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A Systematic Review of Studies on Digital Migration and Coverage of Digital Television Services

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Abstract. This review systematically examines studies published on the relationship between digital migration and coverage of digital television broadcasting services. It is guided by four objectives: to examine the cost of digital migration and coverage of digital television broadcasting services; to analyze consumer awareness and coverage of digital television broadcasting services; to examine subscription payments and coverage of digital television broadcasting services; and to analyze special interactive services and coverage of digital television broadcasting services. The inclusion criteria were based on studies that linkedto the objectives of the review. Effort was also made to sieve and select studies that were scholarly in nature. The review employed a longitudinal descriptive design covering studies published between 2010 and 2018. 35 studies were purposively sampled and classified into periodization (date of publication), geographical scope, content scope, and methodological orientation. It was found that most of the studies were published close to 2015 which was the International Telecommunications Union (ITU) deadline for member countries to migrate to digital television broadcasting. The studies were limited in geographical scope focusing on only 9 out of the 193 member countries of the ITU. Costs, customer awareness, subscription payments, and special interactive services were found to have a strong effect on coverage of digital television broadcasting services.

Introduction

This paper conducts a Systematic Literature Review of studies related to digital migration and coverage of digital television broadcasting services. Television broadcasting is a mode and process of (tele) communication that is used for transmitting moving (color) images and sound to audiences (de Rooj and Hoover, 2015). Television broadcasting may manifest in form of analogue or digital. In analog broadcasting, the transmission method uses a continuous signal that occupies spectrum while in digital broadcasting it is discrete (Agona and Sansa Otim, 2012). Analogue television broadcast was in existence since the inception of television in the 1920s until digital migration that commenced after 2007. Digital broadcasting has several advantages over its predecessor analogue broadcasting that include quality signal

on audio and video, presence of more content providers and efficient utilization of spectrum. Digital migration is the deliberate and systematic processes by which broadcasting services offered on analogue networks are transferred to digital networks over a specific period (MoICT, 2009). The rationale behind the migration process according to Aaronson (2018) is to replicate all analogue signals on digital networks. For a number of countries, the move to digital broadcasting has been plagued by failure to cover areas that analogue broadcasts used to cover.

Coverage of digital television broadcasting services is defined as the geographical area covered with digital television broadcasting signals streaming in the right broadcast quality. The broadcast range is the service area that a broadcast station is able to reach. It is generally the area in which a station's signal strength is sufficient for most receivers to decode it. The primary service area is the area served by a station's strongest signal (Sussan & Acs, 2017). Because digital migration is relatively new, there are many attempts to understand its successes and limitations.

The deliberation on the migration from analogue broadcasting to digital broadcasting was initiated long before the 90's in symposiums organised by the International Telecommunications Union (ITU) of the United Nations. The ITU coordinates the use of radio spectrum and assigns satellite orbits globally as it develops policy and standards that guide the improvement of telecommunications infrastructure. Many countries signed a resolution on the 16th June, 2006 at an international ITU conference in Geneva to migrate from analogue to digital broadcasting by 17th June 2015.

Problem Statement

Although there was a hasty consensus at the ITU on migrating from analogue to digital broadcasting, it has been noted by Adda & Ottaviani (2015) and Kapoor, Mittal & Dhiman (2016) that the process fell short of many of its objectives such as timeline delivery and other expectations. To lend some credence to this disquiet, many countries failed to deliver on the set timelines albeit in varying degrees. Tsebee (2014) noted that for example, the United States set the deadline for transition to be February 2009; Nigeria set theirs to be June 17, 2012; Finland February 2008; the Netherlands December, 11,2006; United Kingdom, December 2012, and Japan July, 2011. The reasons why digital migration was haphazardly implemented remain contentious. Many studies on this process have sought with limited success, to understand the different factors that contributed to the sloppy implementation of the transition and the policy of digital broadcasting.

Study Objectives

The review is based on four objectives given below:

Objective 1 is to examine the cost of digital migration and coverage of digital television broadcasting services; objective 2 is to analyze consumer awareness and coverage of digital television broadcasting services; objective 3 is to examine subscription payments and coverage of digital television broadcasting services; and objective 4 is to analyze special interactive services and coverage of digital television broadcasting services. At the end of the review, it is hoped that an evaluation of studies that examine digital migration and coverage of digital television broadcasting services would have been conducted.

Overview of Systematic Literature Reviews (SLRs)

Systematic Literature Review (SLR) is an approach to collect, evaluate critically, integrate and present findings derived from studies conducted on a particular topic or research question (Pati and Lorusso,

2019). It differs from narrative literature review, which mainly assesses and describes the thematic content of particular studies on a given topic.

Systematic Literature Reviews follow standardized methodology and are normally taken through steps of identifying a research problem, determining selection and validation criteria, analysis and presentation of data and findings (Nightingale, 2019; Xiao and Watson, 2019; Pati and Lorusso, 2019; and Castro, 2006). Although Lame (2019) argues that Systematic Literature Reviews (SLRs) must include all published evidence on the topic, this review has not done that. It has mainly relied on electronic sources that are available on online databases such as journal publications, books and reports. This does not mean then that it falls short of a comprehensive review. Instead, the review is undertaken to sample studies that demonstrate the trends in research on digital migration and coverage of digital television services across the world. It is assumed that by looking at the main preoccupations of different studies on this relationship, the research can be generalized to the larger body of work that exists on this topic.

