INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN BUSINESS & SOCIAL SCIENCES

Vol 16, Issue 3, (2026) E-ISSN: 2222-6990

Radio Literacy in Transitional Broadcast Ecosystems: Infrastructural Differentiation among Listeners in Sabah, Malaysia

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DOI Link: http://dx.doi.org/10.6007/IJARBSS/v16-i3/27735

Published Date: 08 March 2026

Abstract

This study reconceptualises radio literacy as infrastructural differentiation competence within hybrid broadcast ecosystems. While media literacy has been widely theorised, radio literacy remains conceptually underdeveloped, particularly in contexts where analogue and digital systems coexist. Drawing on qualitative focus group discussions (n = 279 participants across 20 groups) conducted in Sabah, Malaysia, this study examines how listeners define and differentiate analogue FM, digital terrestrial broadcasting, and online radio streaming. Thematic analysis reveals three dominant interpretive patterns: platform equivalence assumptions, device-based categorisation, and infrastructural ambiguity. Participants largely conceptualised radio through experiential use rather than transmission architecture, frequently equating smartphone access with digital broadcasting. Grounded in Disruptive Innovation Theory, Technological Determinism, and Media Convergence Theory, the findings suggest that perceptual digitalisation may precede infrastructural digital transformation. The study argues that infrastructural awareness constitutes a neglected dimension of media

literacy and has significant implications for digital migration policy in emerging broadcast economies.

Keywords: Radio Literacy, Digital Migration, Convergence, Malaysia

Introduction

Over the past two decades, digital transformation has reshaped global media industries. Television, print, and online platforms. These platforms have undergone substantial theoretical interrogation regarding convergence, disruption, and audience transformation. In contrast, radio, particularly in transitional broadcast contexts, remains comparatively under-theorised (Tacchi, 2000; Hendy, 2009).This absence is notable given that radio continues to function as a key public communication infrastructure in many parts of countries (Berger, 2010; Martin, 2021).

A central concern in contemporary social science debates is the relationship between technological change and public understanding. Discussion of digital transformation often assumes that societies seamlessly adapt to new infrastructures. However, research on digital inequality and media literacy suggests that access to technology does not automatically translate into comprehension of how systems operate (Livingstone, 2004; Hobbs, 2010). Digital adoption and digital understanding are therefore not equivalent. This distinction becomes particularly salient in hybrid media systems where analogue and digital infrastructure coexist.

Radio provides a compelling case for examining this tension. For more than a century, radio broadcasting has relied primarily on analogue transmission through Amplitude Modulation (AM) and Frequency Modulation (FM) (Ibrahim, 2020; Ibrahim & Abdul Wahab, 2021). Yet the rise of digital terrestrial systems such as Digital Audio Broadcasting (DAB) and Digital Radio Mondiale (DRM), along with satellite broadcasting and internet-based streaming, has introduced new technological layers into the radio ecosystem (Ala-Fossi, 2013; Anderson, 2012; Berger, 2010; Berry, 2014; Cordeiro, 2012; Halbert, 2015; Ibrahim, 2020; Srivastava & Srivastava, 2021; and Ibrahim & Wahab, 2021). In many countries, this shift has been framed as inevitable digital migration. However, the digital transition is not merely a technical upgrade. It is a socio-technical transformation involving policy, industry restructuring, and public comprehension.

Malaysia exemplifies a hybrid broadcast environment (Ibrahim et al., 2025). Analogue radio remains the dominant terrestrial transmission system, and nationwide digital terrestrial radio has not yet been implemented (Ibrahim, 2020). At the same time, listeners increasingly access radio content via smartphones, satellite services, and social media platforms. This coexistence produces a conceptual paradox, whereas audiences inhabit digitally mediated listening environments while structurally relying on analogue transmission infrastructures.

The research problem addressed in this study emerges from this paradox. While policymakers and industry actors discuss digital migration and technological disruption, little empirical attention has been paid to how listeners themselves conceptualise and differentiate among analogue radio, digital terrestrial radio, satellite radio, and online streaming. Existing scholarship on radio literacy has largely focused on radio as a pedagogical tool for promoting literacy and social development (Brophy & Page, 2007; Sanusi et al., 2021). Very few studies

interrogate whether audiences understand radio as a technological system embedded within broader infrastructural transformations.

The concept of analogue, digital and online radio is often framed as a type of technological turbulence induced by different types of transmission standards that lead to the erosion of boundaries and approaches that previously served as foundations for the radio production. Due to the change in listenership, Picard (2004) and Martin (2021) note that the broadcaster's real challenge is to reconfigure value in the digital domain since listeners nowadays are more zealous to explore the digital platforms.

