Cooperative Efforts and the Stages Previous to Internationalization: The Case of Telefónica

Ángel Calvo*

Universidad de Barcelona, Spain

Abstract

This article explores an area that has received relatively little attention from economic historians in Spanish-speaking countries despite the formidable appeal of its economic, technological, regulatory, and geopolitical implications. An interdisciplinary approach is employed which employs a balanced combination of primary and secondary sources. It is framed within the gradualist approach of the Uppsala School, though without adopting all of its postulates, and analyzes Telefónica's "internationalization before internationalization" that occurred through its participation in artificial satellites. As a result of transnational cooperative efforts, the creation of these effective systems of telecommunication sometimes included Latin American countries. The participation of Telefónica in the Spanish system of satellites coincided with the beginning of its direct foreign investment, starting in 1989 with its entry into the Chilean market.

Keywords: Spain, internationalization, telecommunications, Hispasat, Telefonica

* Article received on February 10, 2014; final version approved on September 22, 2014. I thank Emilio Gilolmo, Alejandro Díaz, and Rosa María Sainz of the Telefonica Foundation for the support they provided for this study. I would also like to thank the editors of this journal and Martín Monsalve in particular, for their warm response and the anonymous reviewers for their efforts to improve this text. The purely factual information in this article is from Calvo (2010, 332-348). This study expands the information in that text chronologically and restructures and enriches the approach on the basis of primary and secondary sources as well as through more extensive analysis and by relating the results to contemporary debates.

Ángel Calvo holds a doctorate in History from the Universidad de Barcelona and is professor emeritus of that university. He has published numerous articles in prestigious books and journals in Spain and abroad. His work as a doctoral thesis advisor and editor of books is highly respected. Calvo belongs to various international research groups such as the European Science Foundation and is a member of the board of the Societat Catalana d'Història de la Ciència i de la Tècnica (SCHCIT).
Email: angel.calvo@ub.edu

Vol. XLI, N° 75, Second Semester 2014: páginas 211-242 / ISSN 0252-1865

Acronyms

AMAE	Archive of the Ministry of Foreign Affairs (Archivo del Ministerio de Asuntos Exteriores)
ASCEND	Advanced System for Communications and Education in National Development
Aseta	Association of the Telecommunication Companies of the Andean Countries (Asociación de Empresas de Telecomunicaciones de los Países Andinos)
AT&T	American Telephone and Telegraph
Cavisat	Via-Satellite International Audiovisual Center (Centro Audiovisual Internacional Vía Satélite)
CCITT	Consultative Committee for International Telegraphy and Telephony
CDTI	Center for Technological Industrial Development (Centro para el Desarrollo Tecnológico Industrial)
CEPT	European Conference of Postal and Telecommunications Administrations (Conférence Européenne des Administrations des Postes et des Télécommunications)
COMSAT	Communications Satellite Corporation
Conie	National Commission for Space Research (Comisión Nacional de Investigación del Espacio)
CTNE	National Telephone Company of Spain (Compañía Telefónica Nacional de España)
EBU	European Broadcasting Union
ECS	European Communication Satellites
IFC	International Finance Corporation
ELDO	European Launcher Development Organisation
ESA	European Space Agency
ESRO	European Space Research Organisation
Eutelsat	European Telecommunications Satellite Organisation (Organización Europea de Telecomunicaciones por Satélite)
INI	National Industry Institute (Instituto Nacional de Industria)
Inmarsat	International Maritime Satellite Organization
INTA	National Institute for Aerospace Technology (Instituto Nacional de Técnica Aeroespacial)
Intelsat	International Telecommunications Satellite Organization (Consorcio Internacional de Telecomunicaciones por Satélite)
ITT	International Telephone and Telegraph
ITU	International Telecommunication Union
LACA	Book of Minutes of the Board of Directors, Spanish National Telephone Company (Libros de Actas del Consejo de Administración, Compañía Telefónica Nacional de España)

