

RTM GOES DIGITAL: PROCESS & CHALLENGES

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Abstract

Radio and Television Malaysia (RTM) is a broadcasting station own by The Malaysian Government. The study is to examine RTM's readiness and preparation intended for digital radio broadcasting. These studies apply qualitative approach through in-depth interviews. Issue regarding digital radio are complex and subjective. Moreover, the implementation of digital radio involved technology, organisation and the readiness of RTM. Radio established in Malaya (Malaysia) through electromagnetic wave (analogue) in 1920. As a result of Malaysia formation in 1963, RTM functioned in analogue wave until present. Astro is the first digital broadcasting station in Malaysia. Astro officially aired in 1996 and became a push factor for RTM to begin with the digital project in 2000. Nowadays, RTM begin multicast mode before completely implementing digital broadcasting to be expected in 2020. Multicast occurs when the equipment for radio station is not functioning completely in digital. To begin digital broadcasting, broadcasting station must fulfilled basic principles such as digital studio, digital transmitter, and digital receiver. The digital chasm between RTM and Astro is 11 years. This chasm occurs when RTM opt to proceed with equipment's replacement phase and (at that time) there are no requirements for RTM to transform into digital broadcasting. Thus, analogue equipment is still in a great condition (at that time). RTM has 32 radio stations. To implements digital radio broadcasting, it requires a financial support in turn to replace all the analogue equipment with digital equipment. Therefore, RTM faced challenges and constraints in order to achieve digital broadcasting. Human resource and economic are the aspect of constraints and challenges that RTM must encounter. Subsequently, this research debates on how the Complexity Theory explained digital broadcasting issue. In other words, this theory was selected in order to explain RTM's perspective on determining digitalisation. Complexity Theory explained the condition of a

system which is non-linear, difficult to predict and experienced transformation. Findings showed RTM goes digital caused by follow-factor. In other words, RTM turns digital due to the determination from developed countries broadcaster, hence, RTM is owned by government and not by individuals.

Key words: digital radio, transition, constraint, challenges, RTM, Complexity Theory and follow-factor

Introduction

The phenomenon of invention in technology led to the technology transition (Amelia, 1993; Thussu, 1998; Tuttlebee & Hawkins, 1998, Hamelink, 1997) in the industry of electronic and electrical engineering, broadcasting, medical, shipping, and aviation. The transition of technological explains the evolution of high-technology which occurs from time to time. Particularly, the transition from analogue to digital. Technological evolution proved the credibility of *Homo sapiens* involving the invention and use of technological for the needs of life in accordance with the current era.

It began with the assumption of electromagnetic waves by James Clerk Maxwell. Afterwards, Heinrich Hertz came out with his electromagnetic theory. These electromagnetic theories led to the invention of radio signal. Subsequently, Guglielmo Marconi invented radio signal and succeeded with his transmission from his house in 1894. Since then, radio became a popular medium before television (TV). Time to time, radio has to compete with TV to continue broadcasting.

Development of radio in Malaysia has a significant connection with Malaysia history (Asiah Sarji, 1996; Darusalam Abu Bakar, 2005). Started with the invasion of Portuguese in 1511, Dutch in 1641, the establishment of Straits Settlements (*Negeri-negeri Selat/NNS*) in 1826, Japan in 1941 and Communist has risen up the awareness of Malaya people to fight against the invasion (Asiah Sarji, 1996; Darusalam Abu Bakar, 2005). This invasion, turned the communication as an important medium in Malaya, where, Malayan aware to stop the invaders who came to invade Malaya. In the era of wars in Malaya were against invasions, radio was used to disseminate the information that is known as propaganda. There are two types of propaganda: came from the invader's side and the other from citizens against the invasion.

The development of radio in Malaya became arose when A.L Birch brought the first amateur radio to Malaya in 1921. The justification is to disseminate the information and entertainment elements to the Malayan (Adhikarya, 1977; Asiah Sarji, 1996; Darussalam Abu Bakar, 2005). In other words, amateur radio grows rapidly, especially in the era of Japanese invasion in Malaya. Before Malaya independence in 1957, Radio Television Malaysia (RTM) was known as Malaya Radio, after the establishment of Malaysia in 1963, it is known as Malaysia Radio (Asiah Sarji, 1996; Darussalam, 2005). After the emergence of TV, Radio and TV were combined and owned by The Government of Malaysia.