However, the invention of digital technology has led to misconceptions in society, and the terminologies of digital radio need to be revised (Berry, 2006; Rudin, 2006; Spinelli, 2006; Kuyucu, 2019; Department for Digital, Culture, Media & Sport, 2020; Krause, 2020). It is evident that most listeners do not understand digital broadcasting and mistakenly assume that all technologies are the same. In response, we argue that assessing the enduring significance of terminology like “radio” in an era of digital disruption upheaval necessitates neither a hasty dismissal of these terms’ legacy nor an overly steadfast adherence to them. The changes in listenership do not necessarily mean that listeners are aware of the technology they use.

By situating radio literacy within broader debates on digital transformation, convergence, and socio-technical change, this study contributes to contemporary social science discussions in three ways. First, it expands media literacy theory beyond content evaluation toward infrastructural awareness (Livingstone, 2004; Hobbs, 2010). Second, it empirically examines perceptual digitalisation in a hybrid broadcast context. Third, it offers policy-relevant insights into how public understanding may shape or constrain digital migration efforts in emerging economies.

In doing so, the article argues that perceptual digitalisation, where audiences believe media systems have become digital, may precede infrastructural digital transformation. This misalignment has significant implications for media governance, industry strategy, and public communication policy in transitional broadcast ecosystems.

Theoretical Framework

Media literacy scholarship (Livingstone, 2004; Hobbs, 2010; Potter, 2013) has traditionally emphasized critical interpretation, content evaluation, and the detection of misinformation. However, awareness of infrastructure, such as understanding how media systems function technologically, has received less attention. The term “radio literacy” has historically referred to the use of radio as a pedagogical tool (e.g., adult education via broadcasting). Few studies examine whether audiences understand radio as a technological system. This study proposes that radio literacy should include infrastructural differentiation competence**,** which refers to the ability to distinguish between the transmission systems underlying audio consumption.

Utilizing the tools and methods of sociology, psychology, political theory, gender, and race studies, the study of media literacy is highly interdisciplinary. The term "media literacy" can mean many different things to different people, including academics, scholars, and citizens. Koltay (2011) contends that the quantity of media exposure does not support the necessity of media literacy. It is also justified by the crucial role that information plays in the

evolution of society, the economy, and politics in the modern world. Thus, this article will focus on radio literacy.

Media literacy scholars such as Livingstone (2004), Hobbs (2010) and Potter (2013), emphasize the importance of critical understanding in media consumption. Drawing on this, we define radio literacy not merely as the ability to access or listen, but as the critical differentiation of radio technologies and their implications.

The term radio literacy has several connotations, which have clouded understanding and development of theory about radio for more than 30 years. (Ibrahim, 2020). Until today, there is no specific theory on radio from the social science perspectives. However, we can discuss this issue from the perspective of disruptive innovation theory.

According to disruptive innovation theory, the term "disruptive" describes a particularly particular procedure that explains how newcomers might effectively compete with established firms. (Christensen et al. 2015). In this research context, we contextualize newcomers as the latest technology in radio broadcasting such as digital and online. While established firms can be refer as conventional technology such as analogue radio. It is concerned with no radio business-model innovation that enable new technology to enter radio markets with easy to use, able to cater many radio stations in one transmitter – while analogue radio is limited to the availability of the frequency range from 80-108 MHz For example in Malaysia, the frequency managed to fit 72 terrestrial analogue radio stations and not allowed any new radio stations to broadcast due to the frequency saturation (Ibrahim, 2020). The disruptive innovation theory is primarily concerned with competing dyads rather than systemic effects on industries and it gives little consideration to the competitive interaction between analogue, digital, and online radio.

In this research context, digital disruption is generally perceived from the perspective of radio standards that are heavily change the way society use and consume radio. As for the proliferation of certain digital adex (advertising execution) leads to change in established radio industry structures, established analogue radio face severe pressure to respond. Such responses can prompt fundamental change to radio operations, the technologies that support radio and even the identities of the organisations and professionals within them. When analogue radio face the threat of digital disruption, there is often an acute need to react due to the rapidity and systemic nature of environmental change along with radio business results. However, it is generally difficult to change historically successful radio structures that have emerged from analogue to digital transition (Ibrahim, 2020).

Less attention has been paid to the opportunities that digital disruption may bring to the radio industry due to the industrial reluctance towards digital terrestrial radio (Ibrahim, 2020). Consideration of contemporary empirical process, the general notion of disruption and extent research leads us to examine how do societies define and differentiate between analogue radio, digital radio, and online radio? Are there particular patterns that can shape the transformation of Malaysia's radio industry? Our analysis later is based on a particular perspective on analogue radio, digital radio, and online radio.

The topic of literacy, conventional (old) radio, and new (digital) radio are interrelated (Ibrahim & Wahab, 2021; EdTech, 2020; Brophy & Page, 2007). Above all, not only do these topics introduce the basic conceptualization of radio and its processes, but they also provide relating and integrating approaches on technology perspectives.

