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# ***Examining Networking Effects and Digital Television Adoption in Latin America: A Focus on Argentina***

Deb Tech Coffey

## **I. Abstract**

The transition from analog to digital television provides myriad benefits including better consumer television viewing experiences, increased broadcast spectrum availability for governmental purposes, and a substantial market opportunity associated with the sales of related equipment and services. As a result, four global digital standards have emerged – with the transition well under way in Europe, the United States and many countries in Asia. However, Latin American countries are at various stages of the adoption process, ranging from initial stages of evaluation to implementation. This research provides a theoretical overview of networking effects, as related to the efforts expended by the organizations representing each digital standard in Latin America. An overview of the adoption decisions of various standards within Latin countries is then presented. Specific focus is provided on the unique case of Argentina, which chose a digital standard in 1998 but rescinded the decision and adopted a different standard in 2009. Comparative time series analysis is then used to depict the networking effects of the different standards, providing insight to academia, practitioners, and regulating officials regarding diffusion within Latin America.

Keywords: Networking effects, digital television, technology adoption, Latin America, South America, Argentina

## **II. Introduction**

Digital television (DTV) was adopted by the U.S. Federal Communications Commission in 1996 to refer to television broadcasts that utilize a series of ones and zeros rather than wavelengths, as are used in analog broadcasts. For the consumer, DTV provides for a better viewing experience. At the governmental level, transmitting in a digital format frees up bandwidth for other purposes, as the digital technology allows four or more channels to be compressed into the same bandwidth as previously used by one analog channel broadcast. For industry, this change in technology represents an opportunity to convert 995 million televisions globally (CIA, 2009).

Similar to the progression of analog television, one broadcast standard has not been adopted by all countries in the world. Rather, four standards have emerged – each touting unique benefits<sup>1</sup>. While the different standards were developed on national or regional basis, in Latin America the diffusion of these standards has not followed a pattern based purely on geographic or political factors. Additionally, adoption of these standards may not be based primarily on

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<sup>1</sup> Digital standards include specifications for broadcast via satellite, cable and terrestrial. This research focuses on the terrestrial broadcast which includes “-t” behind each standard’s acronym. Since all standards discussed in this paper refer to the terrestrial broadcast, the terrestrial designation, “-t”, has been omitted in this paper to assist the reader.

technical reasons (Pramik, 2002). This research proposes that networking effects, which may incorporate political and economic factors, have influenced the decision.

In this paper, I compare the adoption decision in Argentina to those in other Latin countries. This research then evaluates the diffusion of the digital standards in South America, utilizing comparative time series analysis to depict the networking effects as a factor in the adoption of digital television standards.

An example of networking effects in the adoption of technology is provided from a macro-economic basis. Additionally, practitioners will benefit from a depiction of the influences of decision-making as influenced by standards organizations and the resulting networking effects.

### **III. Networking effects**

Networking effects, also referred to as bandwagon effects, is defined as the observable increase in the value of a product or service as it is adopted by more users over time. This phenomenon then encourages later participants to adopt the product. Telephones, fax machines and certain electronics are exemplary of products benefiting from networking effects. Many times the superiority of the technology represented by the product may not be the rationale behind the adoption of one technology. In most settings where networking effects are present, compatibility across platforms, or standardization, has been a key factor in the success or failure of a particular technology (Deishin & Mendelson, 2007; Liebowitz, 1999). Research has shown (Greenstein, 1993) that networking effects, in conjunction with economic, political, and cultural ties among nations, is a significant factor in the adoption of standards.

Governments have become more and more obliged to participate in the standardization issue as product diffusion has become more global (OECD, 1991). In the case of DTV, standardization is integral in the diffusion process, as the choice of the DTV standard is made by each national government thus imposing conformity upon the population. In the case of broadcast television, national governments have participated in the standardization process and promotion of networking effects as depicted by the previous selection of analog standards. Past practice has shown affiliation as related to geographic factors. For example, the majority of Latin American countries adopted the United States analog standard (NTSC). Countries farther from the United States, specifically the southern cone of South America, adopted a European standard (PAL) – although it was modified to closely resemble the U.S. standard.