All-Asian Satellite TV and Radio Operator (Astro) was the first pay digital radio and TV in Malaysia and officially aired in 1996 (Intan Soliha, 2011). Astro was formed from privatisation policy and telecommunication policy that introduced by Tun Dr. Mahathir Mohamed, former Prime Minister of Malaysia. Astro aims to bridge the digitisation chasm between the societies and provided high quality of broadcast

services. In terms of technological revolution, it transformed the radio and TV broadcasting industry into an attractive and well-developed medium.

Nowadays, the use of digital technology in radio and television (TV) is world-wide (Ahmad Jailani & Monica, 2000) to achieve modernisation (Price, Haas & Margolin, 2008). Technology is one of the indicators to measure the social and economic development of a country (Intan Soliha, 2011; The World Bank, 2015) even it involves the various selection of digital radio technologies (Anderson, 2012; O'Neill, 2008). The selection of technology depends on the country's perspective, including broadcast stations whether it is owned by government or by private sector.

Generally, there are three types of technology in digital radio broadcasting around the world which are Eureka 147 Digital Audio Broadcasting (DAB), High Definition (HD) and Digital Radio Mondiale (DRM) (Anderson, 2012). DAB was invented in 1985 by a group of scientists from Germany and France (Lax, Ala-Fossi, Jauert, 2008). Subsequently, HD radio invented by United State after seeing DAB as a failure. However, DRM was specifically invented for shortwave transmission and overcome problems and debates that cannot be solved by DAB and HD (Clark, 1998; Senger, 1998).

Radio Versus R@dio

After the emergence of TV, radio is seen as a second medium (Tacchi, 2000). Previously, radio was a popular medium compared to print media. The functions of radio are to disseminate the information and entertainment to the society. After Malaysia independence until today, individuals relied on the radio for entertainment and information. In addition, radio plays an essential role to educate and persuade society. Radio educates society through multi-platform which are agriculture, fishing, business, public service announcement, and enlighten the society on nation's developments.

Rapid developments in the technological revolution of radio broadcasting are acknowledged as new communication technology. By reason of that, radio broadcasting industry experienced transformation and forced to compete with other mediums (Cordeiro, 2012:492). In other words, radio must compete with TV, interactive media, social media and print media. As a result, this new communication technology triggered dilemma in the radio broadcasting world (Anderson, 2012; Cordeiro, 2012). In this article, new communication technology for radio is referred as the digital radio broadcasting.

Digital radio broadcasting is a process of transferring audio into a small unit (digital unit) and allows to process the audio as electronic (Intan Soliha, 2011). Digital unit is identified as binary digit and involves numbering system 1 and 0 (Shiomi & Hatori, 2000; Floyd, 2014). Electronic information processing involves the usage of computer system to submit and exchange the data. On the other hand, analogue radio broadcasting is a process, whereas, audio is transmitted into the electromagnetic waves and not involved with numbers (Intan Soliha, 2011).

For instance, digital radio broadcasting is referring to online radio, digital radio transmits through satellite or terrestrial (Baran, 2007; Intan Soliha, 2011; Anderson, 2012; Cordeiro, 2012). In other words, radio (now) not only can be heard from radio box but can be heard through TV, computer, mobile phone and tablet. Furthermore, the

term digital radio broadcasting itself is complex and can be debated among scholars. Particularly, the characteristic of the technology itself.

However, the concept of radio remained the same. According to Hendy (2000), Berry (2006), Coyle (2000) and Cordeiro (2012), the concept of radio whether it is analogue or digital (radio or r@dio) involves the interaction between human. In other words, what makes a radio broadcasting as a radio is the existence of the role of radio announcer. Furthermore, with radio announcer, the radio station is not only depending on the music list. The interactions between the listeners and radio announcer are important to the radio station to increase the ratings among listeners and advertisers even with the concept of one-man studio.

Medeiros (2007) and Prata (2008) defined radio as a live broadcasting and use the correct intonation as the aspect of the radio show. McLeish (2005) in his popular definition on radio, described radio as: radio is a blind medium but can stimulate the listener's imagination as soon as the voice of radio announcer came out from the loudspeaker. In other words, radio is a medium without visual and radio announcer voice have an emotional content. Radio announcer continuously have interaction with their audience through radio program which is based on hot clock to guarantee listener gratification. This is the enchantment of a radio.