More than a decade has passed since globalisation and digitalisation entered the international lexicon. In the fields of media, communication, and telecommunications, globalization and digitalization have impacted the exponential growth in media and the way society uses and consumes media. Despite the emergence of new media and its global digitization, media literacy is still the topic that is discussed broadly.

Not only media academics interested in media literacy, but also scholars, consumers, activists, and parents who are worried about their children's exposure to media. A Google search for "media literacy" returns 430,000,000 results, yet a more focused Google Scholar search still turns up a sizable body of literature with 2,950,000 articles. However, when using "radio literacy" to search in Google Scholar (220 hits) and Google (6020 hits), there is not much research on radio literacy. Most research is on the radio in literacy, reading radio, or literacy by radio. It shows that many media scholars, academics, and researchers are not interested in exploring radio literacy in terms of radio standard.

From that search, we conclude that not many researchers have studied this matter. From the reading, we found out that most researchers used the term radio literacy as a tool to disseminate information in the name of education. McCullough (2013) wrote about the radio literacy program in Afghanistan. However, the context of radio literacy to him is how radio is used to disseminate education but not to replace the school. In Malaysia, a study about radio literacy is crucial because it can be a baseline for policy and digital radio implementation, whether to adopt Digital Audio Broadcasting (DAB+) or 5G or OTT (Over-the-top).

Brophy and Page (2007) used radio literacy as an approach to deliver knowledge and life skills through a radio program. EdTech (2020) started a project, namely Radio Literacy Models in Uganda, supported by UNICEF, The World Bank and Bill & Melinda Gates Foundation – using radio shows to transfer literacy competencies. Project Alianza (2020) also used radio to enhance children's knowledge about new hygiene practices during the COVID-19 pandemic. We can conclude that radio is an excellent tool for education in promoting social change, while radio literacy refers to the use of radio to teach and disseminate information.

Sanusi, Talabi, Adelabu, and Alade (2021) evaluated the success of adult literacy education radio programming in Lagos State, Nigeria. Their research findings revealed that the majority of study participants (62.4%) utilized the educational radio program Mooko Mooka to be ready for in-class instruction, while 53.5% used it for revision. Additionally, results showed that 40.6% of them listened to the program three times per week, which suggested that exposure frequency might affect literacy ability. Sanusi et al., (2021) claimed that radio teaching methods promoted adult literacy well and advised that radio listening sessions be enhanced as part of initiatives to lower adult illiteracy in the nation. They suggested community media centers should be established in various localities to promote group listening where students may be supervised.

As aforementioned, we can conclude that the term literacy in the broadcasting context refers to the dissemination of knowledge and skills through a radio program. None of the past research focuses on the understanding of digital, analogue and online radio.

Apart from that, the discussion about media literacy has highlighted the importance of identifying fake news and misinformation. Jones-Jang, Mortensen, and Liu (2019) indicated that information literacy significantly boosts the likelihood of detecting false news, but not other forms of literacy. On the other hand, Guess, Lerner, Lyons, Montgomery, Nyhan, Reifler, and Sircar (2020) provide substantial evidence that a lack of digital media literacy is a major contributing factor to why people believe false information they come across online. They proposed that a scalable media literacy intervention can reduce people's perception of the accuracy of bogus news content and enable them to easily distinguish it from real mainstream news in both India and the United States. Therefore, it is crucial for us to examine society's understanding.

Conceptual Clarification: Analogue, Digital and Online Radio

To avoid conceptual ambiguity, this study differentiates radio forms across three dimensions:

Table 1

Dimension of Analogue, Digital and Online

Dimension	***Analogue Radio***	***Digital Terrestrial Radio***	***Online Radio***
Transmission	Electromagnetic spectrum (FM/AM)	Digitally encoded spectrum (DAB/DRM/HD)	Internet Protocol (IP)
Scalability	Unlimited simultaneous reception	Unlimited simultaneous reception	Server-dependent
Infrastructure	Broadcast transmitters	Multiplex digital transmitters	Data servers
Device	Radio receiver	Digital receiver	Smartphone/computer
Dependency	Spectrum	Spectrum	Internet bandwidth

This distinction forms the analytical baseline for evaluating listener responses. According to Amal (in Ibrahim, 2020) among radio practitioner, the confusion and misconception about analogue, digital and online radio is common and always happening. Here we seek to clarify our perspective by describing three key constitutive elements of radio literacy: analogue, digital and online.

Since new communication technology took place, this well-set trap of new medium will completely substitute the old medium (analogue) as discussed in many articles. Anderson (2012), Halbert (2015), O'Neill and Shaw (2010), and Starkey (2008) have examined the development of digital radio (new medium) and its changes. These researchers discovered different patterns of listeners' acceptance and transformation from analogue to digital radio in different countries. It is considered that the political, economic, or political-economy drives the dissimilarity in listeners' acceptance and radio transformation from analogue to digital.