Because Systematic Literature Reviews (SLRs) tend to synthesize knowledge from a prior body of research (Okoli, 2015), the paper does a cross-cutting comparison of all the studies reviewed to establish the interrelations between them in the areas of periodization, content scope, geographical scope, methodology and gaps. This approach is in line with Robinson and Lowe's (2015) recommendation that the review identifies the tools used for data extraction and the reasons for selecting them.

Methodology

Longitudinal Design

The review was constructed as a longitudinal design. Longitudinal design measures the characteristics of study objects over time to follow up and examine change and variation (Salkind, 2010; Caruana, Roman, Hernández-Sánchez, and Solli (2015)). It was longitudinal because it arranged the different studies reviewed over a period of years in which they had been published one year after the other. Thereafter it examined the trends that emerged out of a 7-year period (2010 to 2018).

Tools for Data Consideration and Extraction

Search Engines were the main tools of data collection in the sense that they led to the different databases that carried specific literature related to the objectives of this study and the inclusion criteria mentioned below. According to Hussain (2015) internet search engines are the biggest source of information and the quickest means to access information that may be stored in libraries and elsewhere. They also help to find pin-pointed information which can be time saving. This was the principal consideration for using a search engine to locate databases with studies on digital migration and coverage of digital television services.

Sampling

The sampling was purposive in that the selection of literature for review was determined to be related to the objectives of the study. Purposive sampling studies for inclusion in such reviews helps the research to select a manageable amount of data (Ames, Glenton and Lewin, 2019). Some material that was reviewed was discarded because it did not fit in the inclusion criteria listed below.

Inclusion Criteria

According to Meline (2006), the process of selecting studies for systematic review and meta-analysis is complex, with many layers and so must have a clear criterion for selection. The inclusion criteria in this review involved obtaining publications that were generated by the keywords based on the objective of the study. Inclusion criteria is a process of determining which literature is eligible for review. Normally it is conducted through a search of multiple databases to determine studies that can be potentially used (see also Meline, 2006). As part of the inclusion criteria, online academic databases were searched with the main keywords being digital migration, followed by coverage of digital television broadcasting services, cost of digital migration, customer awareness of digital migration, subscription payments and digital migration, and special interactive services and digital migration. The initial search generated 13.400.000 results (in 0,57 seconds). These results are narrowed down to more specific terms as relayed by the keywords.

Being an academic paper, the sampling also excludes studies that are popular in nature and do not follow standard and rigorous procedures of publishing academic work. Thus, more attention is given to journal papers, books and technical papers that can be relied upon for comprehensive and reliable empirical data.

Analysis

The literature is reviewed with structured analysis focusing on periodization, geographical scope, methodological orientation, content scope, and gaps established in the study. This is to ensure that the study does not only focus on theme, which can overlook some of the critical elements of research that need to be examined and evaluated.

Findings

Studies on digital migration and coverage of digital television services that were analyzed were published in the period 2010 to 2018. In order to explore the costs of digital migration and coverage of digital television broadcasting services; consumer awareness and coverage of digital television broadcasting services; subscription payments and coverage of digital television broadcasting services; and special interactive services and coverage of digital television broadcasting services, 35 publications,have been analyzed. These studies were conducted in several countries including but not limited to Kenya, USA, Tanzania, and Uganda, as shown in **Table 1** below.

Table 1: *Number of publications per country and period*

Country	**Number of publications**	**Periods**
Australia	1	2012
Botswana	2	2012
Canada	1	2016
Kenya	4	2013, 2014, 2016
South Africa	2	2013
Tanzania	3	2014, 2017, 2018
UK	1	2014
USA	4	2013, 2014, 2015, 2016

Uganda	3	2011, 2016
General	14	2010, 2011, 2013, 2014, 2015, 2017
Total	**35**	

Furthermore, these studies reviewed adopted various research designs which included: descriptive design (28 studies), longitudinal design (1 study), correlational design (3 studies), cross-sectional design (1 study), correlational and case study designs (1 study), and correlational and cross-sectional study designs (1 study).

Objective 1: To examine the cost of digital migration and coverage of digital television broadcasting services

Out of 35 studies, 16 have been analyzed to explore the categories of costs of digital migration and coverage, the effects of these costs and the mitigation measures. The rest (19) have not been considered since they did not investigate issues related to the cost of digital migration and coverage. The costs established in the 16 studies were mainly related to equipment for broadcasters, equipment for consumers, and staffing. The costs of digital migration and its effects on customers and broadcasters is illustrated in **Figure 1** below.