Cordeiro (2012) described radio as a multimedia and multi-platform medium after the presence of digital broadcasting, in contrast to the era of analogue radio. Radio versus R@dio changed the radio broadcasting industry by influencing the management and economic standing of the radio station (Cordeiro, 2012:493). This situation occurs due to the competition in market economy (Pelton 2006; Cordeiro, 2012), where the advertiser start to implements new communication technology to advertise their product and services.

Dissimilarity in technology (analogue and radio) shows the development and growth towards goodness and do not cause any harm to the broadcasting company and the listener. Thus, this new communication technology helps the radio station to improve their production skills. In other words, digital radio offers super text and more interactive to guide the listeners with the information of singers and songs. Moreover, digital radio offers high fidelity of sound compared to analogue radio.

In the digital era, print tradition such as newspaper circulation became decreased despite still being relevant and in demand by audience. But the advent of digital technology took over the print task with the convergence of the Internet. Nowadays, people connect to each other through mobile phones, Internet rather than printed letters. Similarly to radio. Analogue radio cannot allow the projection of super text on the radio screen. But, digital radio allowed the super text and provides information to fulfil listener gratification.

Basic principles of digitalisation usually involved three mechanisms, which are digital studio, digital transmission, and digital receiver (Shiomi & Hatori, 2000). Figure 1.1 shows the digital broadcasting equipment in accordance with the digital principles. Thus, digital operational system involves a computing system and calculation of a digit system (Floyd, 2014). For instance, if the studio is digital, transmission is digital but receiver is analogue, as a result, digital broadcast cannot be accomplished.

In radio broadcasting, radio transmitter produces radio waves. According to Figure 1.2 and 1.3, analogue radio transmission uses electromagnetic wave while digital radio uses waves through the air at the speed of light (Intan Soliha, et.al, 2009). Modulation process between analogue and digital radio remained the same. In other words, the dissimilarity between digital and analogue radio operating is the wave and the character of the technology itself.

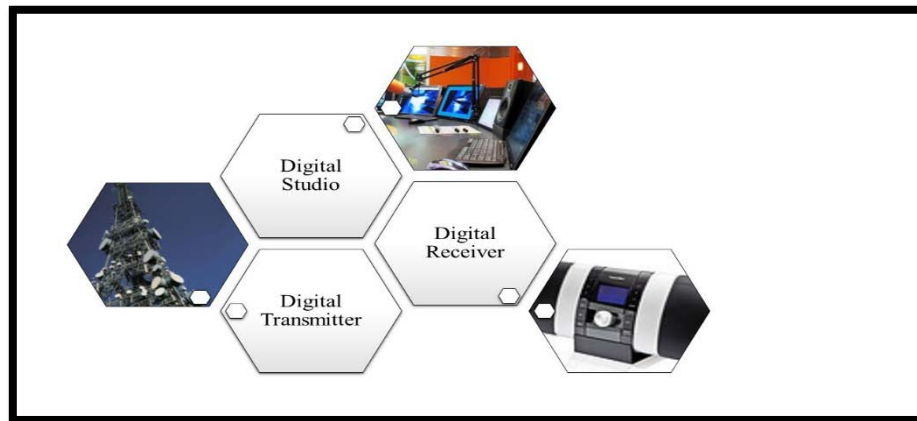


Figure 1.1: Principle of Digital Radio Broadcasting
(Source: Intan Soliha, 2011; DAB, 2015; DRM, 2015)

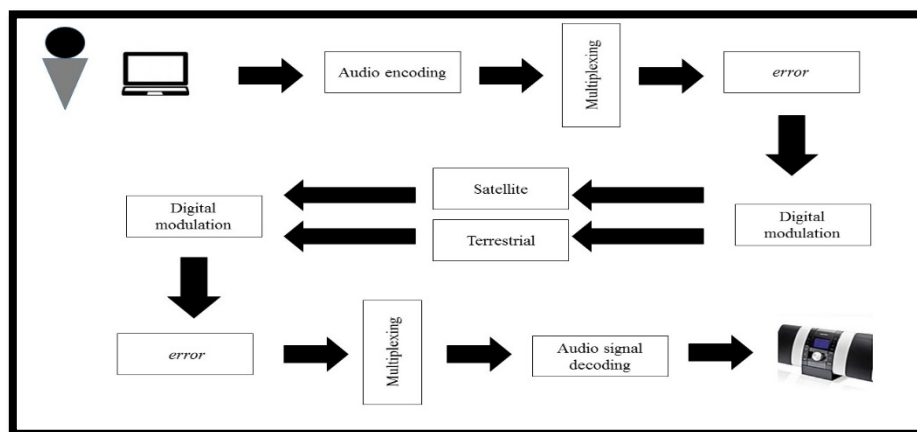


Figure 1.2: Digital Radio Operational Process
(Source: Shiomi & Hatori, 2000)