In the thinking of the new (digital and online) and the old (analogue), debates started when numerous scholars, such as Hendy (2009), McLeish (2005), Berry (2006), Spinelli (2006), Rudin (2006), O'Neill & Shaw (2010), and Jauert (2017), debated on the old and new medium. The central question is, what was new and old on the radio? Past researchers worldwide

focused on the benefits of digital radio and its definition. However, the literature that examined radio terminologies is often confusing and scanty.

McLeish (2005) clearly defined radio as a blind medium with certain established social functions. Hendy (2009) depicts radio as the most adaptable medium at locating its audience to transmit information, education, and entertainment. Hendy (2009) and McLeish (2005) defined radio based on its role and how people used radio by using qualitative research methods. While Tacchi (2000) clearly defined radio as a second medium after television based on the people's acceptance of radio through audience research. Before television, radio was a popular medium, and people relied on radio to receive audio content about information, entertainment, and education.

However, scholars such as O'Neill & Shaw (2010) and Jauert (2017) defined radio based on the technology development and concerns about what was new. Most of these scholars implemented a qualitative approach through in-depth interviews, document analysis, and observations. They defined the new radio that implemented new technology such as Digital Audio Broadcasting, High-Definition, and Digital Radio Mondiale as the new radio.

Meanwhile, scholars such as Berry (2006), Spinelli (2006), and Rudin (2006) viewed online radio as the new radio and suggested that it could replace traditional radio. This suggestion is debatable among scholars, with some telecommunication scholars like Couch (2007) and Haykin & Moher (2007) having different viewpoints on the matter, specifically regarding the spectrum. According to them, there are three principles of digital radio: the digital studio, digital transmitter, and digital receiver. However, Ibrahim (2020) discovered that internet radio does not fit these principles, as it would collapse if 32 million Malaysians went online simultaneously.

Furthermore, Coyle (2000) and Cordeiro (2012) have a different view on radio terminology in another article. They agree that types of technology and the functions of the radio do not change radio terminologies. They believe that the interaction between the radio announcer and listener is what makes radio, whether it is analogue or digital, and this human connection is more important than the medium's technology.

Therefore, in this article, we aim to highlight the misconceptions between analogue, online, and digital radio from Sabah's perspective. We will examine it from various perspectives, including political-economics, technology, telecommunication, and social perspectives.

Without a clear understanding of the differences between "old" and "new" radio, the technological migration from analogue to digital radio among free-to-air (FTA) radio players in Malaysia may be disrupted. Treating the "old" and "new" radio as the same could lead to this situation. The truth is that "old" and "new" radio have similarities and differences, and it is crucial to understand the terms of digital, online, and analogue radio from both listeners' and radio players' perspectives. This understanding is necessary before we educate society on the importance of supporting the government's plan to shift from traditional to digital radio. Apart from that Chan et al., (2020) claimed that reputation is vital, thus in this research

context, without a good reputation in any technologies, the industrial and society would not dare to try or buy the technology.

Methodology

In this research, we have adopted a qualitative approach through a focus group discussion. Scholars such as Anderson (2012), Berry (2006, 2014), Cordeiro (2012), Coyle (2000), Halbert (2015), O'Neill and Shaw (2010), Rudin (1999, 2006), Spinelli (2006), and Starkey (2008) have also adopted a qualitative approach. These scholars used methods such as interviews, observations, and document analysis to engage and encapsulate opinions from industrial radio players and listeners. However, Thomas (2011) uses a mixed-method approach to analyse changes to new media technology among media students.

Informants in this research were from Kota Kinabalu, Semporna, and Keningau, Sabah. Initially, purposive sampling techniques were planned to identify informants from rural and urban areas to examine their understanding of analogue, digital, and online radio. Surprisingly, there was an encouraging response from the participants using these techniques during the Movement Control Order (MCO) phase in Malaysia. Informants forwarded messages to their family and friends, which led to an overwhelming response of 279 informants. It shows that during that time, most Malaysians had a bountiful amount of time. The crucial question is how we control the quality of responses?

Since this research was conducted during the Movement Control Order (MCO) due to the Covid-19 pandemic, we employed an online focus group discussion through Google Meet to conduct a qualitative approach in communication research. Scholars such as McDaniel and Gates (2002), Moore, McKee, and McLoughlin (2015), and Morrison, Lichtenwald, and Tang (2020) have also used this technique. Although online focus group technique is not a new method, there is a lack of non-verbal aspects of input. During the pandemic, an online focus group is the best method to help the government prevent the transmission of the Covid-19 virus.