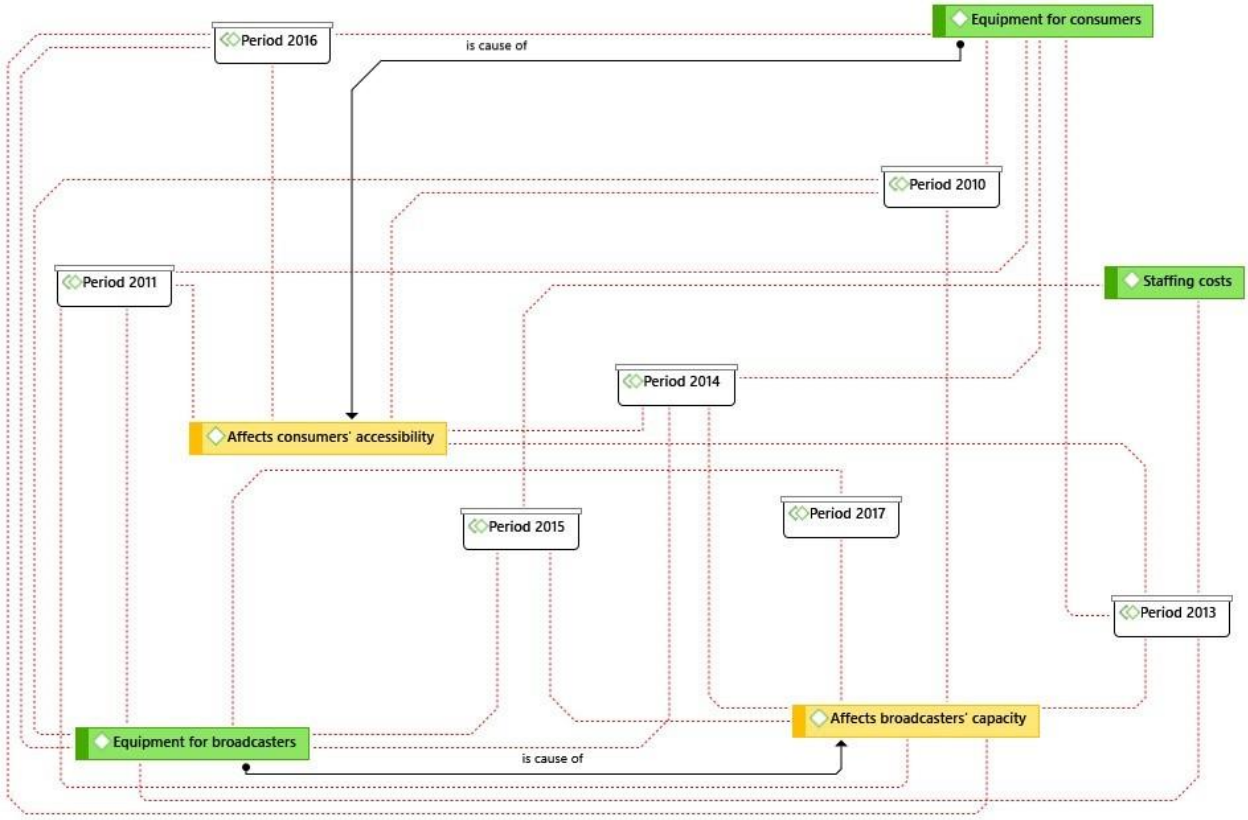

Figure 1
(cost of digital migration and coverage of digital television broadcasting services)

Notably, only 2 out of the 16 studies specified the exact cost in money terms, that is USD 5 billion, and USD 40 million to USD 50 million. The costs indicated in **Figure 1** above, affected broadcasters' capacity and consumers' accessibility. These effects were established in all the study periods.

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Furthermore, out of 16 studies analyzed, only 6 stated mitigation measures for costs incurred on digital migration and coverage. These measures mainly included: reduction of prices and a corresponding media campaign about digital migration and coverage; and underwritten costs by broadcasters and government.

Objective 2: To analyze consumer awareness and coverage of digital television broadcasting services

Out of 35 studies, 12 have been analyzed to explore customer awareness on coverage of digital television services, geographical patterns in customer awareness, and effects of customer awareness on coverage of digital television services. The rest (23) have not been considered since they did not investigate issues related to customer awareness on coverage of digital services. The modes of awareness established in the 12 studies were mainly: websites, newspapers, flyers, integrated approach, stakeholder engagement, marketing (advertisements, call centres, websites), outreach (in home installations, walk in help centers), communication and written publications. The geographical coverage and period of studies on customer awareness and its effects on coverage of digital television services is illustrated in **Figure 2** below.