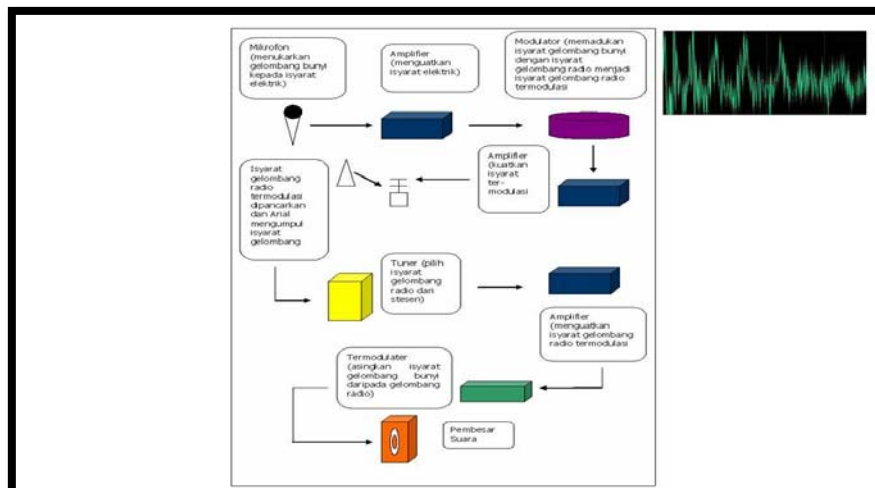


Figure 1.3: Analogue Radio Operational Process

(Source: Intan Soliha, Suhaimi Salleh & Syahrudin Awang Ahmad, 2009)

Digital Radio Perspective in Developed Country: United States

In the name of development, developed country is measured by the modernity. This modernity can be found in various aspects, particularly in gross income, level of education, health status, population growth, and mortality rates. Technology is one of the criteria that contributes to the development of a countries. Intan Soliha (2011) stated that advanced country favoured advanced technology. For instance, United States of America (USA) invented digital radio technology which is known as High Definition Radio (HD) (Anderson, 2012).

The invention of technology and financial support from the investors are factors for the bloom of technology invention. Particularly in the digital radio broadcasting invented by USA (USA Digital Radio Secures \$ 41 Million in Additional Equity Financing”, 2008:1). USA is one of the country that desired to implements short-wave digital radio (Intan Soliha, 2011). The quality of sound and transmission of digital radio with short-wave are better than analogue radio (Intan Soliha, 2011). Short-wave is an electromagnetic waves with high radio frequency ranging between 6 - 25 megahertz and wavelength ranging between 37 - 150 feet (Kamus Komunikasi Massa, 2003:74).

Every country in this world used different types of digital short-wave technology (USA Today, 2003). As emphasised in the introduction, there are three types of digital radio technology which are DAB, HD and DRM. Anderson (2012) explained that, it is depends on the country and broadcasting organization’s perspective regarding the selection of which technology can be applied. When Cold War strikes, USA became a world’s leader in broadcasting. However, history shown that Canada was the first country in implementing digital radio technology (O’Neill, 2007). Unfortunately, the bureaucracy has taken the opportunity for Canada to lead the digital radio industry. For instance, Voice of America (VOA) has been operated for six decades and became a great radio station that serves million of American. Being aired in 53 languages, it has approximately 100 million listeners nowadays.