*Market value* is maximized when one compatible *network is utilized by all participants*. However, the benefits from the technology chosen may depend on incentives offered by vendors or outside parties, implying an interdependence between the benefits garnered by the efforts of adopters and providers (Deishin & Mendelson, 2007). This is in accordance with network economies in which collaboration between public and private sectors influence the diffusion of technologies (Chen, 2006).

The outside parties participating in the adoption of DTV in Latin America include the different organizations formed to promote each standard. The Japanese introduced the concept of digital television as early as 2003 when they began broadcasts utilizing the Integrated Services Digital Broadcasting (ISDB) standard (Tech Coffey & Walters, 2009). This standard was presented to the United States government, but due to the desire to have digital and analog broadcasts co-exist, as well as other technical reasons, the Advanced Television Systems Committee (ATSC) standard was introduced in the U.S. in the early 1990's. A European standard, Digital Video Broadcast (DVB) was introduced in 1993 and quickly adopted by members of the European Union, demonstrating the importance of geographic and political ties

(Villa, 2008). A fourth standard, Digital Media Broadcast (DMB) was developed and introduced by China in August of 2007.

Because the DMB standard was a late entrant into the market, minimal networking effects are apparent as a significant domestic base is required before global networking effects are apparent (Tan, 2002). The remaining three standards organizations participated in varying degrees in promoting the adoption of each specific standard globally. For example, the ATSC Forum was developed with the mission to “educate policymakers, broadcasters, manufacturers ... and to advocate the adoption of the ATSC family of DTV standards” (“ATSC Forum,” 2009). Additionally, web sites were created to promote each standard as exemplified by the DVB organization: <http://www.dvb.org>. This website meticulously tracks the adoption of the DVB standard while providing a wealth of documentation regarding technical specifications and press releases. Because the Japanese standard, ISDB, was adopted by Argentina – the focus of this research, additional detail regarding the efforts associated with the ISDB standard will be provided. Various tactics employed in the promotion of the Japanese standard were also utilized by the other standards’ representatives.

The Digital Broadcasting Experts Group (DiBEG), consisting of a group of Japanese companies associated with the DTV industry, actively promoted the Japanese standard in Latin America<sup>2</sup>. By attending various forums hosted by national governments, the benefits of ISDB were promoted, including:

- Robust, high quality with flexible services,
- Modulation scheme (segmented OFDM) that allows for hierarchal transmissions and mobile reception,
- Unique one-seg service for mobile reception,
- More economic system due to the same transmission frequency for fixed and mobile transmissions,
- No royalty payments for use of the standard (Fukuda, 2009).

Using statistics from the DVB organization and JEITA (Japanese Electronics and Information Technology Association), delegates from the Japanese Government (Ministry of Internal Affairs and Communications) touted the diffusion of 110.8 million ISDB receivers in the market as compared to 94.9 for DVB and 79.1 for ATSC, claiming the fastest diffusion of the standard in the world (Furukawa, 2009). A formalized assistance plan was also developed as evidenced by recent efforts of the Japanese Ministry in Bolivia, offering the same royalty-free utilization of ISDB-related patents as agreed upon with Argentina.

The networking effects of the ISDB standard have been enhanced by the participation of the Brazilian government. Since the adoption of ISDB in 2007, delegates from the Brazilian government have been actively petitioning neighboring countries. As of September 2009, negotiations were in progress with Venezuela, Ecuador, and Chile (“Venezuela and Chile would be close to ISDB adoption,” 2009). Success of their efforts may be evidenced by the 2009 adoption of ISDB by Peru (April) and Argentina (September).