LEO	Low Earth Orbit
NASA	National Aeronautics and Space Administration
PTT	Postal, Telephone and Telegraph
RTVE	Spanish Radio and Television (Radio Televisión Española)
SA	Public Limited Company (Sociedad Anónima)
SACI	Advanced System of Interdisciplinary Communications (Sistema Avanzado de Comunicacio¬nes Interdisciplinarias)
SCAMA	Station Conferencing and Monitoring Arrangement
SCHCIT	Catalan Society for the History of Science and Technology (Societat Catalana d'Història de la Ciència i de la Tècnica)
SERLA	Latin American Regional Education System (Sistema de Educación Regional Latinoamericano)
SPC	Space Communications
USAF	United States Air Force

INTRODUCTION

In the middle of the 20th century, the international telecommunications system was undeniably in a golden age (as was the global economy), under the umbrella of institutions and policies that were favorable to economic development. After the replacement of high frequency radio by undersea cables, it was satellites that opened the door to the newest technology for use in communications, until the time that fiber optics became available. Satellites and cables – two systems that were supposedly inimical to each other but were actually complementary – provided the basis of the world communications network (Dawizciuk and Preston 1980: 127-138; Bacon 1988: 386). In contrast to what occurred in the 19th century with telegraph cables, an essential characteristic of the new era was the achievement of a climate of understanding among nations that permitted the implementation of large-scale projects – a rational formula to increase the possibilities of success, given the technical difficulties and unusually high costs involved.

Beginning with the theoretical framework of the Uppsala school, which advocates gradual internationalization, this article analyzes the "internationalization before internationalization" of Telefónica as a result of the participation of the Spanish operator of artificial satellites.[1] Nevertheless, more solid supports are sought, which make it possible to capture the complex processes in which both the idiosyncrasies of this particular sector and the level of development of countries involved exercise an undeniable influence.[2] This article is situated at the intersection of economic history and technological history. It endeavors to provide an interdisciplinary focus and is based on an equilibrated combination of primary and secondary sources.

The text is divided into four main sections, preceded by an introduction and followed by a conclusion. The first section deals with the general characteristics of the satellite era; the second describes the cooperative efforts necessary to overcome the high costs involved and the legal and geopolitical requirements. The third section describes Spain's place in world commercial system of satellite telecommunications while the fourth and last section describes the issues involved in the role played by Telefónica, as well as their implications.

1. This restrictive approach excludes other types of infrastructure such as undersea cables. For information on the Uppsala model see: Johanson and Finn (1975); Johanson and Vhalne (1977); Blomstermo and Sharma (2003); Durán Herrera (2001). For critiques of the Uppsala school see: Hedlund and Kverneland (1984); Hood and Young (1983); Oviatt and McDougall (1994).
2. On the idiosyncrasies of service sectors see: Flodin and Jansson (2012); Boddewyn *et al.* (1986: 41-57). According to the latter, the inseparability of some services requires the local implementation of the matrix.

THE ERA OF ARTIFICIAL SATELLITES

Parallel to the development of the world network of undersea telephone cables, science expanded the technological frontier of communications through the development of satellites which, with their much better capacity for communication than cables, contributed to the configuration of the worldwide telephone network as the largest logical machine on the globe.

In order to properly understand the issues involved, it is necessary to keep in mind that communication by satellite consists in the transmission of signals on determined frequencies or segments of the radio spectrum between ground stations and satellites in orbit. The function of the satellite is to receive signals, amplify them, and return them to ground stations (Abramowitz *et al.* 1998: 2). The advantages of communications by satellite over alternatives on the earth's surface are various: ubiquitous coverage; consistent quality of service; alternative infrastructure – fiber or microwave networks - are nonexistent, antiquated or insufficient and have prohibitive implementation costs; cost predictability due to distance insensitivity; traffic bypass; scalability and reconfigurability; temporary network solutions to get the necessary information out; total network management; network backbone infrastructure from one extreme to another, all on one level; and a long-term solution for the last mile, providing cost-effective multipoint access (Intelsat 2010). Nevertheless, the development of fiber optic technology in the 1980s provided new opportunities for telephone cables due to the higher sound quality provided (Abramowitz *et al.* 1998: 16).