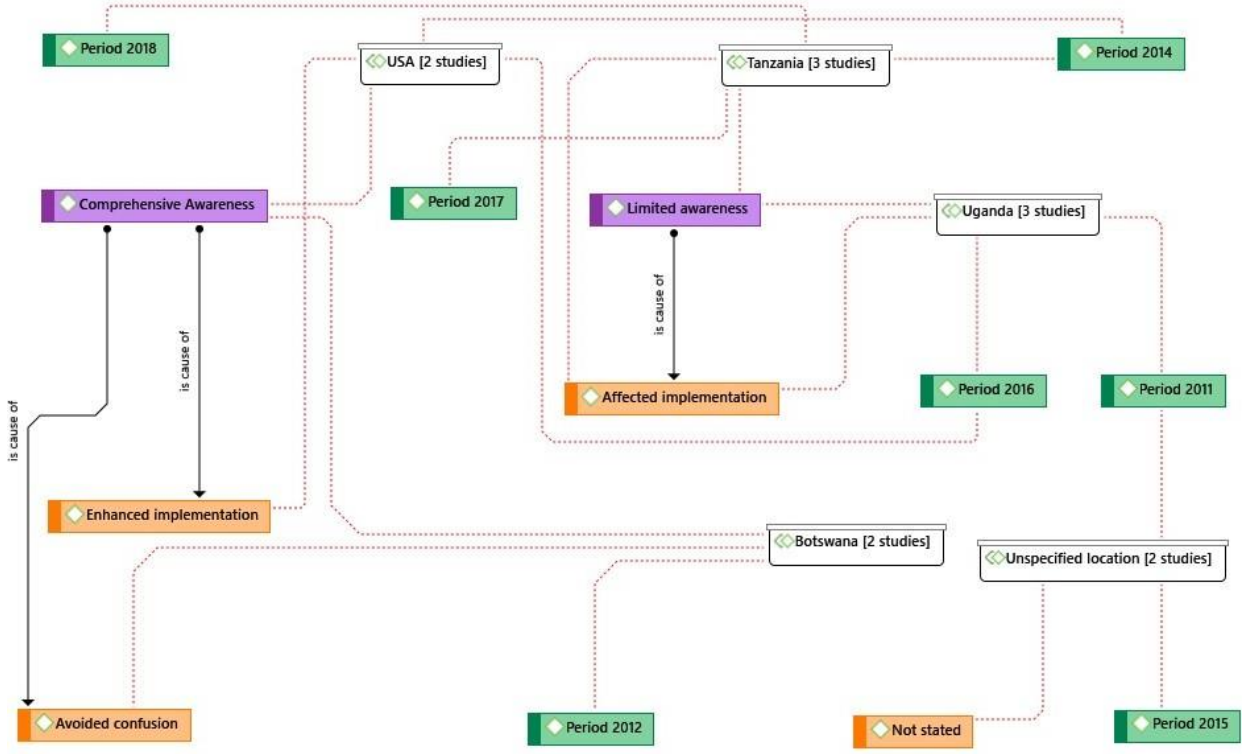

Figure 2
(consumer awareness and coverage of digital television broadcasting services)

As shown in **Figure 2** above, limited customer awareness was reported in studies conducted in Uganda and Tanzania while comprehensive awareness was reported in studies conducted in Botswana and USA. Two studies neither indicated customer awareness level nor geographical scope (country). The six studies that reported limited awareness also revealed that, limited awareness affected implementation of digital migration and coverage. On the other hand, one study revealed that, comprehensive awareness enhanced

implementation of digital migration and coverage of digital television services. Four out of 12 studies did not state any effect of customer awareness on coverage of digital television services in the various periods.

Objective 3: To examine subscription payments and coverage of digital television broadcasting services

Out of 35 studies, 8 have been analysed to explore subscription payments and coverage of digital services, and geographical patterns in customer awareness. The rest (27) have not been considered since they did not investigate issues related to subscription payments of digital services. The geographical coverage and period of studies on subscription payments of digital television services is illustrated in **Figure 3** below.