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<sup>2</sup> Primary participants include NEC Corporation, Japanese Broadcasting Corporation (NHK), Panasonic Corporation, Fuji Television Network, Hitachi, Ltd., Mitsubishi Electric Corporation, Panasonic Corporation, and Sony Corporation. (Gray, 2009)

## IV. Argentina

The decision to adopt ISDB by the Argentinean government was prefaced by several false starts. This study provides an overview of analog broadcasts in the region. A historical account of the decisions made by the Argentinean government as related to digital adoption is provided, with a highlight on importance of the telecommunications market in Argentina.

Networking effects associated with the adoption of analog standards in the southern cone of South America are not apparent as three different analog standards were adopted by four countries in the region. With the exception of Chile, which adopted the U.S. analog standard (NTSC), the southern cone countries adopted an analog broadcast standard that was a modification of the European PAL standard. However, there was little consistency in the modification as Brazil implemented PAL-M while Argentina and Uruguay implemented a third version, PAL-N.

The move toward standardization of digital standards in Latin America began as early as 1998, when Argentina announced its decision to adopt ATSC, making it the first PAL-based country to adopt ATSC for digital transmissions. Thus began the expectation that a common digital standard would be adopted in Latin America, with Mexico adopting the ATSC standard as well. Although Mexico's official announcement to adopt ATSC was not made until 2004, Mexican representatives had participated in the ATSC standards development process. That, coupled with political and geographic ties, ensured the adoption of ATSC previous to the official announcement.

As early as 1999, the Argentinean adoption decision was re-evaluated with a stated new decision date of 2002. During a series of forums organized by the European Commission and the European Telecommunications Institute, the DVB standard was introduced. While the evaluation was to include technical, economic and political comparative analyses, the Argentinean National Communications Commission also acknowledged the importance of a common standard in Latin America, referencing implementation in the world as a decision factor ("Argentina reconsiders DVB for DTT," 1999). It wasn't until 2008 that the networking effects of the DVB standard were evident when the first South American country, Colombia, announced its decision to implement DVB.

The decision to implement DVB by Colombia represented the third standard adopted in Latin America. In 2006, the Brazilian government announced it would implement a modified version of the Japanese standard, ISDB. This modified version is referred to as SBTVD (Brazilian system of Digital Television) or also ISDB-Tb. Upon adopting the ISDB standard, the Brazilian government actively lobbied Argentina to adopt the same standard – promoting the goal of economic and social growth.

In addition to the influence of Brazil, the Japanese government provided financial incentives to promote the adoption of ISDB. These incentives included the donation of equipment to assist in the digital transition – as well a memorandum of understanding regarding the cooperation of industry development. The adoption of ISDB included royalty-free use of the patents associated with the technology. Thus, in September 2009, the Argentinean government revoked the decision to utilize the ATSC standard and opted for ISDB, stating that a regional alignment would facilitate industry growth related to digital broadcast (Gray, 2009).

As represented in Table 1, Argentina represents a significant market in the DTV market—the third largest market in Latin America (second largest in South America) as measured by the number of televisions. Globally, Argentina is the 24<sup>th</sup> largest market (CIA, 2009). The public and

private investment for Argentina to have open terrestrial digital television is estimated to be approximately US\$912 million (Telam, 2009).

Country	Number Televisions
Brazil	36,500,000
Mexico	25,600,000
Argentina	7,950,000
Columbia	4,590,000
Venezuela	4,100,000
Chile	3,150,000
Peru	3,060,000
Ecuador	2,500,000
Guatemala	1,323,000
Paraguay	990,000
Bolivia	900,000
Uruguay	782,000
El Salvador	600,000
Honduras	570,000
Costa Rica	525,000
Panama	510,000
Nicaragua	320,000
Suriname	63,000
Guyana	46,000
Belize	41,000

Source: CIA, 2009

### ***Measuring networking effects by digital standard***

While there is no commonly-accepted methodology for measuring networking effects, time series analysis is useful in graphically depicting the networking effects of each standard within Latin America. Table 2 provides a detailed listing of the various countries reporting standards decisions as of September, 2009.