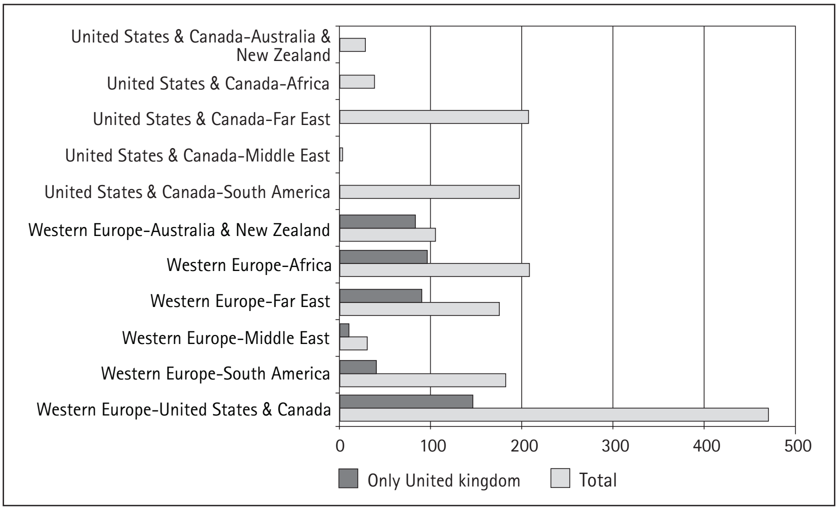
The Cold War and the resulting competition for world hegemony triggered the space race in its varied military and commercial aspects. In 1955, Eisenhower first found out about the possibility of satellites during a meeting in Rome and took the decision to initiate a program and fund it with US$ 22 million.[3] The prestige of the United States suffered a severe blow with the launch of the Soviet Sputnik on October 4, 1957, to the point where the government dreaded that public opinion in Western Europe and Japan might see the Soviet Union as the world power of the future.[4]

At the beginning of the 1960s, large worldwide areas of space communication were being drawn, closely linked to the telephone. It was clear that the need for space com-

3. Eisenhower archive: "Official White House Transcript of President Eisenhower's Press and Radio Conference #123 concerning the development by the U.S. of an earth satellite" (pp. 1-9; DDE's Papers as President, Press Conference Series, Box 6, Press Conference 10/09/1957).
4. Eisenhower archive: "Reaction to the Soviet Satellite. A Preliminary Evaluation" (White House Office of the Staff Research Group; Box 35, Special Projects: Sputnik, 10/16/1957).

munications was connected with the volume of ocean traffic and, therefore, the most important countries were the United States, Japan and, in Europe, the United Kingdom and Germany. There were six routes that appeared as potentially the most significant: the Atlantic route between Europe and the United States with a node in the United Kingdom; the Europe-Africa route; the Europe-Inter-American route; the Europe-Middle East route; the transcontinental United Kingdom-Continental Europe-Far East-North America route; and finally, the United Kingdom-Continental Europe-Australia-New Zealand-North America route. According to reliable estimates, over two-thirds of spatial communications could be served by one satellite in a stationary orbit over the North Atlantic (Figure 1). Spatial communications that included Latin America were of great importance, given the appreciable predominance of export economies in the region (Figure 2). Still, it was not clear that satellites were superior to undersea cables or land routes in linking Latin America with Europe and North America, respectively (Brinkley 1961). On the other hand, satellite technology could threaten the positions gained by certain governments and companies through investments in cables and radio. Clearly, European partners in first-stage projects believed that their financial interests were best protected in cables, a system in which they were most solidly positioned.[5]