Since this research aims to identify the level of radio literacy in Sabah, we stopped receiving participants when the number reached 279 and formed 20 natural groups. We realized that conducting a focus group discussion with a natural group can highlight inconsistencies and similarities between what people say, how they act, and how other participants react and comment. To avoid these inconsistencies in natural groups, a Google Form link was distributed to avoid bias or influence from other participants. It contains a simple set of questions to examine their understanding of analogue radio, digital radio, and online radio in their own voices without interruptions from other participants. It is not easy to determine whether this technique is appropriate for identifying the level of understanding of analogue, digital, and online radio. On the other hand, some participants might be encouraged and empowered to share their understanding without feeling shy in a safe and conducive environment.

Covid-19 brought us 20 groups of focus group discussions, with 13-15 people in a group from various ages and ethnic backgrounds. With these large focus group discussions, we had to steer our research using thematic coding to map the answers by shortening the

questions, since this research needed to finish on schedule. The research was executed from June 2020 to August 2020.

As mentioned above, the researchers had to revamp the questions and ask short questions, as we would do in a quantitative study. Changing the approach from qualitative to quantitative means that we had to refurbish and identify our variables, which would interfere with our schedule and cost us much money. Since the research was conducted during the Covid-19 breakout, we used an online platform like Google Meet to reach those informants.

Below is the list of questions that were revamped to ask the informants to examine their understanding level. Then, researchers used thematic coding to analyze the data:

- What is an analogue radio?
- What is digital radio?
- What is an online radio?

The focus group's collectivist nature provides quality assurance and control: by focusing on the group, it allows for the expression of a variety of distinct opinions. Not only is it feasible to have access to the experiences of many different people, but data is enriched when group members spark each other off, allowing perspectives to be reformed through interchange, nuances of meaning to be pulled out, recollection to be strengthened, and shy members to gain confidence. By having a large focus group discussion, the researchers explained the research procedure and purpose to the informants. Before we conducted the discussion, a Google Form link was distributed to avoid bias or influence from other informants, as we wanted to know their understanding level of analogue radio, digital radio, and online radio in their own voices without interruptions from other informants. After the informants finished answering the questions, we proceeded with the sharing sessions.

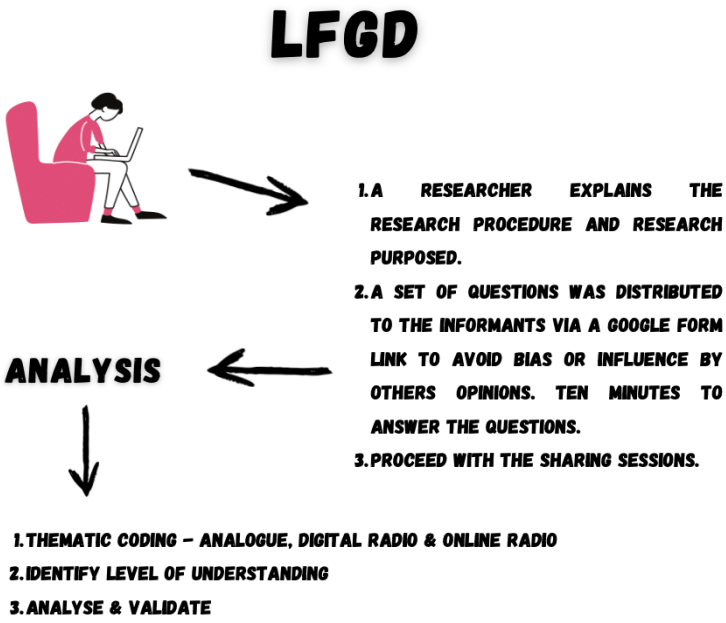

Figure 1: Data Collection Procedure

To analyse the data, we are using MAXQDA 2020 software by determining our thematic coding. Below is the baseline definition of analogue, digital and online radio (reception) from Couch (2007), Haykin and Moher (2007) and Ibrahim (2020);

- Analogue radio uses an electromagnetic wave and transmitted through Frequency Modulation (FM) and or Amplitude Modulation (AM). The range of frequency between 88-108 MHz.
- Online radio use Internet. The signal is not transmitted thru FM or AM.
- Digital radio use digital technology in transmitting or receiving the spectrum by using digit binary 1-0.

In summary, these definitions conceptualised online, analogue and digital radio while also implementing it to complementary approaches. In our reviews, we have established that listeners may have different understanding depending on their knowledge on the subject matter; thus, the understanding can result in varying distribution (reception) and knowledge. With this in mind, the definition above helps us systemically analyse our informants understanding about digital, online and analogue radio.

Findings

The radio industry is evolving due to technology. How can society recognise the distinctions between the various radio technologies when there are so many devices and technologies already available and more are being created every day? Radio is experiencing considerable disruption due to the quickly growing popularity of new global listening platforms, which are often embedded in smart speakers and increasingly in connected car infotainment systems and constantly changing consumer behaviour. However, the central question is how listeners in Sabah, Malaysia, define radio? To what extent do they truly understand the dissimilarity between FM, online and digital?