Studies were done by numerous researchers and organisations regarding the significance of radio in the USA. TV Advertising Bureau (2004), Baran (2007), Radio Advertising Bureau (2012), Radio Survivor (2015) showed that every listeners in USA

owned more than two radios. Previous research carried out by Vivian 1995 (in Dzulkiflee A. Binsin, 2003:162) indicated adolescents and adults in the USA spent 22 hours per a week by listening to the radio. As a result, Americans owned 520 million radio sets. Greenberg (1992:60) showed that approximately every household in the USA owned 5 sets of radio due to the importance of knowledge. Radio Advertising Bureau (2012) stated that radio remained relevant as Americans spent 74% of their time listening per week. Table 1.1 shows the rapid development of radio station in USA from 1930 to 2015.

Table 1.1: the total of radio stations in the USA.

Year	Total of Radio Stations
1930	618
1950	2,867
1970	6,889
2006	11,020
2013	15,358
2014	15,432
2015	15,442

Source: Dominick, Messerre & Sherman, 2004:12; Radio Survivor, 2015

This rapid development of radio stations in the contributed up to seven percent of the nation's Gross Domestic Product (National Association of Broadcasters, 2015). Radio broadcasting industry in the USA is lucrative due to the income generated from commercials. Despite the technological changes (from the analogue radio to digital radio) however it does not affect the uses and gratification of the listeners (Radio Survivor, 2015). Clearly, radio become more practical than before when listeners can get access through tablets, mobile phones, TVs, and online. Everyone can listen to their favourite radio stations through various mediums.

Apart from that, these rapid development of US radio stations was triggered by a group of investors and indirectly contributed to the development of socio-economic's of the country. For instance, US radio broadcasting industry invested USD 41 million to implementing digital radio technology in 2000 (USA Digital Radio Secures \$ 41 Million in Additional Equity Financing", 2008:1). The financial supports from the investors helped the inventor to create new communication technology which in turn contributed to the rapid development of new communication technology in the USA. In other words, investor is the source of financial support for the development of radio broadcasting industry in the USA.

Allbritton New Media; Beasley Broadcast group, Inc; Bonneville International; ComVentures; DB Capital Partners; Flatiron Partners; Grotech Capital Group; Harris Corporation; H & Q Venture Associates; J&W Seligmen & Co. Incorporated; Regent Communications, Inc.; Rigs Capital Partners; LLC; Saga Communications; TI Ventures; Waller-Sutton Media Partners; Whitney & Co; and Williams, Jones &

Associates are the investors for the digital radio in the USA. (USA Digital Radio Secures \$ 41 Million in Additional Equity Financing”, 2008:1)

Digital radio in USA developed based on In-Band-On-Channel Digital Audio Broadcast or iDAB. It is a HD radio. This technology converted AM and FM analogue spectrum into digital spectrum through terrestrial. Furthermore, there are eight radio stations (the pioneer) applied for experimental licence, which are, WNEW-FM and WHFS-FM in 2000. As a result, digital radio stations have 110 million listeners. (USA Digital Radio Secures \$ 41 Million in Additional Equity Financing”, 2008:1)

In addition, Sirius FM and XM transmitted through satellite and known as satellite radio. XM Satellite Radio aired in 2001 and became the first US satellite radio, while Sirius FM in 2003. XM Satellite Radio operates with two geostationary satellites at 85°W longitude and 115°W on equator (Dominick, Messere & Sherman, 2004). However, Sirius FM worked with three satellites in the orbit. Furthermore, Sirius FM and XM competed each others to attract more listener. Both radio stations offered more than 100 channels of news, musics and talk shows.

In conclusion, the development of new communication technology in the USA thriving when investors are willing to invest and believed its potential. With more than 15,000 radio stations in the USA, this trend is expected to increase annually giving rise to higher employability for the country’s improved socio-economic growth.

RTM Goes Digital

RTM goes digital due to follow-factor (Intan Soliha, 2011). The International Telecommunication Union (ITU) in conjunction with the Asia – Pacific Broadcasting Union (ABU) initiated broadcasting stations in the world to shift to digital broadcasting technology. The decision has been made when broadcasting station in developed country agreed to analogue shutdown. In other words, manufactures discontinued producing analogue equipment for broadcasting industry.

To avoid dumping of analogue equipment to the developing country, the Malaysian Government and RTM agreed towards digital broadcasting (Intan Soliha, 2011). In other words, determination from developed countries led RTM to implement digital technology and analogue shut down in 2015 (Intan Soliha, 2011). Thus, RTM must take the initiative to transform implementing digital broadcasting for radio and TV. This transformation should consider the readiness and acceptance of Malaysian, particularly in rural areas.