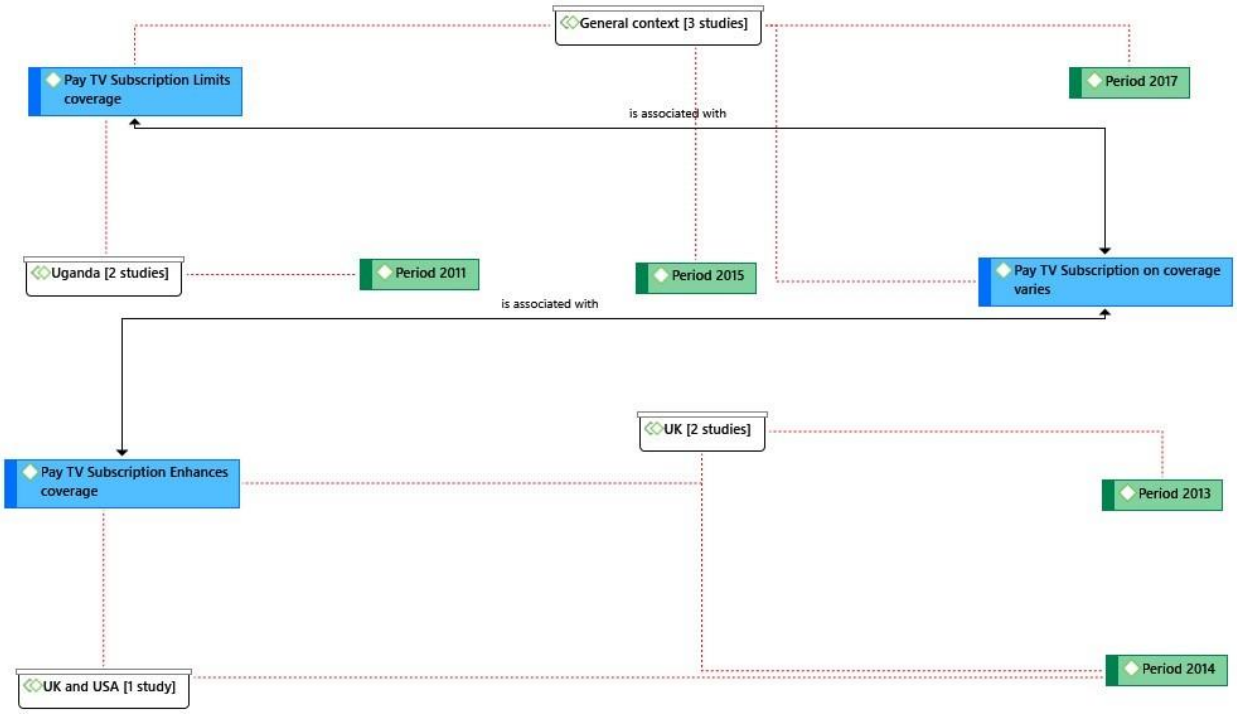

Figure 3

(subscription payments and coverage of digital television broadcasting services)

As shown in **Figure 3** above, payment of TV subscription either limited coverage of digital television services which was observed in Uganda or enhanced coverage of digital television services as observed in the UK and USA. In the general context, payment of TV subscription either limited or enhanced coverage.

Objective 4: To analyze special interactive services and coverage of digital television broadcasting services

Out of 35 studies, 11 have been analysed to explore special interactive services and coverage of digital services, and geographical scope of these services. The rest (24) have not been considered since they did

not investigate issues related to special interactive services. The geographical coverage and period of studies on special interactive services and coverage of digital television services is illustrated in **Figure 4** below.

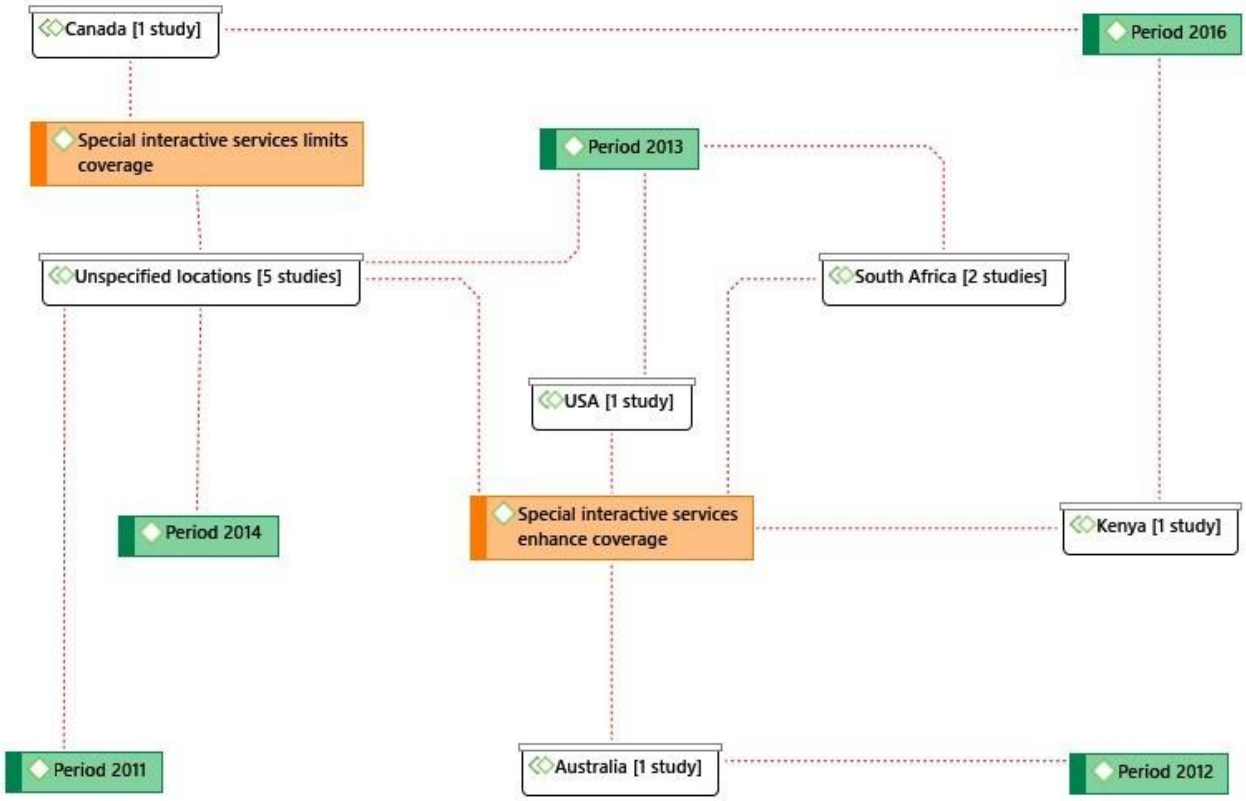

Figure 4
(special interactive services and coverage of digital television broadcasting services)

As shown in **Figure 4** above, special interactive services either enhance (8 studies) or limit (3 studies) coverage of digital television services. Notably in 5 out of 11 studies analysed, no specific geographical location was stated.