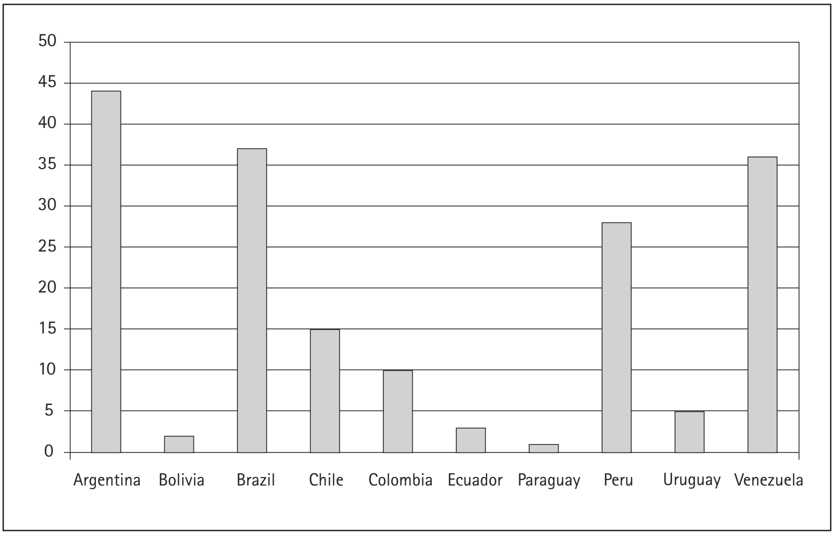
Figure 1
Calculation of the number of international telephone circuits needed, 1961



Source: Brinkley (1961: 7-8).

5. L.B. Johnson Archives: White House Central Files, FG 806, Comsat Corp. Confidential (8/21/1965, 10 am). This source points to the United Kingdom as the most reticent country.

Figure 2
Calculation of the existing telephone circuits between South American countries and terminals in Europe, 1961



Source: Brinkley (1961: 11); compiled by author.

In Latin America, preliminary experiments related to artificial satellites in Latin America had education as their goal. One was the SACI project (Advanced Interdisciplinary Communications System) in Brazil, inspired by former NASA researcher, F. Mendonga, which barely managed an initial trial in Río Grande del Norte with the support of NASA and through the ATS-6 experimental satellite. Another such effort included CAVISAT (International Audiovisual via Satellite Center) and the Advanced System for Communications and Education in National Development (ASCEND) published in 1967. In 1969, the CAVISAT project was developed in Chile, sponsored by universities in Latin America and the United States together with North American commercial firms and financing from COMSAT (Communications Satellite Corporation) and other private institutions such as General Electric. However, this project was terminated not long after by the Andrés Bello Convention (Convenio Andrés Bello) signed by the ministries of education of the Andean region, at their meeting in Bogota. After the incorporation of Argentina, Chile, and Paraguay, which were not part of this convention, the Serla project was initiated and produced the following study in 1973: "Design and Methodology of the Viability Study of a Tele-Education System for the Countries of South America"; this was a veritable swan song not only for this organization but also for the prestige of education for development via satellites (Schmucler 1983, 1997: 74).

The real launch pad for the development of a real need for satellites came from the queen of the media – television. The year after the creation of Intelsat (International Telecommunications Satellite Organization), a meeting was held that resulted in a provisional world satellite communications system. Four Latin American countries participated: Argentina, Brazil, Colombia, and Uruguay. In 1968, three more countries had terrestrial antennas that linked them to the international system: Panama, Chile, and Mexico.

Peru has interesting characteristics because its mountainous terrain requires satellite services. It joined Intelsat and, in 1992, increased its investment quota while participating in the 22nd meeting of the organization's signatories. Peru provided its own land and rented transponders for 15 years under favorable conditions (Dodd et al. 1998: 154).[6]

Currently all Latin American countries participate in Intelsat for international communications and a group of five – Brazil, Chile, Colombia, Mexico, and Peru – also rent segments for national communications.

