' – from the original AM mode of broadcasting, which was 100 years old, to FM, over 50 years old, and now into the digital multimedia world of the twenty-first century [11].

C. FUTURE

Reports endorse that the life expectancy of free-to-air tv broadcasting can be no extra than a decade. the public carrier broadcasters (BBC and Ofcom) in United Kingdom have attain this conclusion. those broadcasters propose that despite the fact that broadcasting can be necessary some years but, but after 2030 virtual Terrestrial television (DTT) will be switched off and changed with net Protocol (IP) based answers for media transport. IP is suggested to in all likelihood supply more than 20% of all media within the coming years. the United Kingdom government by myself has given the major telecommunications groups more than £37 million for records on clients and their sports in the beyond 5 years. (Thomas, 2016) the usage of IP in all verbal exchange therefore broadens the scope for complete and continuous surveillance. The questions that arises approximately this alternative is if broadcasting is to be replaced with IP delivery, then a huge numbers of homes which presently rely upon the terrestrial tv platform, the mobile community, alongside wired broadband networks, can be anticipated to supply loose to air tv via multicast technologies along with more desirable Multimedia Broadcast Multicast carrier (eMBMS), permitting reception on cellular as well as constant gadgets [12].

V. PAST, PRESENT AND FUTURE OF BROADCASTING ENGINEERING IN NIGERIA

A. PAST

According to [13] Radio Broadcasting began in Nigeria in 1932, when the British colonial government established a Re-diffusion Centre in Lagos, for the reception and rebroadcast of the British Broadcasting Corporation's programs. BBC's programs were sent to the Re-diffusion Centre through the Post and Telegraph (P & T) department of the colonial administration. Such programs were meant to cement the political and economic ties that existed between Britain and her Nigerian colony. Based on the report submitted by Turner and Byron in August 1949, the colonial government established the Nigerian Broadcasting Service (NBS) in April, 1951. The NBS functioned as an arm of the colonial government until 1956 when it became a corporation. the Western Region established the Western Nigeria Radio-vision service and commissioned the Western Nigeria Television (WNTV). Thus, the first television station was established in 1959 in Ibadan, capital of the then Western Region. Thereafter, the other two regions in Nigeria took steps to equally establish their own stations. The Eastern Nigeria Broadcasting Service (ENBS) emerged in 1960 while the Northern Region established the broadcasting company of Northern Nigeria in 1962. This company gave birth to the Radio Kaduna Television (RKTV) in 1962. the Federal Government in Nigeria to set up the Nigerian Television Service (NTS). in 1962, to complement its radio station which had been renamed Nigerian Broadcasting Corporation on October 6, 1956. Having realized the power of the broadcast media, the Federal Government of Nigeria directed the NBC to establish an external broadcasting institution. This directive gave birth to the voice of Nigeria in January 1962. Consequently, Nigeria's voice was heard for the first time beyond Nigeria's borders. The voice of Nigeria which was set up in Ikorodu Lagos was meant to project Nigerian news, activities and culture abroad. Equally, the station was established to

ensure that Nigeria policies were better understood by her neighbours. The creation of 19 states in 1976 led to an increase in the number of stations as the federal government Ministry sought to make its impact felt in the new states.

Despite the increased number of stations, people still complained about the technological efficiency of existing stations and the professional integrity of workers in the broadcast media. People argued that the broadcast media should be deregulated and democratized. It was argued that since private individuals were free to own print media establishments, capable private individuals should also be allowed to own radio or television stations

B. PRESENT

- The country has 82 AM radio stations and 35 FM stations. There are 11 brief-wave stations in Nigeria.
- there are 23.5 million radios and 69 million tv units [14]. training is a completely important factor of the corporation's work. The NBC's objective is to make sure the development of skilled workers thru accredited packages that provide publications in Mass communique and Broadcasting. And the final mandate is to assure the liberty and safety of the broadcasting enterprise below the charter.
- The president appoints the Board of director for the NBC based on the recommendation of the Minister of statistics. The fee consists of a md, the Director-preferred. Ten different participants are also on the board representing regulation, enterprise, tradition, training, social technological know-how, broadcasting, public affairs, engineering, and country safety service. contributors serve on the board on a component-time basis. The Director-general, who occupies the position of leader, conducts daily oversight.

C. FUTURE

Digital broadcasting is the transmission of audio (Radio) and audio and video (Television) by digitally processed and multiplexed signal, in contrast to analogue and channel separated signals used in analogue broadcasting [14]. It is said to be the first significant innovative service in the evolution of broadcast technology, especially television broadcasting since the evolution of color television in the 1950s. The need to improve the transmission of broadcast signals has been on the front-burner of many discussions in the international broadcast industry and with the advancement in technology driven by the computer age it is necessary for major milestones in digital broadcasting to be met. The improvement of broadcast signals as a catalyst for national development can only be made possible by the migration from analogue to digital broadcasting. The need and advocacy for the world of broadcasting to migrate from analogue to digital has some years been championed by the International Telecommunication Union (ITU). It is now obvious that the world of broadcasting is going through a gradual change, due to the development of digital technology [15]. explained that the significance of digital broadcasting is that many more radio and TV channels can be squeezed into the exact same frequency space than is impossible under analogue transmission. According to him, the space freed-up by switching to Digital Terrestrial Television (DTT) is known as the "digital dividend" and it means that some of the vacated band can be used for other purposes. He also noted that with a digital radio, a multiplex can facilitate an ensemble of up to 50 channels on a single signal, and the same TV broadcaster could also run radio services at certain times of the day on the Multiplex, and switch to TV or data streams at others. The transition from analogue to digital is a welcome revolutionary change in the broadcasting industry especially in this century and it is an initiative that will benefit many sectors of the society. The benefits could be in terms of programme content, media convergence, quality signals and multiple channels in Nigeria [16].