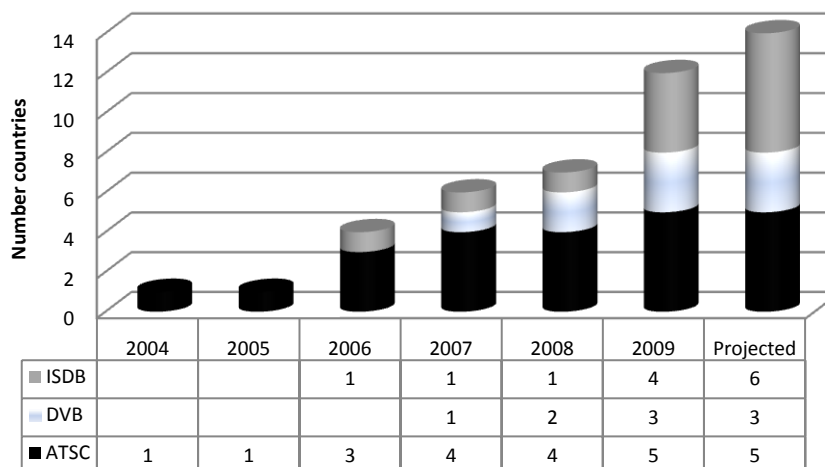
Country	Digital Standard	Status	Number Broadcast Stations	Number Televisions
<b>Argentina</b>	SBTVD-T (2009) : ATSC (1999)	2009/09/28 - Adopted	42	7,950,000
<b>Belize</b>	N/A	N/A	7	41,000
<b>Bolivia</b>	ISDB (SBTVD-T)	2009/07/15 - Considering	48	900,000
<b>Brazil</b>	ISDB (SBTVD-T)	2006/06/29 - Adopted	138	36,500,000

<b>Chile</b>	ISDB (SBTVD-T)	2009/09/14 - Adopted	63	3,150,000
<b>Columbia</b>	DVB-T	2008/08/28 - Adopted	60	4,590,000
<b>Costa Rica</b>	ATSC	2006 - Adopted	20	525,000
<b>Ecuador</b>	DMB	2009/07/01 - Considering	7	2,500,000
<b>El Salvador</b>	ATSC	2009/04/22 - Adopted	5	600,000
<b>Fr. Guiana</b>	DVB-T	N/A	N/A	N/A
<b>Guatemala</b>	ATSC	2006 - Adopted	26	1,323,000
<b>Guyana</b>	N/A	N/A	3	46,000
<b>Honduras</b>	ATSC	2007/01/06 - Adopted	11	570,000
<b>Mexico</b>	ATSC	2004/07/02 - Adopted	236	25,600,000
<b>Nicaragua</b>	N/A		3	320,000
<b>Panama</b>	DVB-T	2009/05/12 - Adopted	38	510,000
<b>Paraguay</b>	N/A	N/A	5	990,000
<b>Peru</b>	ISDB (SBTVD-T)	2009/04/23 - Adopted	13	3,060,000
<b>Suriname</b>	N/A	N/A	3	63,000
<b>Uruguay</b>	DVB-T	2007/08/27 - Adopted	62	782,000
<b>Venezuela</b>	ISDB (SBTVD-T)	2009/07/15 - Considering	66	4,100,000

Source: CIA, 2009; (Trappe, 2009)

This research uses empirical data to demonstrate the networking effects of the three active standards in Latin America. The total number of countries adopting each standard is reflected in Figure 1, demonstrating similar networking effects for DVB, ISDB and ATSC. However, due to the small sample size, results are not conclusive.