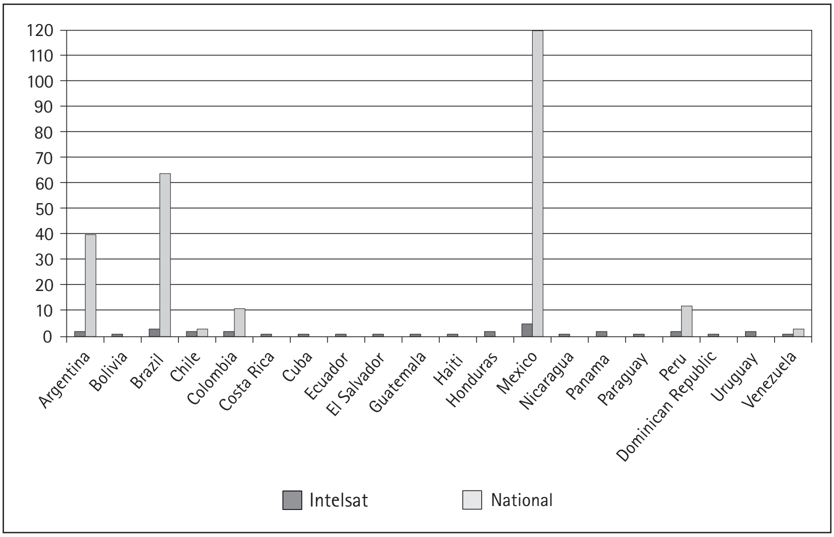
But the challenge lay in satellites ownership, something that various Latin American countries aspired to despite the recommendations against this measure by a number of organizations.[7] In 1966, ITT (International Telephone and Telegraph) rejected a proposal by the Argentine government to construct a satellite, an action that clashed with the climate of cooperation noted above and the supposed aid offered by the United States to promote communications in developing countries (Wells and Ahmed 2006: 40). It took 33 years until the launch by the U.S. of Nahuel I, which covers all of the Americas. Previously, in 1969, the Italian company Telespazio initiated a program of cooperation with the National Telecommunications Company of Argentina, which consisted of a professional training course in Buenos Aires, the training of a group of Argentine engineers at the Fucino station and the construction of a terrestrial station in Balcarce.[8]

6. Entel Perú represented Peru in organizations of this type, including Intelsat (Entel Perú 1992: 21). By decision of the Peruvian government, in 1995, the relevant ministry became a signatory of Intelsat, without this affecting the services that Telefónica del Perú (the entity that resulted from the merger of Entel Perú and the Compañía de Teléfonos de Perú after privatization) received from Intelsat nor its investment in Intelsat. Telefónica del Perú reinforced its presence in international and regional undersea cables as an additional part of Columbus II, America 1, APCN, TPC-4 y TPC-5, and perhaps became a principal investor in the Pan-American undersea cable project (Telefónica del Perú 1995, vol. 2: 23, vol. 1: 21).
7. In 1984, Intelsat tried to dissuade the Association of Telecommunication Companies of the Andean Countries (Associación de Empresas de Telecomunicaciones de los Países Andinos, Aseta) from building its own regional satellite, arguing that costs would be high and technical efficiency would be limited (Volkmer 2012: 130).
8. See: De Maria y Orlando (2008: 226); Centro di Documentazione (vol. 21: "El sistema Morelos quedó formado por los satélites Morelos I y II y el Centro de Control de Iztapalapa, del Distrito Federal," 1972); Szymanczyk (2013: 207).

