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# Interactivity, digital dividend and information in the implementation of DTT. The case study of Ecuador

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## Abstracts

**Introduction.** This research study seeks to establish the reason why interactivity is absent from Ecuador’s digital terrestrial television (DTT) broadcasts; to identify the use given to the digital dividend; and to determine the knowledge the Ecuadorian population has about the implementation of DTT. **Method.** The study is based on the review of governmental documents, interviews with representatives of the sectors involved and surveys. **Results.** Interactive applications linked to public services are being developed at universities but they are not been integrated in DTT broadcasts. The digital dividend will be used for mobile broadband. There is a lack of information campaigns about the features of DTT. **Conclusions.** Ecuador has the capacity to create interactive applications; the benefits of interactivity are conditioned to the universal acceptance of the middleware language. The allocation of the digital dividend for its exploitation by private companies and the development of IPTV have led to an uncertain future about users’ consumption forms. The responsibilities and cooperation mechanisms of the government and private companies to promote the transition to DTT among the population are yet to be defined.

## Keywords

Digital television; interactivity; democratisation; information; audiovisual; public policy.

## Contents

1. Introduction. 2. Methods. 3. Results. 3.1. Interactivity development. 3.2. Digital dividend. 3.3. Awareness of DTT. 3.4. Discussion. 3.5. Conclusions. 4. List of references.

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## 1. Introduction

Regular digital terrestrial television (DTT) broadcasts began in May 2013 in Ecuador. However, the transition to DTT in the Andean nation has fallen into contradictions as it occurred in Spain where the analogue status quo was transferred to the digital stage of television (Bustamante in Albornoz and García-Leiva, 2012: 17), i.e. more channels did not translate into better or more diverse content (Román, 2012: 806). The transition to DTT in Spain failed to meet the social needs and involved some paradoxes, such as the discretionary allocation of frequencies and the failure to fulfil the expectations of interactivity (Bustamante, 2009: 9). This situation was reflected in such headlines as this: *Los canales pirata invaden la TDT* (“Pirate channels invade DTT”) (*El País*; 2012, 23 November). An evaluation of the transition to DTT in Spain concluded that the process suffered from economic problems and the lack of attention to the development of interactive services (Zallo, 2011, in Videla and Costa, 2012: 41).

Interactivity, one of the main features of DTT, requires production teams that involve journalists, designers and ICT experts capable of developing contents for new platforms. Ecuadorian television developed interactive applications, such as SMS messages, phone calls and mailing services, before the implementation of DTT and used them in news programmes, showbiz and sports shows (Bucheli, 2009: 29 - 30).

The Japanese-Brazilian DTT standard adopted by Ecuador uses the middleware called Ginga for its interactive applications. “Ginga-based software applications allow expanding viewer’s experience, access data and interaction with contents” (Becerra, García-Castillejo, Santamaria and Arroyo, 2012: 158). Unfortunately, the first regular broadcasts of DTT in Ecuador were not accompanied by interactive applications.

The type of interactivity that Ecuador knows is the one that “cable and satellite pay TV is delivering [to] access certain services, that allow viewers to do more than just zapping and choosing what to watch” (Fernández and Goldenberg, 2008: 7). Interactivity requires predisposition to action, and demands viewers to change and develop an active attitude. DTT content providers will have to offer products that balance entertainment and interactivity (Fernández, 2005). The countries that have begun broadcasting DTT face the challenge of employing interactivity effectively.

Ideally, citizens would interact with the screen, would search for and obtain information, and would exercise their citizenship (Caffarel, 2007: 17). Interactive applications do not ensure interactivity by themselves; they depend on the decisions of television stations, and on regulation and audiovisual policies in general (Cobo, 2005 in Fernández and Goldenberg, 2008: 10).

The technological reasons why interactive applications for TV have not been massively disseminated include the limited processing capabilities of the set-top boxes and their narrow return channel. If DTT wants to deliver a platform with good services, it will be necessary to have a set-top box [decoders] with greater capabilities. Currently, there are still difficulties to integrate return channels; and a solution to this is to download all the interactive content in the set-top box, so that viewers can interact with it [...] This type of service, known as the walled garden is a solution to the lack of infrastructure [...] but its possibilities are limited compared with the possibilities that the Internet offers. (Fernández and Goldenberg, 2008: 11)

This context seems to require “an inclusive migration programme that promotes universal access, the compulsory establishment of open standards that contribute to the interoperability of software, middleware and hardware [...] the incorporation of operators and the simplification of access for users” (Bizberge, Krakowiak, Labate and Morone, 2013: 204), because technology, despite not being the ultimate solution to social inequity, is an opportunity for the exercise of rights, especially those of young people (Tripp and Herr-Stephenson, 2009: 1193).

The width of each analogue television channel is 6 MHz, but it becomes narrower when transformed to the digital format. The freed space is what is called the digital dividend. The use of the digital dividend is a subject of debate among public and private stakeholders because it can reduce the digital divide through state-operated public services or concessions.

DTT has the potential to give the population access to contents and information in interactive environments, and this would contribute to the broader exercise of duties and rights by citizens. In this sense, this study investigates the macro elements linked to public policies that will define the forms of television consumption. The objectives of this research study are: to establish the reason why interactivity options are not present in DTT broadcasts; to identify the use given to the digital dividend; and to determine how much does the population know about the implementation of DTT in Ecuador.