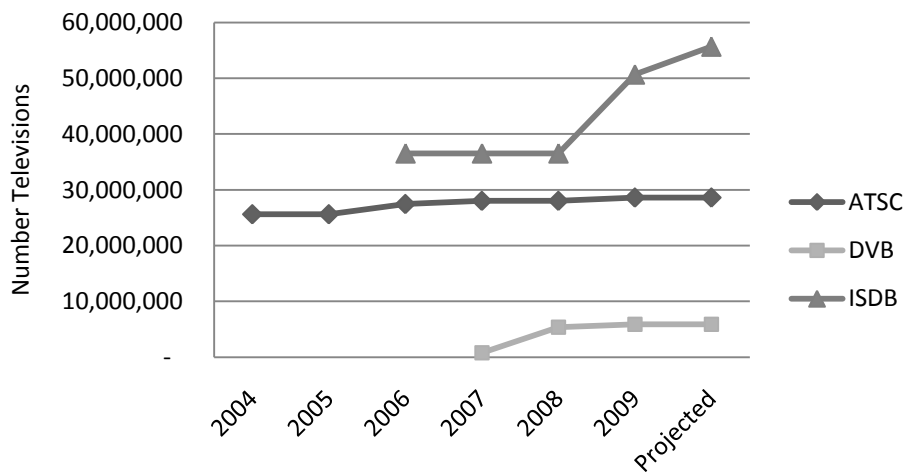
Figure 1: Number countries versus standard adoption



Time series analysis of the adoption of each standard was then conducted, comparing adoption date versus number of broadcast stations and televisions. An analysis of broadcast standards as well as televisions was utilized to reflect differences in commercial versus consumer markets. As shown in figures 2 and 3, the ATSC standard began with the largest base as reflected

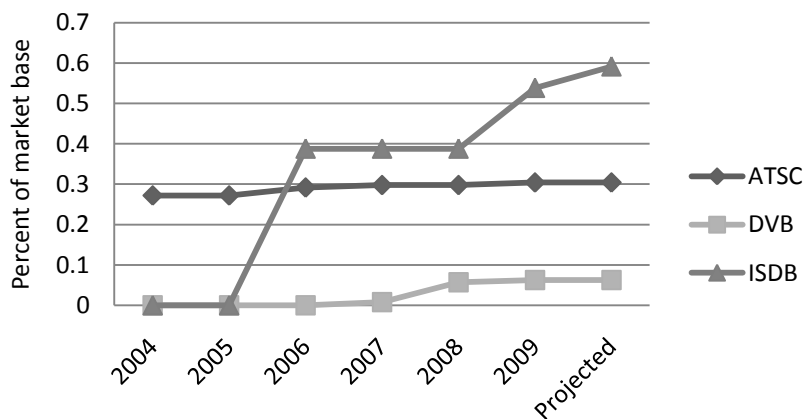
by Mexico's adoption of the standard in 2004. Subsequent networking effects are minimal, as adopting countries – mostly in Central America – do not have a significant number of televisions or broadcast stations. The introductory dates of ISDB and DVB are reflected by Brazil's 2006 decision and Colombia's 2007 decision. As with ATSC, countries that adopted the ATSC standard do not represent a large number of users. The significant increase in the ISDB standard is represented by Peru and Argentina's 2009 adoption decision. If expert projections of the inclusion of Venezuela and Bolivia are included, it is apparent that the adoption of ISDB shows the greatest increase in total adoption as compared to the other standards.

Figure 3: Televisions by standard



Additional analysis based on ratios of market size, represented by number of televisions, versus total Latin America Market is provided in Figure 4. This time series analysis reflects the overall expansion of each standard compared to the total base in Latin America.

Figure 4: Diffusion compared to total television base





## **V. Summary**

This research depicts the results of networking effects as related to the diffusion of digital standards in Latin America. While the ASTC standard showed early promise of becoming the common standard in Latin America, other factors influenced the diffusion of this standard. As depicted in the Argentinean case, efforts from outside parties, specifically the Japanese and Brazilian governments were significant in the diffusion of the ISDB standard – showing the greatest increase in diffusion when analyzing broadcast station and consumer television market size. Theoretical research is supported by the empirical data and case study analysis demonstrating that diffusion of standards is heavily influenced by governmental actions, thus enhancing networking effects of the adoption of the ISDB standard over other standards presented in the region.

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