RTM launched digital project in 2000, four years after Astro aired. The chasm between RTM and Astro is 11 years. This chasm occurs when RTM opted to proceed with equipment’s replacement phase and (at that time) there are no requirements for RTM to transform into digital broadcasting. Thus, analogue equipment (installed in 1987) is still in a great condition (at that time) and expectation can be used for 10 years. There are no requirements for RTM to replace the equipment. (Intan Soliha, 2011)

Replacement phase referred to the process whereby analogue equipment has been replaced with the newest analogue equipment. The first replacement phase began end of 1993 and completed early 1994. The first phase involved RTM Kota Kinabalu, RTM Johor Bahru, RTM Kuching and RTM Langkawi. Figure 1.4 shows the replacement phase of RTM’s studio.

According to figure 1.4, the second phase of equipment's replacement between 2000 to 2003 involved RTM Melaka, RTM Terengganu, and RTM Pulau Pinang to experienced the replacement phase of analogue equipment with the newest analogue equipment. Moreover, RTM has 32 radio stations. To implement digital radio broadcasting, it requires a financial support in turn to replace all the analogue equipment with digital equipment.

In other words, the replacement phase done by stage and depended on the financial support from the government as the stakeholder. The process of replacing equipment is the RTM efforts to achieve digital broadcasting. Subsequently, RTM Pahang and RTM Negeri Sembilan were the first radio stations involved in the digital project. The digital project for radio station began in 2007.

However, due to the upsurge in iron price, the digital radio project has been postponed. The relationship between iron price and digital radio project is important. This is because, mast made from iron. The height of a mast can influenced a microwave coverage (Intan Soliha, 2011). Figure 1.5 shows the mast for terrestrial transmitter to support a microwave made from iron.

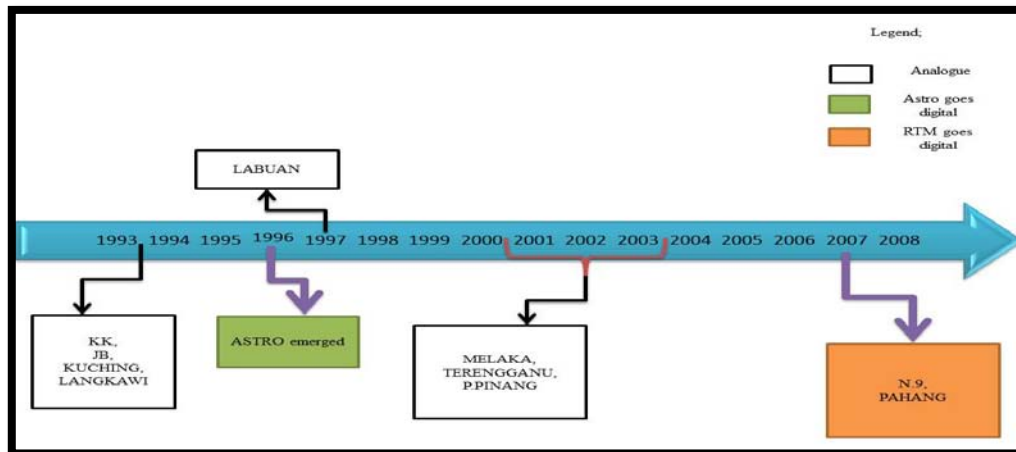


Figure 1.4: Replacement Phase

(Source: Intan Soliha Ibrahim, Suhaimi Salleh & Syahrudin Awang Ahmad, 2009)



Figure 1.5: Radio's Transmitter.

(Sumber dipetik daripada: Radio and Terrestrial Microwave, 2001)

Nowadays, RTM begin multicast in broadcast before completely implementing digital radio to be expected in 2020. Multicast referred to the process of communication signals either TV and radio encode to receiver. Multicast occurs when the equipment for radio station is not functioning completely in digital mode. In other words, multicast allow digital equipment and analogue equipment operating together.

RTM is not fully ready to be broadcast in digital spectrum due to the receiver still in analogue mode. To begin digital broadcasting, broadcast station must fulfilled basic principles for digital broadcasting, that is, studio, transmitter and receiver must in digital mode. Thus, government estimated to fully broadcast in digital in 2015 (Intan Soliha, 2011).