The development of interactivity is secondary in comparison to the interest of the electronics industry and the government in making the radio spectrum profitable, which is the potential result of the digital dividend (Albornoz and García-Leiva, 2012: 29; Caffarel, 2007: 11). There are questions that demand global answers for Latin America: Who benefits from the spectrum savings resulting from the introduction of digital technology in television services? What will be the use of these spectrum savings? In short, what do we want DTT for? (Becerra, García-Castillejo, Santamaria and Arroyo, 2012: 156).

The take-off stage of DTT faces challenges and opportunities to gain more space for communication. Ecuador’s Constitutional Law of Communication, effective since June 2013, develops, protects and regulates the rights to communication and sets the conditions under which DTT must be developed. However, despite this framework of guarantees,

...the transition process from analogue to digital terrestrial television has been marked from the outset by the interest of governments in taking advantage more efficiently of the spectrum currently used for analogue television, to expand the range of channels, and to promote the new services and facilities that digital television will offer (interactivity and later Internet). (Caffarel, 2007: 11)

The most coveted frequencies by the telecommunications operators are those used for broadcast television, which contributes to the final transition to DTT. After the digitisation process there would be possibilities for using the digital dividend, but defining its use involves adopting public policies to decide what kind of interests and operators will prevail (economic or social interests? traditional or new operators?) or whether there will be opportunities for new interactive contents and services (Albornoz and García-Leiva, 2012: 36).

A brief look at the experiences of some American countries shows that in Mexico the digital dividend, the 700 MHz band, is one of the main benefits of the introduction of DTT. The United

States of America auctioned the band in March 2008 and obtained about 20 billion USD (Covi in Albornoz and García-Leiva, 2012: 158). Mexico's Federal Telecommunications Commission pointed out that if the band were auctioned it would generate between 3 and 4 billion USD and would allow a single company to provide broadband services (MediaTeleCom, 2013).

In Argentina, article 4 of the Law of Audiovisual Communication Services provides a generic definition of the term digital dividend that does not indicate whether the spectrum released in the UHF band will continue to be attributed to audiovisual communication services or, on the contrary, will be attributed to the broadband and mobile telephony services offered by telecommunications companies, or, as a third option, divided into parts to offer the best of both types of services (Mastrini, Becerra, Bizberge and Krakowiak, 2012: 76).

Ecuador's National Institute of Statistics and Censuses (INEC) indicates that in 2010 85.1% of the population had a TV set in their homes, and that 99.2% of the households devoted at least one hour a day, mostly at night, to watch TV on weekdays. Television is an element of socialisation that acts on the community and is a free resource to access information (Bucheli, 2009: 26; Orozco and Vassallo, 2011: 263). It is also important to note that 58% of Ecuadorians have access to the Internet (Ayala and Herrera, 2013: 241).

To advance the use of the radio spectrum, President Rafael Correa, through the Executive Decree No. 681 of 18 October 2007, began the DTT implementation process in Ecuador. The telecommunications authorities proposed the 'Plan for the development of DTT capacities' to formulate effective ways to exercise the right to communication, in keeping with the spirit of the Constitution.

The transition to DTT in Ecuador involves an important technological and socio-economic impact because:

...many and varied areas of the government, the private sector, the industry and commerce are concentrated around this transition, above all, because of the fact that it directly influences citizens, in the sense that television disseminates what happens at the local, regional, national levels, and because it is considered that the state needs to develop an ordained process with the greatest positive impact for the Ecuadorian state, through the regulation and control of telecommunications and broadcasting" (CITDT - Grupo I+D+I, 2012: 13).

The set of actions developed to implement DTT in Ecuador are detailed in table 1.

**Table 1. Ecuador’s DTT implementation schedule**

LEGAL BASES AND DATES	PROPOSALS
Executive Decree 681, of 18 October 2007.	Research on new broadcasting and television technologies will be only carried out by the Superintendence of Telecommunications; analysis of the benefits of digitisation, taking into account global standards.
STL-2008-00116 of 19 February 2008.	The Superintendent of Telecommunications delegates the Institutional Commission to carry out testing and evaluation of DTT standards.
Resolution ST-2009-0038, of 5 February 2009.	The Superintendent of Telecommunications carries out research and analyses to define and implement DTT.
9 December, 2009	Testing of DTT broadcasts begin
Resolution 84-05-CONATEL-2010, of 25 March 2010.	The National Telecommunications Council (CONATEL) adopts the ISDB-T standard with innovations developed by Brazil.
Interministerial memoranda of 26 March, 2010.	The Ministry of Telecommunications and Information Society (MTSI) signs agreements with the Ministry of Internal Affairs and Communications of Japan and the Ministry of Communications of Brazil to establish the bases for the implementation of DTT.
Resolution RTV-596-16-CONATEL-2011 of 29 July 2011	CONATEL delegates MTSI to lead and coordinate the DTT implementation process.
Interministerial agreement 170, of 3 August 2011	Creation of the Interinstitutional Technical Committee for the Introduction of DTT (CITDT).
Resolution RTV-039-02-CONATEL-2012 of CONATEL, of 25 January 2012	The implementation of DTT is given the status of “national significance” in the field of telecommunications.
May 2013	Regular DTT broadcasts in high definition begin