Regarding the theme of FM, online, and digital radio, 279 informants were involved in this study from July to August 2020, with varying educational qualifications, gender, and geographical locations, bringing uniqueness to the findings.

One hundred fifty-two (152) informants with secondary school qualifications and one hundred twenty-seven (127) with tertiary certificates. One hundred thirty-four (134) are male informants, while one hundred forty-five (145) informants are female. Ninety-nine (99) of them live in urban areas (10,000-74,000 people), seventy-four (74) is from small urban (1,000-9,999 people), seventy-seven (77) are from rural areas, and twenty-nine (29) are from metropolitan (more than 75,000 people). These various backgrounds bring uniqueness to the finding.

Three interrelated themes emerged, which are platform equivalence assumption, device-based categorisation, and infrastructural ambiguity.

Platform Equivalence Assumption

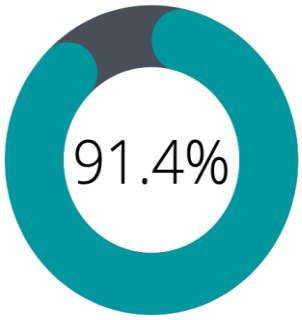

Figure 2: Level of Understanding
Notes: Dark turquoise represents not understand the term FM, online & digital radio

We discovered that radio is defined through experience rather than infrastructure. Informants largely conceptualised radio through everyday practice than transmitter architecture. Many informants used “digital” as a catch-all term for contemporary radio (analog radio and Internet radio). We find out that misconceptions about digital radio, online radio, and analogue radio are high. Based on figure one, the study discovered that from 279 informants involved in the focus group discussion, 255 informants (91.4%) could classify in general as a group of people who do not understand the terms online, digital and analogue radio. In contrast, 24 informants or 8.6%, could differentiate between online, digital and conventional radio. The analysis shows a significant relationship between the level of education and their not understanding. Feldman (1997) claims that "we are all familiar with the analogue". However, it was valid during the 1990s in Western countries. While in Malaysia, we still employ analogue radio in the digital age, still, listeners have misconceptions between FM, online and digital radio.

Amal (2017, in Ibrahim 2020) explains that "*many people interpret digital radio variously*." That statement shows that everybody could have a different point of view on digital, online and conventional radio. Thus, the findings in this study are in line with Amal’s statement.

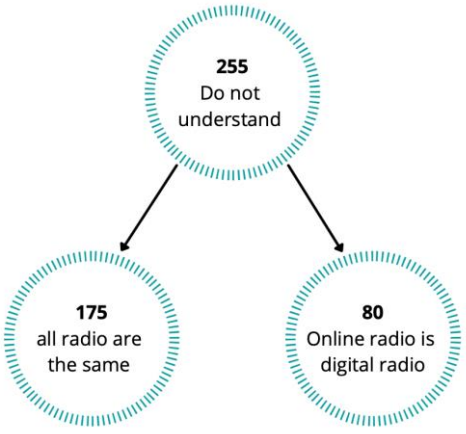

Figure 3: Listeners Understanding

In this research, we could see that 255 informants intensely believe that the radio they are listening to in the car, through mobile phones, and from the computer is all digital. From 255 informants that classified 'as do not understand', we found it is critical when 69% or 175 of them could not tell the difference – all radio is the same. Meanwhile, 31% (80 informants) of 255 informants think of Internet radio as digital radio. In short, most informants do not understand the difference between online, digital and FM radio. According to Ibrahim (2020) in Malaysia have zero digital radio terrestrial – in fact all cars in Malaysia still depending on the FM.

Gyr, Friedman and Gyr (2015), Ibrahim (2020), and Alston (2021) state that today we are moving from the analogue to digital and to disruptive era in which listeners have their expectations and perceptions on technology that they consume. We cannot blame listeners if they are perplexed and mistakenly assume all radios are the same, digital.

We concluded that the world is dramatically disrupted by digital technology. The technological determinist might say that the development of digital technology in radio is due to the revolution in listeners' consumption-led technology. Globalisation has made radio a powerful communication tool that penetrates many people on a low-cost budget. However, convergence has made radio more flexible. Today, people can listen to the radio through various platforms such as television, mobile phones, computers, tablets, iPods, and radio sets. Anyhow, thanks to the convergence that brings digitalisation into radio ecosystems.

As we know, a radio paradigm, analogue, has been perfected and shaped over the last 100 years, and it does not seem to want to disappear that easily until the listener mistakes it for digital radio. There is no doubt that radio consumption is changing due to the technological improvements in the disruptive era, whereas listeners assumed all audio they consumed today in a digital mode. Today, digital radio satellite, digital radio terrestrial, and online radio have become global phenomena. Today's generation is accustomed to using multiple technologies to access radio in the disruptive digital era.