Mexico joined the race with its Morelos satellite in 1985 and with the second generation geostations Solidaridad 1 and 2, built by Hughes Aircraft and launched in 1993 and 1994 by the European rocket Ariane, to cover traffic from the southern United States, Central America, and the Caribbean.[9] Mexico itself launched Satmex 5 through the privatized Satmex to provide internet service for all of the Americas. At the same time as Mexico launched its first satellite, Brazil launched Brasilsat in 1985; it was manufactured by Aérospatiale and Ford Aerospace and acquired by MCI in 1999 (Huurdeman 2003: 433).[10]

In 1993, the ground stations of the Latin American satellite system included 33 belonging to Intelsat and 253 of their own. The most important holdings were in Mexico – 5 Intelsat and 120 national, Brazil – 3 and 64, respectively; and Argentina – 2 and 40. In other words, these three countries had almost one third of Intelsat's satellite territorial stations and more than three-fourths of country-owned stations (Figure 3). Much further behind, Peru ranked among the countries that had the least of its own satellite capacity, in fourth place, just ahead of Colombia (Cole 1996).

Figure 3
Distribution of Ground Satellite Stations in Latin America



Source: Cole (1996).

9. The total cost of both was US$ 452 million (Mosco and Schiller 2001: 139).
10. Together with Intelsat and Panamsat, Solidaridad covered the space needs of Orion in Central and South America (*South American Telecom Newsletter* 1997: 5).

Going back in time, the main milestones in the modern adventure of satellite use were reached between 1961 and 1965, the years stretching from J.F. Kennedy's proclamation of support for a system of satellite communications, followed by the recommitment to this policy by L.B. Johnson, and then the launching of the first commercial satellite, Early Bird (National Security Action Memoranda 1968).[11] In this period, the congress of the United States approved the Communications Satellite Act and COMSAT was created in 1962. COMSAT is a mixed public-private corporation, conceived as an instrument to challenge Soviet space communications. NASA's entry into the fray starting in 1960 provided both economic and technical capacity and coordination and alignment with the interests of industry, all of which were necessary to overcome the obstacles to an initiative that was commercial in nature, closely linked to the expansion of television (Smith 1976: 251).[12]

In reality, it was the North American giant American Telephone and Telegraph (AT&T) that first studied the possibility of a "mirror" in space whose mission it would be to facilitate communications. The market research, experiments with Echo 1, and subsequent technical developments culminated in the launching of the first commercial satellite, Telstar 1 in 1962. The first conversation transmitted via satellite took place by telephone between Vice President Lyndon B. Johnson in Washington and Frederick Kappel, head of AT&T in Andover, Maine.[13] On July 10, 1962, the vice president and the top corporate executive exchanged views for a couple of minutes regarding the advantages of communication by satellite and the necessary collaboration between government and industry. The next day, television viewers were able to see a performance by the French singer Yves Montand as well as comments by the chief engineer of the British Post Office via the same satellite – the first transatlantic television transmission. After 1962, Telstar 1 was followed by two other satellites – Relay and the Syncom series. One Snycom satellite demonstrated its capacity for coverage by transmitting the signal of the Tokyo Olympic Games.[14] By the middle of 1966, commercial satellite stations consisted of one satellite for communications between

11. It should be noted that Johnson considered plans to help promote communications in developing countries and, at the same time, was concerned about the technological gap between the United States and Europe (National Security Action Memoranda 1968). During these years, the president of the United States clearly foresaw that science and technology would have a privileged place in the conduct of foreign policy (L. B. Johnson Archives: "Donald F. Hornig Oral History Interview I," 04/12/68, by David G. McComb).
12. One concise testimony about the weight of military and industrial interests in the U.S. administration can be in found in the L.B. Johnson Archives ("Donald F. Hornig Oral History Interview I," 04/12/68, by David G. McComb).
13. At the same time, the first fax was transmitted by satellite (Schwoch 2009: 128).
14. All had a low earth orbit (LEO) and stood out for their small size and simplicity (Tirró 1993: 1). Syncon I was built by Hughes and Goddard (Smith 1976: 86).