Source: MTSI, SUPERTEL, CONATEL

Source: Authors’ own creation

The analogue switchover in Ecuador will be progressive (see table 2). The Interinstitutional Technical Committee created for the introduction of DTT (CITDT) pointed out that in 2018 would be better conditions to carry out the analogue blackout because changes in transmission and reception equipment would occur throughout the country. A necessary condition is to possess enough reception equipment, but “there is shortage of television receivers that incorporate the ISDB-T

standard in the national markets; and instead there is a large number of TV with American and European standards” (CITDT - GAE, 2011: 4).

**Table 2. Phases of the analogue switchover in Ecuador**

PHASES	LOCATIONS	ANALOGUE SWITCHOVER
1	Areas of coverage of the stations covering at least one provincial, cantonal or parish capital city with a population greater than 500,000.	31 December 2016
2	Areas of coverage of the stations covering at least one provincial, cantonal or parish capital city with a population between 200,000 and 500,000.	31 December 2017
3	Areas of coverage of the stations covering at least one provincial, cantonal or parish capital city with a population of less than 200,000.	31 December 2018

Source: CITDT - GATR (2012: 8)

Preliminary investigations indicate that digital television should be seen, beyond the physical aspects, as a new model of telecommunications that also reconfigures the content production processes (Hernández, 2009). Regarding interactivity, it has been said that it would help democratise citizen participation (Hellín, Rojo and San Nicolás, 2009: 176) through spaces for dialogue, which would reduce the digital divide in the access to the information society.

Altogether the capabilities of DTT will give way to new entertainment, information, advertising business and advertising channels for public services such as education and culture (CITDT; 2012: 2). However, some scholars do not believe citizens will take advantage of the interactive features to access information about public affairs (Boczkowski and Mitchelstein, 2012: 4)

In several countries DTT was seen as the gateway to the globalisation of goods and services in the digital age (Bustamante, 2003: 167 in Bizberge, Krakowiak, Labate and Morone, 2013: 175) because it would increase the quantity and quality of audiovisual content, interactivity and pluralism and would reinforce citizens’ freedom of choice. However, many of these promises have been unfulfilled, because DTT is almost just “an extended version of the previous [model] because the excessive focus on the technical aspects and on meeting deadlines has been made at the expense of the potential of interactivity and the supply and demand of advanced services (Román, 2012: 804).

María Trinidad García-Leiva (2008, 2012 and 2013) has addressed the implications of DTT in the political economy of communication, rights, and technological relations. However, studies on the relationship and impacts of the implementation of DTT in other countries will help us to interpret and plan the future of the medium.

The interest in knowing the value of the digital dividend arose because DTT was supposed to involve “an open, free and plural television with the ability to become an element of development in the information society” (Caffarel, 2007: 13)

...the increased transmission capacity of DTT has been used in North America to broadcast in high definition at least in prime time [...] in the United States high definition has become the lifesaver that keeps networks afloat in a competitive, multi-channel and cross-platform environment. (García-Leiva, 2012: 38)

It should be noted that “the commodification of the spectrum, already underway, can endanger the provision of those services -such as [free] public service radio and television broadcasting- that are not as profitable as mobile telephony” (García-Leiva, 2013: 112). The predominance of monetary arguments leads us to believe that if “the future distribution of the dividend does not respond to national communication policies [...] there is a risk that the pursuit of short-term profits could undermine the preservation of public interest” (García-Leiva, 2013: 132).

The beginning of the regular transmissions of DTT in Ecuador, in May 2013, inspired reviews of the developments made in Ecuador in terms of interactivity:

Digital transmission is related not only to high-definition content, but also to other developments needed to achieve user interaction. Therefore, some local universities such as the National Polytechnic School, the Polytechnic School of the Army, the University of Cuenca, the Polytechnic School of the Litoral, with the support of the Superintendence of Telecommunications, promoted the development of applications that allow users to interact with digital television. The University of Cuenca, for example, worked for a year in two applications: one of which offers games to develop children’s intellectual abilities. (*El Comercio*, 2013: May 21)

Regarding the population’s knowledge on DTT, a study carried out in 2009 by the CIESPAL pointed out that the information generated and reported on the transition to DTT was limited and that just one-third of the population had some knowledge about it (Bucheli, 2009: 32). In Ecuador, as in other countries, there is a “general interest in knowing all about Digital Terrestrial Television [...] this includes its proper definition, benefits, operating costs and technology necessary for its appropriate use [...] It is necessary to develop stronger information campaigns about this subject” (Hernández, 2009).

Previous studies have concluded that “it is the responsibility of the government, not the industry, to set the rhythm of this process, and to ensure the existence of timely and relevant information for decision making” (García-Leiva, 2011: 36). However, the assimilation of digital television will be possible “if DTT is eventually perceived as a simple and appealing product, and not as a distant, exotic and complex technology (Vicente, 2005: 91).