Government allocated USD 19.5 million for RTM to be digitalised. Presently, RTM used and combined two types of digital format which is DAB + and DRM. According to Anderson (2012) DAB + and DRM is the geostationary spectrum (land-based frequency). RTM installed DRM in 2007 at Kajang (Intan Soliha et.al., 2009; Intan Soliha, 2011). However, in this case, RTM used short-wave spectrum for DRM and DAB + have two frequencies which is for TV channel and LM (2.4G) (Intan Soliha et.al., 2009; Intan Soliha, 2011).

RTM completed the pilot project (Pilot DRM) at the end of 2010. For DAB + project, RTM gave the government tenders to Australia (Encik Abdul Wahid Abdul Hamid, 2008. Director of Engineering (Radio) RTM. Interviewed. 21 April). The combination of these two technologies particularly for the purpose of high-definition quality of radio program and good fidelity of sound. DAB and DRM also implemented by developed country such as United Kingdom (UK), Germany, France and Holland (O'Neill, 2007).

RTM goes digital must be prepared from the aspect of infrastructure and human resources. Infrastructure referred to digital studio and digital transmitter. These

infrastructures are important for radio industry to connect with the listeners. Subsequently, human resources referred to personnel who have expertise on how to operate digital equipment and increase personnel to produce digital content.

Personnel who are experts in operating digital equipment is important because digital programming is different from analogue programming; while, the functions of the equipment remained the same. For example, analogue mixer programming depends on the sound needs. Compared to digital mixer, whereas, personnel have to follow the protocols to set up the programming. No doubts, digital mixer is easy to operate by broadcasters compared to analogue mixer.

Analogue and digital transmitter have pro and cons. Analogue transmitter produced magnetic effects caused by flutter and led to the modulation noise and drop out. However, digital transmitter is stable and produced high quality of sound to satisfy the listeners. The programming for both transmitter are different. Thus, RTM guided technical personnel to gain training in Italy. Doing so allows RTM to face the challenges and constraints in switching the technology.

Besides, through digitalisation, air space become systematic and can load up with hundreds of digital radio channels since, a block of digital frequency can carry 10 radio channels. Clearly, with digital technology, air space can be saved without undue interference. Thus, to prepare digital contents, RTM needs to increase trained personnel due to the increase of radio stations and channels.

Constraints & Challenges

There are two challenges that RTM faced in the implementation of digital radio broadcasting: RTM's readiness and the readiness and acceptance from the society. However, the most difficult challenges that RTM must encounter in order to achieve digital broadcasting are the readiness and acceptance from the society.

Third principles of digital broadcasting is digital receiver. Digital receiver referred to the society who can access to digital radio. The society needs to know and understand the justification of RTM goes digital and the advantages of digital radio broadcasting towards them. Thus, awareness of the society on the issues of digital radio is important since digital receiver is the basic principles for digital broadcasting.

Previous research was done by Eurofiction, 2002; Muller, 2002; Bit Digital, 2002; Marca 2002; and Bonet et.al, 2009 proved that without support from society, digital radio broadcasting is virtually non-existent. The success of digital radio depends on how many listeners subscribed to the technology. The more listener purchases digital radio decoders, the market becomes more stable. Consequently, Government of UK is aware of the impact of this regarding digital radio technology. Through campaigns that indicated in Digital Radio Action Plan, UK's government successfully educated their societies regarding the importance to switching into digital radio technology (Digital Radio Action Plan, 2010).

In this study, there is a need to create awareness between societies regarding RTM goes digital. With the awareness campaigns, the society will understand and

willing to replace their analogue radios with digital radios. This is because, with the implementation of digital radio, the people are required to buy new decoder to receive channels from RTM. In addition, household income vary among the society. Household income below RM 2000 may have problem to buy new decoder. Subsequently, RTM must implement an action plan to help those living in the rural areas particularly in Sabah and Sarawak (geographical factor). Researchers are optimistic that once the society accepts and ready to switch their technology, the implementation of new communication technology will be a success.

RTM's readiness and preparation intended for digital radio broadcasting is a must despite its challenges for RTM. As a broadcasting station owned by The Government, a lot of effort and preparation from technical and non-technical aspects must be arranged by RTM. Technical aspects referred to the transition of studio and transmitter from analogue to digital. Non-technical aspects referred to the management of RTM, digital content and training for personnel.