Discussion

Periodization

In terms of periodization, most (8) of the studies reviewed were published in 2013, two years to the deadline set by the International Telecommunications Union (ITU) for the transition to digital migration amongst member countries. They were followed by studies published in 2014, which were 6 and those published in 2016 (5). 4 of the studies were from 2011 and 2015 each, while 3 were published in 2017. In 2012, 2 of studies in the review were published while 2010 and 2018 had 1 of the studies each. These trends indicate that many of the studies were concentrated around 2015, the period of the ITU deadline. As research, they sought to evaluate the extent of implementation of the deadline and the successes and challenges that were experienced by different countries.

Geographical Scope of the Studies

The geographical scope of the studies is relatively limited. Vanderplank (2013), Galperin (2014), Einstein (2015) and FCC (2016) research on USA, Levy, Ford-Livene & Levine (2013), Mansell (2014), Noam (2016), Ndavula and Lidubwi (2016) cover Kenya, Alexander & Cunningham (2014), UNCTAD (2017) and Skinner (2018) focus on Tanzania, and Imaka (2011), Oluka (2011) and Obonyo (2016) study Uganda. Bekker (2012) and Ngcaba (2012) discuss digital migration in Botswana, while Marks (2013) and Samsel & Perepa (2013) study South Africa. Two studies, one by Tanner, Green and Burns (2012) focuses on Australia while another by Aarreniemi-Jokipelto (2016) makes observations about Canada.

From the geographical scope of these studies, only 9 countries are specifically discussed across all the studies reviewed, which are: Uganda, Kenya, Australia, USA, South Africa, Canada, Botswana, Tanzania, and UK. Considering that there are at least 193 members of the International Telecommunications Union (ITU) (International Telecommunications Union (ITU) N/D) a lot more work needs to be done to evaluate the relationship between digital migration and coverage of digital television services across the other members of ITU.

Content Scope

The review examined each study in relation to a specific objective. Thus, it looked at each objective and determined which studies focused on examining that particular issue. On objective 1: to examine the cost of infrastructure and coverage of digital television services, almost half of all the studies explored the relationship between digital infrastructure and coverage of digital television services. Berger (2010); Imaka (2011); Oluka (2011); Todreas (2013); European Commission (2013); Levy, Ford-Livene & Levine (2013); Alexander & Cunningham (2014); Bajon & Villaret (2014); Mansell (2014); Shapiro & Varian (2015); Einstein (2015); Bourgault (2015); FCC (2016); Noam (2016); Obonyo (2016) and UNCTAD (2017) specifically tackled cost of infrastructure and coverage of digital television services.

The studies in some instances differ on the type of costs that affect coverage of digital television studies. For example, 14 studies out of the 35 in the review list cost of equipment as the main cost, 2 studies focus on staffing costs, and 1 study dwells on implied cost. In more detail the review identifies that the particular costs stated by the different studies are: equipment for broadcasters (7 studies: Oluka (2011); Todreas (2013); Alexander & Cunningham (2014); Einstein (2015); Bourgault (2015); FCC (2016); and UNCTAD (2017)), equipment for consumers (6 studies: Imaka (2011); Levy, Ford-Livene & Levine (2013); Bajon & Villaret (2014); Mansell (2014); Noam (2016) and Obonyo (2016)), equipment for broadcasters and consumers (1 study: Berger (2010)), and staffing costs (2 studies: European Commission (2013) and Shapiro & Varian (2015)).

Amongst the studies reviewed, only two (Bourgault (2015) and FCC (2016)) presented the actual specification of cost. The rest of the studies did not specify, which is a gap found in their research. For the case of the effect of various costs on coverage of digital television services, more studies approached this

question. 8 studies (for example Oluka (2011); Todreas (2013); European Commission (2013); Alexander & Cunningham (2014); Shapiro & Varian (2015); Bourgault (2015); FCC (2016); and UNCTAD (2017)) noted that costs affected broadcaster's capacity to continue their services, while 6 studies (Imaka (2011); Levy, Ford-Livene & Levine (2013); Bajon & Villaret (2014); Mansell (2014); Noam (2016) and Obonyo (2016)) stated that costs of consumers affected their accessibility to digital television services. Berger (2010) indicates that cost affects both broadcasters and consumers while Einstein (2015) did not show any effect of cost. The burden of cost therefore appears to be more on broadcasters and it could be the most pressing challenge within the costs of digital migration, that needs to be addressed.

While costs were incurred in different countries reviewed in these studies, there were only 6 studies with findings that showed how the costs were mitigated. With the exception of Imaka (2011), Levy, Ford-Livene & Levine (2013), Mansell (2014), Einstein (2015), Noam (2016) and Obonyo (2016), all the other studies on cost and coverage of digital television services do not offer mitigation measures for costs. Imaka (2011) and Obonyo (2016) separately observes that costs of equipment for consumers was mitigated by a reduction of prices and a corresponding media campaign about the price reduction. Levy, Ford-Livene & Levine (2013), Mansell (2014) and Naom (2016) also highlight the reduction of prices as ways through which cost was mitigated while Einstein (2015) says cost was underwritten by government and private broadcasters. By discussing how costs that impede coverage of digital television services can be managed, the respective studies offer practical solutions for countries faced with the burden of cost.