The hypotheses of this research study are: 1) In Ecuador, interactivity is an option that has been poorly explained and is not included in DTT transmissions because the necessary physical conditions to do so do not exist; 2) the digital dividend will be used to guarantee, through DTT, with the right to communication; and 3) citizens have limited knowledge about the DTT implementation process that is taking place in Ecuador.

DTT is a challenge and an opportunity as it involves not only a technological change but also a change of relations between creators and citizens which would be provided with an interaction channel. The arrival of a new technology does not necessarily or immediately mean replacing the

previous technology (De Moraes, 2007: 103). Technological evolution by itself does not justify a conversion if it is not accompanied by the exploitation of its potentialities which ultimately aim to achieve the democratisation of communication as proposed by the MacBride report (Caffarel, 2007:18):

There is no doubt that the best remedy for various problems that affect communications would be to increase its democratisation. By definition, it is the public who is interested in a more abundant, better and more free communication, but a more democratic approach must be established so that the public's voice can be heard. This way, individuals could cease to be receivers and become active stakeholders in the process of communication, the diversity of messages would increase, and the level of quality of the public's participation would improve. (MacBride *et al.*, 1993: 144)

There are other ways to access television that emerged before DTT and are widely accepted by the population, particularly by young people. One of these other ways is internet television, which is an individual rather than collective experience. Here it is important to remember that television is a “mass medium that produces messages and [...] a mass flow of audiovisual messages, integrated in multiple networks and platforms” (Bustamante, 17 Albornoz and García-Leiva, 2012: 17). For this reason, there is the need to know the ways of consumption and establish whether DTT will keep its privileged place at homes as the dominant medium to deliver content.

## 2. Methods

The study is based on qualitative and quantitative methods. The qualitative instruments are the review of the official documentation published by Ecuador's Superintendency of Telecommunications and interviews with representatives of the academic, public and private sectors involved in the DTT implementation process (table 3).



**Table 3. List of interviewees**

N°	SECTOR	INSTITUTION	NAME	POSITION
1	Academic	CIESPAL	César Herrera	Director of the Audiovisual and Multimedia Centre
2	Academic	National Polytechnic School of Ecuador	Iván Bernal, Ph.D.	Professor and researcher
3	Academic	University of Cuenca	Mauricio Espinoza	Professor and researcher
4	Public	Ministry of Telecommunications and Information Society	Vladimir Vacas	Public servant in charge of the DTT process
5	Public	Public television. Ecuador TV	Marcelo del Pozo	Director production and programming
6	Private	Canal UNO	Segundo Tumalia	Operations Manager and Chief technology officer
7	Private	TC Televisión	Fernando Bellido	Operations Manager and Technology Manager
8	Private	RTU Televisión	José Luis Hidalgo	Production Manager

Source: Authors' own creation

The first two interviews were published in the website of the International Centre of Higher Studies in Communication for Latin America (CIESPAL), and correspond to dialogues and roundtables. The rest of the interviews were conducted individually by the authors of this study.

The quantitative data was obtained from two surveys (table 4) designed to investigate the degree of knowledge that the population has about DTT. The surveys were applied in cities that were about to receive DTT services but on different dates to be able to contrast results. The first survey was held in Quito and Guayaquil and the second in Loja.

**Table 4. Survey details**

IMPLEMENTATION DATES	23 JULY 2012	20-23 SEPTEMBER 2013
Sample of respondents	400 in each city	284
Cities	Quito and Guayaquil	Loja
Universes	Urban population aged 16 and older	
Sampling method	Multistage stratified / Random Route	
Unit of selection	Homes	
Interview method	Direct administration (individual)	
Application method	Random	
Reliability	95%	
Margin of error	+/- 3%	

Source: Authors' own creation based on data provided by CIESPAL and *Informe Confidencial* in the case of the surveys applied in Quito and Guayaquil; and on data collected by the authors in the case of the survey in Loja.

### 3. Results

#### 3.1. Interactivity development

Iván Bernal, professor at the National Polytechnic School of Ecuador, indicated that his team develops interactive applications with public impact since late 2011. For instance, they developed a mechanism that gives early warnings about natural disasters. Bernal points out that it is necessary to study the behaviour of the audience to determine the type of applications they want.

Mauricio Espinoza, professor and researcher at the University of Cuenca, indicates that the fundamental advantage of DTT is the interactive applications that improve the quality of the transmission. The University of Cuenca also develops interactive applications, like an educational app for children aged 3 to 6, that allows them to watch videos about mathematics and then to interact by answering questions. This university is also investigating how digital television and the semantic web can be related to create a system of intelligent content recommendation based on user's profile.

The University of Cuenca implemented a digital television lab to create prototypes of digital television via streaming, data, applications, and video. According to Mauricio Espinoza, Ecuador has the capacity to create interactive applications. The media can take the work developed at universities or buy it somewhere else. Ideally, the media should choose applications developed in Ecuador because they are novel and take into consideration the national context. Television with smart apps could even transmit personalised advertising.

César Herrera, director of the Audiovisual and Multimedia Centre of the CIESPAL, points out that DTT opens up possibilities of interactivity but that it is necessary to investigate the audience to know the type of interactivity they want and their expectations about the new forms of relationship. Interactivity should be based on the requirements and needs of citizens, so that it can provide concrete answers to everyday needs such as weather, traffic, food, services, prices of goods, nutrition guidelines, etc. The challenge is for DTT to develop its own elements.