The only constraint that RTM faces is financial support. In general, financial support for RTM is provided through the Government's Malaysia Plan (RMK 8, 9 & 10) and annual financial planning in order to bridge the digital chasm between rural and urban areas. The constraint of financial support led RTM to implementing digital technology by stages. Without sufficient financial support, digital project will discontinue.

Complexity Theory

Complexity theory originated from mathematical theory and emphasising on knowledge of science including physic, biology and chemistry (Kiel & Elliott, 2004; Urry, 2005). The words of complexity originated from Latin meaning total (Dimitrov, 2003) and portrayed as a non-linear phenomenon (Krasner, 1990). Complexity theory has been modified appropriately to correspond with social science scholars in the direction of explaining the interaction of social phenomenon (Urry, 2005). New media scholars, such as, Urry, 2005; Qvortrup, 2006; and Rooke, 2013; applied this theory to explain the development and transformation of new media technology.

To live in this complex world, society must have solution to every problem occur in a phenomenon (Cambel, 1993). Complexity presence in a form of natural elements (solid, liquid and gas), social (community, organisation and institution) and artificial (technology) (Cambel, 1993). Consequently, theory complexity is an instrument to explain the complex situation happened in new media and communication world. When a communication occurred, the message received and encoded by the society, giving implications to the society on how the message is decoded.

For instance, with new media technology (internet and digital device) it is feasible to disseminate malicious information. In addition, it is possible for society to accept malicious information considering on how society decode the message. In this case, complexity occurs when the malicious information is accepted by the society and becomes viral. This results in a phenomenon in the society.

Digital radio broadcasting is a phenomenon because how digital technology operates by broadcast station is complicated due to the apparatus interacting each other. The operation of digital radio and analogue radio is dissimilar but how it functions

remained the same. Furthermore, how stakeholders decide to implement digital broadcasting is contributing to the creation of the phenomenon. Apart from that, stakeholders must consider various aspects, particularly on policy making, broadcasting stations, manufacturers, distributors, and society. Digital radio broadcasting are complex systems and radio technology is unique since it is evolving from time to time – forming more complex behaviour of radio station and end users.

At the international level, digital broadcasting's issue triggered a dilemma due to the various technology itself: DAB, HD and DRM. As a result, there is a coercion regarding invention of innovation, where, developed countries insist developing countries to transform from analogue radio into digital radio broadcasting. In other words, developing countries are obliged to change the radio's technology (Intan Soliha, 2009). This situation is a complex phenomenon, since, the process to transform (from analogue to digital) involves the stakeholder (Government/ owner), broadcasting station (RTM), manufacturers, distributors and society as end users.

This theory is based on the assumption that every complex system consists of three elements: nature, social and artificial that interact with each other to form a phenomenon. In this research, social elements consist of RTM and society, artificial elements referred to the digital broadcasting technology. As a result, the phenomenon created a butterfly effect (Urry, 2005). RTM, society and digital technology interacted with each other triggering a positive impact on the socio-economic development in Malaysia. However, the whole impact can be perceived after RTM completely implemented digital broadcasting in 2020.

Conclusion

This phenomenon occurs when all of the elements (RTM, society and digital technology) interact with each other. To implement digital broadcasting, there are three basic principles that a broadcaster must follow: digital studio, digital transmitter and digital receiver. Thus, RTM must follow the basic principles of digital broadcasting in order to go digital by 2020. Furthermore, there is a need for Government to provide financial aid for RTM to bridge the digital chasm between society in Malaysia through a digital project.

Readiness of RTM and receiver is the aspect in technology transformation, since it is formed through the interaction between RTM and digital receiver. During the period of readiness, there are challenges and constraints that RTM and society must face. RTM must provide enough human resource in turn to broadcast digital program to the society. Thus, digital receiver must buy a new decoder or change the TV set to receive digital program as suggested by the Government. At the same time, Government must come out with a digital broadcasting action plan in order to help the society with the transformation process.

As a result, interaction between elements produced an impact. Thus, the whole impact can only be seen once RTM and the society are fully-digitalised. We assumed that digital radio will give a positive impact toward gross national income through advertising industry and open many job opportunities in broadcasting industries. For social impacts,

we optimistically believe that, digital radio can bridge the digital chasm between rural and urban area in all aspects especially the access of information.

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