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Digitization As A Tool For Radio Frequency Utilization: What Benefits For The Nigerian Broadcast Industry?

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Absract
Radio frequency is a scarce resource and public property which must be managed and utilized for public good. Its scarcity throws up serious challenges for managers of the radio frequency spectrum, and even users across the world. There is obvious high demand for radio frequency for different purposes ranging from broadcasting to telecommunications and marine navigation. This global scramble for available spectrum requires a lot of intellectual ingenuity to manage in the interest of the public. Most developed nations of the world, e.g. the US, have literally exhausted their share of the radio frequency spectrum and are continually devising means of conserving what is available and also exploring the lower and higher frequencies for alternative purposes.

This paper examines the situation in Nigeria and the role which digitization plays in frequency utilization as Nigeria journeys towards broadcast digitization in 2015 not without considering particularly, the seemingly rapid growth in the Nigerian telecommunications industry, which is a great user of the radio frequency. It will consider the need for, and ways of sharing frequencies among users for different purposes, and frequency conservation or dual utilization of frequency among others, as ways of utilizing the limited radio spectrum.

Introduction

Since the young Italian Physicist, Gulgliemo Marconi, experimentally confirmed Heinrich Hertz's testing of the possibility of transmitting information from one point to another using electromagnetic elements discovered by Michael Faraday, there has been an inexorable global drive at discovering, inventing and developing better ways of exploring and exploiting physical space to convey information in the form of text, sound or picture from one source to another spanning several thousands of kilometers.

Sound or pictures are not transmitted in their original forms but as radio waves by electromagnetic radiation until they are converted by receiving sets into either sound or light waves traveling through the air to us. That section of the atmosphere in which electrical radiation takes place, with the accompanying and inevitable magnetic

Radio frequency is a scarce resource and public property which must be utilized and managed for public good. Its scarcity throws up serious challenge for managers of the frequency spectrum, such as the International Telecommunications Union (ITU) at the international level, and other national agencies at domestic levels – (the National Broadcasting Commission (NBC) in Nigeria.

The introduction of digital technology seems to provide new and better ways of producing and sending sound, picture and textual information. It provides room for enhanced information services, wider use of sophisticated multimedia applications, improved picture and sound quality, and indeed better mobile reception, and more important, allows for more television and radio channels.

Digital Broadcasting Defined

Digital broadcasting involves the use of digital data to

convey broadcast signals over TV channels or assigned frequency bands instead of the usual analogue wave forms. This practice is becoming increasingly popular for TV broadcasting, including satellite TV, but receiving slower acceptance rate for radio broadcasting.

Digitization And Radio Spectrum Utilization

Traditionally, radio programmes are broadcast on frequencies via Amplitude Modulation (AM) and Frequency Modulation (FM), and the radio is tuned into each frequency. AM and FM broadcasts in countries across the world are still largely on analog signals. The information they transmit causes a range of variations in their carrier waves which is detected by appropriate receiving sets and transformed into sound or picture. This consumes a comparatively large amount of spectrum for a relatively small number of stations, leading to limited listening choice.

But with the introduction of Digital Audio Broadcast (DAB) System (a process of transmitting sound by first encoding it into digital form – a series of 0s and 1s – with every possible sound corresponding to a long chain of binary numbers, and with an appropriate receiving set to decode these numbers and turn them back into any of the information components), the combination of multiple audio streams into a single broadcast frequency, called a DAB ensemble, is made possible. This is achieved through the application of MULTIPLEXING or MUXING and compression. Multiplexing is a process which permits the combination of multiple analog message signals or digital data streams into one signal over a shared medium, leading to less amount of the spectrum been utilized as the expensive resource is shared.

The muxed or multiplexed signal is demuxed or demultiplexed as the original channels are extracted on the receiver side through a reverse process known as DEMULTIPLEXING using a device called a DEMULTIPLEXER (DEMUX).

In addition to accommodating more stations for a particular area, digital technology also promote local stations competition with international stations broadcasting via the satellite straight to digital receiving sets, permits point-to-point delivery of programmes (on-demand services), and interactivity, whether by wire (such as broadband) or wireless (mobile telephony).