Vladimir Vacas, representative of the Ministry of Telecommunications and Information Society (MTSI) points out that the public must have the necessary equipment to receive DTT. The MTSI together with the National Council of telecommunications, the ministries of production and industries and the Ecuadorian Standardisation Institute prepared a technical regulation which prohibits importers from selling TV devices without the ISDB-T standard. Vacas said that there are 26 companies with license to broadcast digital TV in Ecuador (table 5).

**Table 5. DTT stations in Ecuador**

Nº	PROVINCE	LEGAL REPRESENTATIVE	STATION NAME	FREQ.	TYPE	CLASS	COVERAGE	LEGAL PERSONALITY
1	Azuay	Arosemena Robles Enrique	Ecuador TV	47	R	P	Cuenca	Juristic
2	Cotopaxi	Caicedo Álvarez Fredy	Color TV	25	M	C	Sierra centro	Natural
3	El Oro	Quevedo Guerrero Jesús	OK TV-TeveCorp	24	M	C	Costa sur	Juristic
4	Guayas	Coello Beseke Carlos	TC - Televisión	29	M	C	Guayas and SA	Juristic
5	Guayas	Vásquez Donoso Ricardo	Ecuavisa - Guayaquil	23	M	C	Guayas and SA	Juristic
6	Guayas	Arosemena Robles Enrique	Ecuador TV	21	R	P	Guayas and SA	Juristic
7	Guayas	Manciati Alarcón Roberto	RTU - Costanera	41	M	C	Guayas and SA	Juristic

8	Guayas	Andrade Herrera José	TV+ (Tevemas)	35	M	C	Guayas and SA	Juristic
9	Guayas	Gómez Rodríguez Mercedes	Canal UNO	33	M	C	Guayas and SA	Juristic
10	Guayas	Corral Bustamante Sebastián	Teleamazonas Guayaquil	27	M	C	Guayas and SA	Juristic
11	Guayas	Gómez Amador Luis	RTS - Telesistema	25	M	C	Guayas and SA	Juristic
12	Guayas	Calle Gómez Luis	Televisión Satelital	39	M	C	Guayas and SA	Juristic
13	Manabí	Andrade García Juan	Capital TV	25	M	C	Portoviejo and SA	Natural
14	Manabí	Pérez Herrera Carlos	OROMAR	23	M	C	Manta, Portoviejo and SA	Juristic
15	Pichincha	Carrillo Guevara Jaime	Canal UNO	45	M	C	Quito and SA	Juristic
16	Pichincha	Corral Bustamante Sebastián	Teleamazonas	32	M	C	Quito and SA	Juristic
17	Pichincha	Najas Cortéz Emilio	Telesucesos	41	M	C	Quito and SA	Juristic
18	Pichincha	Arosemena Robles Enrique	Ecuador TV	26	M	P	Quito and SA	Juristic
19	Pichincha	Gómez Amador Luis	RTS - Telesistema	34	M	C	Quito and SA	Juristic
20	Pichincha	Peñaherrera Muñoz José	RTU	43	M	C	Quito and SA	Natural
21	Pichincha	Arosemena Robles Enrique	GAMA - TV	30	M	C	Quito and SA	Juristic
22	Pichincha	Calle Gómez Luis	Televisión Satelital	39	M	C	Quito and SA	Juristic
23	Pichincha	Jaramillo Vásquez Juan	Ecuavisa - Quito	36	M	C	Quito and SA	Juristic

24	Santa Elena	Tacle Galarraga Moisés	ESPOL TV	24	M	P	Santa Elena, Salinas, La Libertad	Juristic
25	Santo Domingo de los Tsachilas	Alarcón Lombeyda César	RTU - TeleAtahualpa	24	M	C	Santo Domingo de los Tsachilas	Juristic
26	Tungurahua	Manciati Alarcón Roberto	RTU - Unimax	23	M	C	Sierra centro	Juristic
P = Public Service C = Commercial/Private SA = Surrounding Areas								

Source: Authors' own creation based on data from the National Secretariat for Telecommunications (SENATEL, 6 September 2013).

Vladimir Vacas points out that the R&D group of the Technical Interinstitutional Committee for the introduction of DTT (CITDT) worked with the Army Polytechnic School and the National Polytechnic School to develop interactive applications, but that interactivity has not been implemented at the regional level. There are efforts in Brazil and Argentina but they still have not decided what platform they will use. Argentina tends to use free interactivity software, particularly the Nested Context Language, and Brazil promotes the use of Java, which is proprietary software. The development of the academic sector in interactivity will be result of the international agreements that the middleware negotiation group reaches at the ISDB-T Forum.

Vladimir Vacas also notes that Brazil annually requires equipment manufacturers to incorporate Java middleware interactivity software in a percentage of their TV sets and that this policy will probably be adopted in other countries based regional consensus. Vladimir Vacas also mentions that Japan donated 40,000 DTT decoders that will be given to low-income people living in Ecuador's main cities.