the United States and three European stations, located in England, France, and Germany. In 1968, the Interim Communications Satellite Committee evaluated the number of satellite circuits needed during the following years as 1240, of which 672 circuits corresponded to the Atlantic, 512 to the Pacific, and 56 to the Indian Ocean.[15] Late in entering the program, Spain had three circuits that could only be used through land access to the corresponding station in each country, which meant paying elevated costs for transit rights.[16]

COOPERATIVE INITIATIVES

Just as was the case with cables, the technical complexity and the costs involved made international cooperation on satellites necessary (Calvo 2014). Some of the agreements reached in the 1960s and 1970s were bilateral and involved Spain, which was initially internationally isolated as a result of the dictatorial character of the Franco government. In 1964, the governments of Spain and France signed an agreement to install a satellite telemetry and remote control station on the Canary Islands to be used for peaceful space research. This agreement, which expired on February 23, 1975, was based on French predominance in the provision of technology and operational management. At the end of the four years, both countries signed a new agreement for the installation of an optical satellite observation station in San Fernando (Cadiz). Nevertheless, other space projects were not successful. Plans to establish a base in Cabo Ortegal (Galicia) did not come to fruition despite French interest in obtaining a monitoring station for military missiles launched from a future base in Landas. Spanish cooperation with other nations improved with an agreement regarding the establishment of a provisional regime for a world commercial telecommunications satellite system. A new step in the same direction was taken with the signing of an agreement between the government of Spain and the European Space Research Organization (ESRO) regarding the establishment and use of a control station for geosynchronous satellites in Villafranca del Castillo (Madrid) in Paris on August 2, 1974. This was followed by a complementary agreement regarding the application of certain provisions of the protocol on privileges and immunities pertaining to the European research organization.[17]

15. See: Pelton *et al.* (2004: 38, 248); Byers (2003: 36-37); Deloraine (1969: 13).
16. See: Pierce (1968); Alper and Pelton (1984); Brown (1981); McDougall (1985); Crowley and Heyer (1991); Krige (1993); Snow (1987). Until 1960, NASA did not recognize the operational potential of satellite communication technology.
17. *BOE* (05/18/1965: 6.995, 07/12/1975); AMAE (07/09/1975: 14.482, 01/27/1971: 1.212, 12/03/1965, 07/12/1975). The French contribution to the Cabo Ortegal base was 500 million pesetas, a sum that was much larger than the 20 or 30 million pesetas that Spain would have contributed (AMAE R-010270, exp. 4).

With the stimulus of increasing global demand for telecommunications, 19 governments agreed to establish a space station that brought together latest technology, the low level of traffic flows, and the existence of economies of scale. After a complex process encompassing discussion, confrontation of interests and negotiations, which lasted for seven years and put the will to cooperate to the test, in 1964, 73 signatories established Intelsat, in reality a cooperative based on consensus that operated as a clear international monopoly. Its foundational task was to establish a platform to design, develop, construct, establish, operate, and maintain a commercial global satellite system.[18] It started slowly, primarily due to joint venture contractual agreements between the US promoter COMSAT, owner of the North American share, and international members in the dual sense of governments or entities designated by them.[19] The projected investment for the system's development was approximately US$ 187 million, unequally distributed over six years, increasing in the first phase and descending in the second. According to the first estimates, COMSAT was responsible for 53.7% of the space segment, which gave the United States leadership of the consortium. To this sum were added the corresponding costs of ground stations, supported in identical proportion by COMSAT and other US entities in the country. The initial projections underwent slight variations so that, at the moment that the consortium was created, the participation of COMSAT and Western Europe was 61% and 30%, respectively. It is worth noting here that COMSAT provided the Spanish National Telephone Company (Compañía Telefónica de España, CTNE) with the opportunity to send personnel to be part of the Intelsat program in Washington and receive training for a year (Mackay *et al.* 1968: 183 ss).[20]