The relationship between customer awareness and coverage of digital television services is discussed by 12 of the studies reviewed (Oluka (2011); Imaka (2011); Armstrong and Collins (2011); Ngcaba (2012); Bekker (2012); Alexander & Cunningham (2014); Galperin (2014); Einstein (2015); FCC (2016); Obonyo (2016); UNCTAD (2017) and Skinner (2018)). The inclination in these studies is towards the type of awareness and its effect in specific countries. Three studies (Imaka (2011); Oluka (2011) and Obonyo (2016)) show that there was lack of awareness in Uganda and another three studies (Alexander & Cunningham (2014); UNCTAD (2017) and Skinner (2018)) indicate that there was lack of awareness in Tanzania. On the contrary, two studies about USA (Galperin (2014) and FCC (2016)) show that there was adequate awareness created about digital migration, and in Botswana, another two studies (Bekker (2012) and Ngcaba (2012)) confirm that there was sufficient awareness. This implies that although there are indications that there was more awareness created by developed countries about digital migration, evidence from Botswana demonstrates that some developing countries did create awareness about digital migration.

Lack of or limited customer awareness was found by these studies to have negatively affected coverage of digital television services in different areas or can potentially affect coverage of digital television services negatively (Imaka (2011); Oluka (2011); Alexander & Cunningham (2014); Obonyo (2016); UNCTAD (2017) and Skinner (2018)). On the other hand, Ngcaba (2012) states that customer awareness prevented confusion during the implementation of digital migration in Botswana.

When it comes to subscription payments and how they impact on coverage of digital television services, 8 studies reviewed address this issue and include: Imaka (2011); Oluka (2011); Levy, Ford-Livene & Levine (2013); Galperin (2014); Goodwin (2014); Tilson, Lyytinen & Sorensen (2015); Ndemo & Weiss (2017) and Quinones, Heeks & Nicholson (2017). In their handling of this subject, 4 studies (Imaka, 2011; Oluka, 2011; and Tilson, Lyytinen & Sorensen, 2015) indicate that subscription payments limit coverage of digital television services, because only a few can afford. 3 of the studies (Levy, Ford-Livene & Levine (2013); Galperin (2014); and Goodwin (2014) argue that subscription payments enhance

coverage of digital television services. 1 study by Quinones, Heeks & Nicholson (2017) states that the effect of subscription payment on coverage of digital television services varies from country to country. It should be noted that the countries listed by the studies that suppose that subscription payments limit coverage of digital television services are mainly developing countries, while those that suggest that it enhances coverage are on developed countries.

For the case of special interactive services, 11 studies ((Burns (2011); Tanner, Green & Burns (2012); Vanderplank (2013); Samsel & Perepa (2013); Marks (2013); Hsu Hwang, Chang & Chang (2013); European Commission (2013); Kruger and Steyn (2013); Kothari & Bandyopadhay (2014); Aarreniemi-Jokipelto (2016) and Ndavula and Lidubwi (2016)) were found to explore their contributions to coverage of digital services. In relation to their actual impact, 7 studies ((Burns (2011); Tanner, Green & Burns (2012); Vanderplank (2013); Samsel & Perepa (2013); Marks (2013); Hsu Hwang, Chang & Chang (2013) and European Commission (2013)) show that Special Interactive services improve coverage by enabling access for disabled people. However, 4 studies differ. These studies by Kruger and Steyn (2013); Kothari & Bandyopadhay (2014); Aarreniemi-Jokipelto (2016) and Ndavula and Lidubwi (2016) indicate that either special interactive services are either not adequate or are restricted to pay TV channels making it difficult for disabled people to utilize them.

Although many (5) of the studies on special interactives services and coverage of digital television services are not specific to a particular country or geographical location, two of the studies (Marks (2013) and Samsel & Perepa (2013)) focus on South Africa, one study (Tanner, Green & Burns (2012)) is on Australia, another study (Vanderplank (2013)) covers USA, while one study analyses Kenya (Ndavula and Lidubwi (2016)) and another by Aarreniemi-Jokipelto (2016) refers to Canada. It may seem as if only these few countries have explored with Special Interactive Services in digital migration.

It was also found that some studies cut across the content related to the different objectives of this review. This was the case for Imaka (2011) and Oluka (2011) which both discussed cost of infrastructure, customer awareness and subscription payments. European Commission (2013) addressed issues of both cost of infrastructure and special interactive services while Levy, Ford-Livene & Levine (2013) and Galperin (2014) covered cost of infrastructure and subscription payments. In Alexander & Cunningham (2014), Einstein (2015), FCC (2016), Obonyo (2016), and UNCTAD (2017) cost of infrastructure is examined with customer awareness.