For Marcelo del Pozo, director of production and programming of Ecuador TV, DTT is still an unresolved technological issue in the countries that already broadcast this signal. Brazil, Argentina and Mexico have made little progress in interactivity because there is conflict regarding the use of free software.

For Segundo Tumuliala, Operations manager and Chief technology officer at Canal UNO, interactivity is an important complement to digital television but is not currently considered because interactive apps are not the main demand made by the government to the media. The government's main demand is high definition programming. The demands of second order are interactivity and the increase of digital transmitters to cover other cities in addition to Quito and Guayaquil, where the emissions started. App developers have yet to be integrated to develop new ideas.

Viewers should have the possibility to interact through appropriate receptors and, thus, a number of complements should accompany the exploration of digital television in Ecuador. The government

will provide basic set-top boxes, which will only allow people to receive high definition signals because most TV sets are not enabled for interactivity, as they lack a return signal modem port. None of the TV sets currently on the market have the option of interactivity. Interactivity development depends largely on the government, the policies it proposes, but above all on a community motivated by the same government. Public policy measures should be taken so that the population is able to receive DTT (for example a policy to subsidise of set-top boxes).

According to Tumalia, the benefits of interactivity must be for everybody. The average selling price of decoders in Ecuador is 60 USD (Hoy; 2013, 20 May). An important issue that is not guaranteed is the ability to run interactive applications on all devices and this is a problem that should also be addressed through public policy. An example of this type of policy is one that regulates receivers so that they meet the ISDB-T standard and include interactivity, otherwise the devices will only receive the signal.

Fernando Bellido, the technology and operations manager at TC Televisión, considers that interactivity development was left for a second, still uncertain, stage, since there is a lack of interactive applications, and that this is an opportunity for universities to offer professionals that can develop these applications. Bellido also believes that the government must get the public used to interactivity, which is a long-term work. José Luis Hidalgo, the production manager at RTU, points out that interactivity has not been addressed at RTU because this television company is focused on providing digital programming, and it would need to bring experts to train the staff team on this new technology.

### 3.2. Digital dividend

Vladimir Vacas indicates that in Ecuador the digital dividend band is occupied by terrestrial codified systems, UHF channels (51 to 69), and concession contracts that expire mostly in 2014, and will not be renewed to take advantage of the band. Channels 21 to 51 will be used for DTT. Channels 52 through 69 will be used for mobile broadband with LTE (Long-Term Evolution) technology. Ecuador adopted the Asia-Pacific Telecommunity band segmentation plan that allowed taking advantage of channels 50 and 51 for digital television.

Vacas points out that the digital dividend will be assigned for the mobile broadband promoted by government, which values the use of the Internet as a source of information for citizens. With this vision, the government began the auction of the radio spectrum in July 2013. Ecuador's Vice-President, Jorge Glas, mentioned that "the government will begin a process of negotiation with the mobile operators affected by the new frequencies... We will negotiate new spectrum, we are assessing this. But in this new contract we will be much more demanding regarding the quality of mobile services" (MediaTeleCom, 2013-1). The Vice-President also mentioned that companies paid around \$700 million dollars for the existing mobile telephony licences.

In October 2013, Ecuador's National Telecommunications Corporation (CNT) launched a device called *Mi wi-fi portátil (sic)*, which provides high-speed mobile internet access. The device will cost between 35 and 50 USD, and will offer access packages of two to five gigabytes (El Comercio; 2013: 18 October). César Regalado, NTC's general manager, said that it is the first stage of installation of the LTE network, whose investment amounts to 36 million USD.

According to Vacas, the stations that generate more programming could receive the 6 MHz occupied by the analogue signal. However, there is the risk that Ecuador will experience the same that happened in Spain, which rented a whole 6 MHz channel to single operators, but the advertising

income did not manage to cover the cost of programming and this alternative became unsustainable. The trend in Ecuador is that channels will broadcast a high definition signal.

There is the possibility for operators to share one 6 MHz channel and the costs of implementation; four private, mostly regional, operators could agree to share costs of installation and maintain their programming, although perhaps not in high definition.

This alternative would allow optimising the use of a radio spectrum that will not be enough for everyone. It is important to test the properties of the single-frequency, single-channel nationwide networks. The current problem is that when an analogue channel wants to serve two parts of a city, two points of transmission for the antennas are needed.

Iván Bernal indicates that around the world, and in the country, internet access will be provided via optical fibre, through technologies such as GPON. The installation of access means increased transmission rates. Television services will be accessed via IPTV technology, which allows users to decide what contents to watch and when. The future of television will be defined by the strategy used to manage digital television, interactivity and programming.

Technology foresight studies indicate that we must wait for the inevitable, the greater impact of IPTV. If a greater access to a lower cost is achieved in Ecuador, it could be creating a path that leads the population to decide for an alternative: DTT or IPTV.

Bernal also says that the price of internet services have been going down and access rates have risen, so that people can now access YouTube for free with a connection of 1 or 2 MB per second. There are more than 17 million mobile lines registered in Ecuador where the population was 14.3 million in 2010, according to Ecuador's National Institute of Statistics and Censuses.

The International Telecommunication Union has set the minimum internet download rate at 1GB per second, which allows the consumption of video, video calls, on-demand videos or HD movies.