In this research context, we define radio literacy as the listeners' comprehension of analogue, digital, and online radio. Ibrahim and Wahab (2021) highlighted the migration from conventional radio to digital radio and the issues that contributed to the slow transition. They believe that the lack of awareness among society regarding the transformation from radio analogue to digital has affected the plan.

Disruptive Innovation Theory explains how new technologies displace established systems by offering greater convenience or affordability, often at the expense of technical superiority (Christensen et al., 2015). In the radio context, digital platforms and online streaming services represent "newcomers" challenging the entrenched analogue system. These innovations offer multichannel capabilities and mobile access, threatening the sustainability of frequency-bound FM radio.

Technological Determinism posits that technological development shapes social structure and cultural values (McLuhan, 1964). In this study, listeners' inability to distinguish between analogue and digital formats reflects how technological change outpaces public

understanding. Listeners interpret technological shifts through experiential use rather than technical differentiation, supporting deterministic assertions.

Jenkins (2006) articulates convergence as the flow of content across multiple media platforms. In Malaysia, convergence has led to hybrid consumption patterns where FM radio, online platforms and streaming apps coexist. However, without adequate media literacy, listeners blur the lines between these platforms, as shown by the findings of this study.

Devised-Based Categorization

Past research conducted by Clark (1998), Liikanen (2001) and Ala-Fossi (2013) shows that society plays an imperative role in determining the readiness and acceptance of radio migration in a country. Those scholars revealed that countries such as the United Kingdom, Spain, and Norway were confronted with disappointment in radio migration since society does not fully support radio digitalisation. Later in 2018, Norway successfully migrated to digital radio, while the United Kingdom and Spain are struggling with the radio digitalization, expressly to get accepted by society (Ibrahim, 2020). Past research shows that it is impossible not to avoid digital radio migration failure at the first stage. So, it is vital to educate society on this matter before Malaysia's government carries out the digital radio project and, at the same time, reduces the risk of digital radio migration into a fiasco.

Ibrahim (2020) elucidates that as technology evolves, the radio industry has two types of technology: the analogue and the digital. The analogue radio technology consists of three standards, which are frequency modulation (FM), amplitude modulation (AM), and short wave (SW). In contrast, digital technology could transmit via terrestrial or satellite. For digital terrestrial radio, Digital Audio Broadcasting (DAB), High Definition (HD), and Digital Radio Mondiale (DRM) were invented to replace the analogue radio standards. As she stated, both technologies represent a different way of a radio studio, transmitter, and receiver operation. According to her, in Malaysia, the conversion to digital radio is not fully implemented by free-to-air (FTA) services due to uncertainty.

Couch (2007) and Shiomi and Hatori (2000) explained that analogue radio is transmitted in electromagnetic waves. The standard transmissions that use electromagnetic waves are FM radio and AM radio. AM radio has been unavailable in Malaysia since 1997 after the government decided to cease the transmitter (Ibrahim, 2020). Typical theoretical examples to understand analogue radio in Malaysia context are any radio stations end with FM is analogue radio - such as Nasional FM, Klasik FM, Era FM, Suria FM, and Best FM.

Further explanation by Amal (2017 in Ibrahim, 2020), the value chain for analogue transmission is straightforward or point-to-point radio channels. He mentioned that the process starts with the radio studio. The microphone captures the voices, and the audio mixer will mix the voice from the microphone and audio from the computer. Then send the compilation of audios to the Main Control Room (MCR). A carrier wave creates and modulates the carrier wave frequency to the transmitter and transmits through an antenna to receivers (the listener).

In contrast, digital radio via satellite has invented and built-in geostationary orbit for uplink and downlink, which offer a unique capability, global coverage. Past researchers

defined digital radio as the transmission and receiving of sound that has been converted into numerical patterns, or digits (Couch, 2007; Ibrahim, 2020). Most past researchers agreed that digital radio is different from online radio. An internet connection is used to receive a stream of data via a computer, mobile device, or internet-enabled radio.

Amal (2017, in Ibrahim, 2020) says that "*online radio is neither analogue nor digital. It is supplementary*". In his explanation, Amal says that "*online radio relies on the Internet and is against the "broad" and "cast" concept*". The online radio gist is the audio transmitted through the Internet, and online radio is not broadly broadcast through the transmitter. He added that if 32 million Malaysians go online, specifically for a specific online radio station, at the same time, the system will collapse. However, if that 32 million Malaysian watches or tunes to any terrestrial or satellite broadcast station, the system is stable unless the power supply suddenly breaks down.

According to Amal (2017, in Ibrahim, 2020), online radio is often mistaken as digital. Based on Amal's (2017, in Ibrahim, 2020) explanation, the study found that 80 informants believed that Internet radio is digital radio, which turned out false based on Amal's explanation (2017, in Ibrahim, 2020).