Methodological Orientations of the Studies

With the exception of Berger (2010) which was a longitudinal study, and Oluka (2011), and Kruger and Steyn (2013) which were correlational studies, most of the other studies are descriptive. Only a handful (Alexander & Cunningham (2014) and UNCTAD (2017)) have some elements of cross-sectional design.

Gaps

The following gaps were identified in the studies analyzed. 10 of the studies ((Berger (2010); Armstrong and Collins (2011); Burns (2011); European Commission (2013); Bajon & Villaret (2014); Kothari & Bandyopadhay (2014); Bourgault (2015); Tilson, Lyytinen & Sorensen (2015); Ndemo & Weiss (2017); and Quinones, Heeks & Nicholson (2017)) do not have or give a geographical scope. Considering that digital migration is being implemented in specific country contexts, it may be difficult to apply their findings to other countries. For the studies that state their geographical scope, they are still restricted to one country context, and this limits their studies to the specific circumstances of a single geographical area. Some of these geographical contexts are USA (FCC (2016); Einstein (2015); Galperin (2014); Vanderplank (2013), Uganda (Obonyo (2016); Imaka (2011)

and Oluka (2011)), Botswana (Ngcaba (2012); Bekker (2012)), Kenya (Noam (2016); Mansell (2014)), Tanzania (Skinner (2018); UNCTAD (2017)), South Africa (Marks (2013); Samsel & Perepa (2013)), Australia (Tanner, Green & Burns (2012), UK (Goodwin (2014).

With the exception of Einstein (2015); Shapiro & Varian (2015); Bourgault (2015); Tilson, Lyytinen & Sorensen (2015); Aarreniemi-Jokipelto (2016); FCC (2016); Noam (2016); Obonyo (2016); Ndavula and Lidubwi (2016); Ndemo & Weiss (2017); Quinones, Heeks & Nicholson (2017); UNCTAD (2017) and Skinner (2018), all of the other studies were carried out and published before the ITU deadline, which makes them tentative studies. It is difficult to tell whether the same issues surrounding digital migration and coverage of digital television services continued to play out after the studies have been published and before the deadline set by ITU.

Some of the studies (for example Berger (2010) and UNCTAD (2017)**)** do not show any mitigation of cost, nor do they mention alternatives or recommendations to mitigate cost. This trend is also reflected in studies by Oluka (2011), Todreas (2013), European Commission (2013), Alexander & Cunningham (2014), Shapiro & Varian (2015), Bourgault (2015), FCC (2016) and UNCTAD (2017). Despite showing that there was reduction in prices(cost) of decoders to boost consumption in Uganda, Obonyo (2016) does not show why it did not eventually result in an increase in consumption of digital television services.

Other studies (such as Imaka (2011) and Oluka (2011)) overlook other costs beyond the costs they point out. This gives a false impression that the costs that they highlight are the only costs of digital migration. European Commission (2013), Todreas (2013) and Bajon & Villaret (2014), Mansell (2014), Shapiro & Varian (2015), Obonyo (2016) and UNCTAD (2017) equally narrow cost to a specific item. Furthermore, the studies that indicate that there was awareness (for example Armstrong and Collins (2011), Galperin (2014), Einstein (2015) and FCC (2016) do not show the results or outcomes of the customer awareness campaigns that were conducted where they were conducted. UNCTAD (2017) and Skinner (2018) also do not show how or if the issue of lack of awareness was resolved. Einstein (2015) writes of customer awareness strategies but does not specify which particular strategies are involved.

While they state that special interactive services enhance coverage of digital television services, Tanner, Green & Burns (2012), Vanderplank (2013), and European Commission (2013) focus only on developed countries to prove their case. They do not provide evidence of the same in developing countries that have limited technology and resources. The same can be said of Galperin (2014), and Goodwin (2014) who note that Pay TV subscription enhances coverage of digital television coverage services, yet their studies are conducted in or refer mainly to developed countries. Quinones, Heeks & Nicholson (2017) do not show the outcomes or results of the initiatives around Pay TV.

Conclusions

From the review, it is concluded that most of the studies sampled were published before the deadline set by ITU on digital migration. They can therefore not be relied upon for current data on digital migration and coverage of digital television services in different countries. However, as a benchmark for what countries go through when implementing the policy in different stages, they can be a good resource. There is need for more current studies on digital migration and coverage of digital television services.

The study also concludes that the geographical scope of the sampled studies is limited to only 9 countries, yet the membership of the ITU is 193 countries. By having more case studies of countries that have implemented digital migration, such studies can be able to make better conclusions on the relationship between digital migration and coverage of digital television services in different country contexts.

Another conclusion drawn from the review is that costs of digital migration affect coverage of digital television countries in many countries. These costs refer to costs of infrastructure, costs of equipment and costs of awareness. Measures to mitigate the smooth implementation of digital migration should be considered in a subsidized form from government and hybrid models that cojoin the private sector and government in funding the costs of this process.

Most of the studies reviewed are descriptive in design. This methodology can be restrictive because it does not allow the researchers to unearth hidden factors or the depth of visible factors that may be affecting digital migration. Other designs need to be integrated in future studies on digital migration and coverage of digital television services.

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