### **3.3. Awareness of DTT**

The knowledge of the Ecuadorian population about the implementation of DTT is minimal: more than 50% of the consulted population of Quito and Guayaquil have heard something or nothing about digital television (table 6). This survey was applied before the emissions of DTT began, and a second survey was applied to a similar sample a year later in Loja to contrast the results of both surveys. The results of the second survey varied a little: 64.9% of the population had no knowledge of digital television, and on 32% had some knowledge.

**Table 6. How much have you heard about digital television?**

VARIABLES	QUITO	GUAYAQUIL
A lot	17.0%	11%
Some	29.3%	36.5%
A little but it's unclear	21.8%	17.3%
Nothing	30.3%	32.3%
Did not answer	1.8%	3.0%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>

Source: Authors' own creation based on *Informe Confidencial* (data from July 2012)

The main aspect with which the population of Quito and Guayaquil associated DTT is better quality of image and sound, while “high definition” occupied the second position, followed by other potential benefits of digital television (table 7). In Loja the most selected option in relation to digital television is “I do not know”, while a third of the people rightly associated DTT with the transmission of audio and video with interactive applications, and 13% linked DTT with “high definition” (table 8).

**Table 7. Based on what you know, imagine or heard, which of the following options do you associate with digital television?**

VARIABLES	QUITO	GUAYAQUIL
Improves image and sound quality	24.5%	28.5%
HD	24.0%	19.5%
It will reach any part of the country	13.8%	12.8%
More channels	7.0%	6.5%
Enables recording	2.8%	3.8%
3D channels	4.5%	5.0%
Internet TV	3.5%	3.5%
Channels and programming guide	1.3%	2.0%
Interactivity	2.3%	1.3%
Others	0.3%	1.5%
Did not answer/Don't know	16.3%	15.8%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>

Source: Authors' own creation based on data from *Informe Confidencial* (July, 2012)



**Table 8. What do you think digital television is?**

VARIABLES	LOJA
It is the digital transmission of Full HD video	13.0%
It is the digital transmission of audio and video with interactive applications	32.0%
It is the standard transmission of audio and video, which is currently transmitted by free-to-air signal in Ecuador	10.4%
I do not know	44.5%
Total	100.0%

Source: Authors' own creation (data obtained in September 2013)

The population of Quito and Guayaquil demand information about digital television; they are interested in knowing how much it will cost, and the equipment that will be needed to receive the signal (table 9). In contrast, in 2013, most of the population of Loja have not receive information about digital television (72.9%) and those who have received it, have done so mainly through Internet (19.5%) and people (10.9%).

**Table 9. What would you like to know about digital television?**

VARIABLES	QUITO	GUAYAQUIL
What will I need?	14.8%	17.0%
How much will it cost?	28.3%	28.8%
When do I need a decoder?	10.0%	6.8%
What is going to become useless?	6.8%	4.5%
Will it reach everyone?	4.0%	5.3%
Is it easy or difficult?	6.5%	8.8%
How is it used?	4.0%	3.8%
Does it look better?	3.3%	6.8%
Will it have more channels?	2.3%	1.5%
Will it be interactive?	4.0%	1.8%
Other things	1.3%	1.0%
Did not answer/nothing	15.0%	14.3%
Total	100.0%	100.0%

Source: Authors' own creation based on data from Informe Confidencial (July, 2012)

For Vladimir Vacas the main beneficiaries of the technological change are the operators, and for this reason the education of the public about DTT should be the responsibility of the channels themselves, and their support is needed to inform the community. The Ministry of Telecommunications and Information Society (MTSI) works with representatives of the TV stations to create educational videos, while the Ministry will develop an awareness campaign.

According to Vacas the closer the analogue switchover is the more the government should intervene. It cannot leave the population without service and a form of intervention is to subsidise the cost of set-top boxes. The concern of the government is that low-income people who receive the free-to-air signal will no longer have a medium of information and entertainment.

Marcelo del Pozo, of Ecuador TV, agrees that the management of communication policies is the responsibility of the government, and the entities responsible for promoting the implementation of DTT: the Superintendence of Telecommunications and the MTSI. Public television of Ecuador will provide information about the characteristics of DTT, but the possibilities to broadcast information would come from private companies as long as there is commercial interest on their part. In order for the switchover to work, the work of all the stakeholders is required; while Ecuador TV would welcome any initiative to inform about the features of DTT.

Fernando Bellido, the technical and operations manager at TC Television, says that there is a lack of information dissemination and that people do not know exactly what digital television is, and that they do not know about its free access or about the ISDB-T standard. Likewise, Segundo Tumulia, operations manager and Chief technology officer at Canal UNO, remarked that there is lack of knowledge, and that it is necessary to inform the people that there is a new way of doing television. The information should be provided by the media and the government. Canal UNO is ready to broadcast DTT and will launch an information campaign to explain that digital television is at the service of the community and what every citizen needs to be able to watch this new television.

These opinions are supported by César Herrera, who believes that the population should be informed about the implications of the transition process. He thinks that the government should prepare the audience about the new form of television and the new way of interacting with a medium that has set reading standards.