The digitalisation of broadcasting started in Malaysia in 1996 through Astro (Ibrahim, 2020). Astro not only offered satellite television but ten satellite radios in 1997. Apart from that, Astro also operates FM radio, and recently, Astro has dropped the words FM from all its analogue radio stations (Ibrahim, 2020). For instance, Lite FM and Mix FM re-brand to Lite and Mix. We are questioning, are all Astro radio no longer broadcast in an analogue way?

Although Astro radio drops the words FM, the radio itself broadcasts in multiple transmitters such as thru satellite, FM, and online. Listeners listen to any radio station from a radio set or car still considered broadcast in the analogue spectrum, specifically in Malaysia. As Ibrahim (2020) found in her research, at the moment, Malaysia does not have a transmitter for digital terrestrial radio. Thus, that means the radio that listeners tune in the car, specifically in this country is analogue radio since the Malaysian government has not (yet) opted for analogue-shut-off for the radio industry.

In short, even Astro radio ditches the words FM from its radio - it is still using an analogue transmitter to reach its listeners who are listening to them in the car. At the same time, the listeners can access Astro radio stations through satellite and online platforms.

The study also discovered that the radio's ecosystem changed drastically after globalisation and digitalisation. People no longer rely on the radio set physically. Most listeners shift from a physical set of radio to an online platform. As we observed, 39% of our informants owned the radio set, while the rest were listening to radio from online platforms, satellite radio, podcasting, mobile phones, and in-car radio sets. The finding shows the changing pattern in radio listenership, especially in Sabah.

Undeniable that the way people consume and tune to the radio in the new communication technology world differs from radio during the Guglielmo Marconi era. Earlier, radio employed analogue technology in transmitting the content whereby listeners need a radio set to receive the signals. Today, listeners can access radio through satellite,

digital terrestrial, and online radio via the medium's diversity such as television, smartphone, and computer. The difference between online, digital radio and analogue needs to be explained to increase awareness among listeners.

Infrastructural Ambiguity

Since the findings show that the radio terminology literacy rate is low, and most listeners assumed that what they heard was digital, no wonder today we have the radio on social media. Today, listeners can listen to radio thru TikTok, Facebook, and Instagram. The critical question that all radio players must ponder is how conventional radio can sustain itself since it must compete with new communication technology, especially when advertisers shift from conventional mediums to a digital platforms. In other words, the listeners and monetization are segmented. It shows how society consumed radio can affect its function, future and accessibility. Radio once became a platform to create political figures of the twentieth century who faced challenges from television, binge-watching, and streaming. To make a projection on the radio in future, there is a need for large-scale research involving listeners, radio players and policymakers.

Conclusion

The findings affirm that radio literacy is both a technological and cultural construct. As globalisation and digitisation reshape communication landscapes, the lack of public understanding may hinder policy efforts such as digital migration. Theoretically, these results reinforce Disruptive Innovation Theory by illustrating the inertia of legacy systems and the cognitive lag among societies. Furthermore, the misunderstanding between online and digital radio validates McLuhan's claim that "the medium is the message"-listeners internalise the form of media consumption without grasping the technology behind it. From a convergence perspective, Malaysia is experiencing a hybrid ecosystem where the conventional and digital forms coexist, but the terminological ambiguity threatens the clarity of this evolution.

The study was conducted to identify the level of radio literacy in Sabah, Malaysia. Our analysis suggests that the understanding of FM, online, and digital radio is relatively low. In short, this study has confirmed that misconceptions among listeners in Sabah, Malaysia, are high. We concluded that online radio is not the same as digital radio, as its criteria do not meet the broadcast principal. Digital radio refers to satellites or terrestrial radio that use DAB, HD, or DRM standards and are transmitted digitally. In contrast, analogue refers to FM radio broadcast through electromagnetic waves.

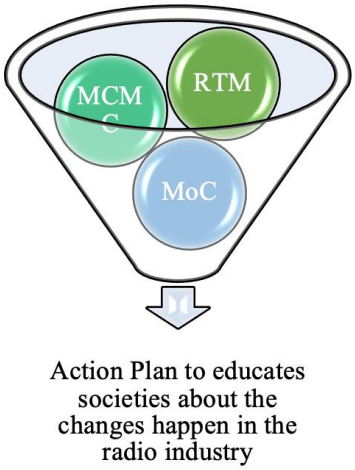

Figure 4: Solution to Misconception

To increase listeners' understanding, Radio Television Malaysia (RTM), Malaysian Communication And Multimedia Commission (MCMC), and the Ministry of Communications (MoC) should educate and raise awareness among people about the transformation in the radio industry. George Santayana (nd) once said, "*those who do not learn from history are doomed to repeat it*". This study will assist Malaysia to fasten and develop a digital radio action plan. This action plan will help RTM, MCMC, and MoC steer a systematic plan for the radio industry.

Acknowledgement
This work is supported by the Trust UMS **DLV2408** and *KPT Skim Latihan Akademik Bumiputra* (SLAB).

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