VI. PAST, PRESENT AND FUTURE OF BROADCASTING ENGINEERING IN CANADA

A. PAST

During the early days, at 1921 to be precise, Canadians built radio sets to listen to American radio stations transmitting near the border. The major reason for the establishment of a Canadian broadcasting station was to provide a counter balance to the American broadcasting system which led to the Canadian radio broadcasting commission establishment in 1932. [17]. The Americans were gradually going to invade the Canadian airspace since they had no broadcasting station, with most Canadians tuning to American channels for information. This was not the only reason for the establishment of the Canadian broadcasting station, there were vigorous debates over the air waves being reserved for profit making though advertisements or channelled to public service. Most influential Canadian spokes men like Graham Spy instigated the motion of the airwaves being used for profit making, further stating that *'the primary consideration of*

the broadcaster is not the listener who listens, but the advertiser who pays'. Commercial broadcasters were interested in radio because of the profit it brings but the public/citizens had to be prioritized.

The first national radio station in north America was the CNR (Canadian National Railway) radio which was recognized in 1923 with maximum aid from the president in power, SIR HENRY THORNTON, who ensured trains were well equipped with radio receivers to enable passengers listen to broadcasts. By 1924, CNR began building stations and by 1928 it was able to create a network [17]. The CNR radio served the purpose of providing sports, entertainment, and political information to passengers on board for about nine years and also to citizens living within the coverage area of the station transmitter until political issues forced its closure and a conversion of most of its assets to the Canadian radio broadcasting commission. The CNR network as at 1930 had 87 amplifiers, eight studios, 27 radio engineers and 27 stations with transmission strength of 500w the CNR network was saturated with private stations which never operated their own radio transmitter, but loaned or leased airtime from a station which owned the equipment, these stations were generally referred to as phantom stations. The spread of digitalization and home satellite television systems began in 1990, where there was a gradual migration from analogue to digital broadcast transmissions. this was particularly because majority of the population had access to cable TV creating issues of cable capacity. [18]

B. PRESENT

In present times, the rapid growth in technology has transformed content production, transmission, reception and programming. In recent years, new digital broadcasting technologies offer improved audio/video quality and reception, with integrated multimedia content intertwined. The digital audio broadcasting (DAB) which is a standard for audio broadcasting, enhanced as a European research and launched in the world war 1 has been of great aid to the Canadian broadcasting cooperation over the years. In recent times innovation led to the commencement of the DAB+ [19]. Some new features the DAB+ has over the conventional DAB are; stronger error correction coding, better modulation techniques to reduce as much as possible attenuation, etc. the DAB as compared to formally used analogue FM radio stood out in noise, multipath and interference reduction, despite the fact that it accommodates more channels and efficient utilization of the spectrum [19]. Also, recently there's been greater population of people listening or tuning to radio on their mobile devices or smart phones by simply downloading the application compatible with the OS of the mobile device. This is solely because Canadian radio stations have adapted to the advancement in technology, thereby developing their own applications

C. FUTURE

The Canadian broadcasting cooperation, while making plans for the future established Google, amazon, Netflix, YouTube etc. as their competition, knowing fully well how unlimited the ability to create content of these enterprises are. This has already added more arms to their muscle in efforts being made to improve broadcasting in the future.

With the arrival of wireless communication, the future of broadcasting in Canada can be easily predicted, applications will only be constantly innovated as the years go by, also glitches in the DAB+ will be adequately corrected and implemented to enable better transmissions.

For TV transmissions, subscriptions would be made directly to vendors of the program instead of cable TV subscription which encompass channels of little or no interest being paid for. This enables citizens channel cost adequately and simultaneously receives almost maximum satisfaction from services being provided. Services like HDTV and 3DTV would be offered to customers while attaining greater spectral efficiency [20]

A few broadcast television standards would be initiated in operation. Example of such are the MPEG-4 AVC and the DVB-T2. These standards allow more services or channels to be transmitted in each TV channel [20].

VII. CONCLUSIONS

It can be concluded that broadcast engineering has moved or has progressed from analogue to digital. And in the United Kingdom, broadcasting stations started on long wave, medium wave and short wave bands. Later on it used very high frequencies and ultra-high frequencies (VHF and UHF), they then moved to using DAP and for the future they plan on using Internet Protocol (IP) based solutions for media delivery.

With the arrival of wireless communication, the future of broadcast engineering can be easily predicted, applications will only be constantly transformed as the years go by, also malfunctions in the DAB+ will be adequately corrected and implemented to enable better transmissions.

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