### **3.4. Discussion**

The possibilities and spaces for a democratic exercise of communication in DTT will be possible only if there are more audiovisual signals and people express their views through interactive applications. Ecuador is experiencing some changes that seek the physical and legal conditions for the exercise of the right to communication. These changes are supported by articles 16, 261 and 313 of the Constitution which also promote the competence of the government to manage and regulate the radio spectrum.

Internet access through set-top boxes involves opportunities to achieve the information society. With the integration of the proper technological innovations, DTT could even be used to download content, which could contribute to the digital literacy of the low-income and low-education population, but the speed of access and penetration of the internet must be improved rapidly to achieve this goal.

The return channel of the TV sets, needed to run interactive applications, would be provided by the internet service provider, and by the mobile telephony operators in the case of mobile devices. This opens the way to new applications, new forms of interaction and greater user participation.

However, the projections of employment and the democratising effect that interactivity involves are limited to the universal acceptance of the middleware language and for this reason the conflict over the use of free software must be overcome. Interactivity has not been implemented at the regional level, despite the efforts of Brazil and Argentina, and an agreement on the platform, i.e. between free software, Nested Context Language, and the use of the proprietary software Java, must still be reached.

However, according to Ecuador's telecommunications authority, this environment is suitable for testing content transmission and consumption models which, thanks to the emerging phenomenon of DTT in the region, will end up being assimilated by other countries (Rosas, 2013).

The Ecuadorian television stations that began DTT transmissions do not include interactive applications, partly because of the lack of agreement over the middleware language but also because the Superintendency of Telecommunications requested the media to prioritise HD broadcasts because there was international evidence pointing to quality as a competitive argument against cable and satellite offerings.

Users must also be prepared to receive DTT through appropriate receptors, but few TV sets have the option of interactivity. Representatives of the sectors involved agree that public policy measures should be taken to help the population in the transition to DTT.

The previous study confirms the first hypothesis: "In Ecuador, interactivity is an option that has been poorly explained and is not included in DTT transmissions because the necessary physical conditions to do so do not exist".

Regarding the use of the digital dividend, the MTSI's decision to auction it so that private companies can exploit telephony services and mobile internet, generates conflicting positions. The media that use radio-frequency in Ecuador have been managed by private companies. In 2007 when the transmission of public television started in Ecuador, there existed a utilitarian logic that has prioritised the financial benefit over the promotion of communication rights. The free-to-air television signal covers the territory through national, regional and local stations and its contents are available to citizens of all economic levels.

In Ecuador, internet prices have been going down and access rates have risen: about 57% of the population has internet access. This scenario will lead the population to decide between DTT and IPTV. In other words, there is still unclear whether in fact "the digital dividend will be used to guarantee the right to communication through DTT", i.e. the second hypothesis is not accepted.

According to the results of this research, from 2012 to 2013 the percentage of Ecuador's population who learnt about DTT increased slightly, it went from 32% to 36.5%. But the latter percentage is still low considering that DTT transmissions already began in Ecuador's main cities. The most-demanded type of information is the cost of DTT and equipment needed for reception.

There is a predisposition in television stations to assist the government in information campaigns, but the lack of actions is striking. Even the CITDT has noted the need to establish mechanisms for the dissemination of the transition process in order to educate the population on the digital migration and thus ensure the protection of their civil rights.

Representatives of the television stations indicate that there is a lack of information about the concept of DTT, the necessary equipment, the adopted standard, and above all about the new way of doing and watching television. The information collected for this study allows us to confirm the third hypothesis: that the population knows little about the DTT implementation process in Ecuador. This situation will change if public institutions and television stations provide greater information.

### 3.5. Conclusions

- The academic sector is involved in the development of applications that enable interactivity: the National Polytechnic School of Ecuador proposed an app that alerts about natural disasters; the University of Cuenca developed an educational interactive app for kids; and the Polytechnic School of El Litoral is also working along this line. The conclusion is that Ecuador has the human resources to create interactive applications, but it is necessary to investigate the audience to determine the type of interactivity they need.
- The digital dividend in Ecuador will be dedicated to mobile broadband, and the government has already started auctioning the spectrum to private operators and Ecuador's National Telecommunications Corporation, which took the first stage in the installation of the LTE network and will market high-speed internet. In this context it is worth remembering that the trend is to develop infrastructures that allow high-speed transmission rates, because otherwise will be faced with an uncertain future about the forms of consumption: DTT or IPTV?
- According to the representative of the Ministry of Telecommunications and Information Society, private stations should generate information about the DTT implementation process because they are the main beneficiaries of the transition. However, public television companies and the private stations indicate that it is the responsibility of the government to educate the population because the management of communication policies corresponds to the government.

Knowing the limitations will allow us to advance in the implementation of DTT without leaving in the background its potential as a medium to democratise information. The right to communication should be focal point of the practices of communication companies, so that the goods and services that they generate will contribute to reduce the economic, social, cultural and even technological inequalities existing among the population.

\* This research study is part of the project titled *Situación y oportunidades de la implantación de la televisión digital terrestre en Ecuador* ("Situation and opportunities of the introduction of digital terrestrial television in Ecuador"), carried out in 2013 by researchers from the Department of Communication Sciences of the Universidad Técnica Particular de Loja, thanks to the funding provided by [Convocatoria de Proyectos UTPL](#).

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