Benefits For Nigerian Broadcast Industry

2015 date has been set by the International Telecommunications Union (ITU), the body responsible for global spectrum management, as deadline for full switch over from analog to digital broadcasting in the Ultra High Frequency (UHF) band and 2020 for Very High Frequency (VHF) band all over the world. Nigeria has reacted by setting June 17, 2012 as deadline for its own transition from analog to Digital terrestrial broadcast system.

Considering Article 1(2) of the World Administrative Radio Conference (WARC) Outer Space Treaty of 1979 which states that: "Outer space shall be free for exploration and use by all states", which is akin to the kind of regulation that guides the ITU in its management of the radio frequency spectrum, and also the global Agreement on wavelength allocation based on: area of the world involved; land area involved; size and density of population; and extent of telephone and telegraph traffic in the area, Nigeria and indeed most developing African countries may not as favoured as Western countries in global frequency spectrum allocation and exploration.

Nigeria is currently witnessing a phenomenal increase in the demand for frequencies on the Ultra High Frequency (UHF) and Very High Frequency (VHF) bands either for FM and TV broadcasting or for telecommunications purposes; not forgetting the strong agitation for the expansion of the broadcast terrain to accommodate community radio broadcasting in Nigeria, which would also be on the FM band. These put so much strain on the available spectrum. And the challenge is further compounded by Nigeria's level of technological advancement which makes taping into and expanding the use of higher frequencies for TV broadcasting somewhat difficult.

With the huge rise in the demand for certain spectrum, without a commensurate increase in available frequency and even the technology (Satellite, for

example.) for the utilization of higher spectrum for broadcasting, digitization appears to be a solution. Digital signals allow for more stations in a single broadcast spectrum, thereby permitting the sharing and conserv g of the expensive resource. Communication dense areas like Lagos where many broadcast stations are on air, and many more having been licensed to operate on different frequencies, is liable to consume a large portion of spectrum. In such an area, careful allocation of frequency is required to avoid signal interferences like spillover effects at frequency boundaries and intermodulation interference resulting from a sum of or difference between two given contiguous or near contiguous channels. Digitization, therefore, will not only reduce the stress of frequency allocation based on calculations by engineers and careful construction of transmitters, but also eliminate co-channel interference and boost resistance to noise.

Challenges

Although this sounds pretty interesting and potentially beneficial to the Nigerian broadcast industry, the challenges of adopting and utilizing digital technology for the 21st century broadcasting are enormous:

The financial implication of importing and maintaining high-tech digital broadcast transmission and receiving equipment is prohibitive.

Lack of clear and effective national communication policy necessary to catalyze and propel the process of digitization.

The politics of frequency allocation and the possible social constraint emanating from the unwillingness to share frequency with other users, especially in the short run.

Conclusions

Although digitization of broadcasting will no doubt help Nigeria in managing its share of the frequency spectrum considering the seemingly fast growth in the industry and other competing users of the spectrum, its success is not only dependent on government's willingness to ensure adequate financial commitment to the project in broadcasting and the audience regarding cost of digital receiving sets, but also its ability to engender the right attitude in the managers of the spectrum and all stakeholders in the digitization project.

References

Dominick, J. (1993) The Dynamics of Mass Communication, (4th ed). New York: McGRAW-HILL, INC.

Folarin, B. (2000) Foundation of Broadcasting. Ibadan: Atlantis Books

Http://en.www.wikipedia.org/wiki/Digital_ audio_ broadcasting, Digital Audio Broadcasting Retrieved Tuesday, November 10, 2009

Peterson, T. (1971) The Mass Media and Modern Society, (2nd ed). New York: Holt, Rinehart and Winston, INC.

Rumphorst, W. (2006) Broadcasting Goes Digital: Regulatory Requirements www.ebu.ch. Retrieved Tuesday, November 10, 2009

White, C. (2007) Data Communications and Computer Networks, Boston: Thomson Kurse Tech.