Seven years after the creation of Intelsat, on August 20, 1971, the operative agreement and its annex were signed in Washington, giving the organization independent legal personality, privileges, and an arbitration mechanism. In a few years, it became a high capacity global system with a fleet of 22 satellites in geosynchronous orbit over the Atlantic, Pacific, and Indian oceans. In 1975, Intelsat, which now had 11 antennas in 88

18. See: Douglas-Home (1971: 9); Frieden (2001: 47); McPhail (2006: 279).
19. See: Sterling *et al.* (2006: 144); Hamelink (1995: 70); Space (1986: 76); Jasentu-Liyana (1984); Snow (1992: 15-25); Smith (1976: 135-154); Natalicchi (2001: 113); Kavanaugh (1985: 70-79). The driving force behind COMSAT was L. Marks, one of a group of 15 members who came from the industrial and banking sectors. Against the wishes of AT&T, they chose a synchronous rather than a random orbit. H. Geneen, the president of ITT, saw satellites as way to get a jump on AT&T. On the impact of satellites see: Hudson (1990).
20. AMAE ("Sistema Comercial Mundial de Comunicaciones por Satélite, Comité interino," R-008040, exp. 1). The British Post Office, the second-largest investor in Intelsat, with 7.23%, held out the hope of increasing its share to 10% when a final agreement was reached. (HC deb 07/19/1972, vol. 841, cc592-3). Intelsat delegated the tests of sophisticated equipment components to ITT (AMAE, "Subcomité Consultivo de Asuntos Técnicos," R-009854, exp. 4).

different ground stations, provided 325 regular means of communication between all the nations on earth. [21]

Increasing its collaboration, the Spanish government relied on Telefónica to take part in the Eutelsat operative agreements in which the Spanish company held the presidency of the board of signatories, as well as of Inmarsat (International Maritime Satellite Organization).[22]

It is worth looking at some of the details of the decision-making that led to the Eutelsat convention, authorized by the Spanish Congress of Deputies. The centrist group favored the agreement because it provided ample communications coverage to all of "Multi-party, democratic and parliamentary Europe,"[23] in addition to paving the way for Europe's increased technological independence from the United States. The Popular and Socialist groups ratified the value of the agreement. Among the arguments used by the Socialists to vote in favor of the convention was that in exchange for reasonable economic participation, it allowed for additional means of telecommunications between the peninsula and the Canary Islands.[24]

We need to ask ourselves about the reasons for the coexistence of two systems that were hypothetically in competition and responsible for duplicate communications infrastructures. If we look at the economic aspects, we find that satellites require up to five times less initial investment than undersea telephone cables but have higher maintenance costs, as shown in Table 1.[25] In the absence of any clear economic advantages held by satellites

21. See: *BOE* (03/29/1973: 76, 03/17/1973: 66, 17); and Bryson *et al.* (2003: 140). The ratification instrument is dated November 16, 1972; see: Hugill (1999: 217) and Smith (1976: 152). At the request of the Spanish government and in accordance with the report of the Commission of Foreign Affairs, the Congress of Deputies approved the authorization for the government to give its consent to be bound by means of the ratification of the Protocol on Intelsat Privileges, Exemptions and Immunities (Archivo del Congreso de los Diputados 29/10/1980).
22. See: Ungerer (1998) and Telefónica (1988: 154). Between 1986 and 1988, Telefónica chaired the Commission of the World Telecommunications Plan for Europe and the Mediterranean Basin of the ITU in addition to holding three vice-presidencies in the Consultative Committee for International Telegraphy and Telephony (CCITT).
23. Translation by *Apuntes.*
24. Archive of the Congress of Deputies ("Convenio sobre establecimiento de la Organización Europea de Telecomunicaciones por Satélite [Eutelsat] y del protocolo de modificación del mismo" 10/4/1984). Other related documents in the Archive of the Congress of Deputies include: "Enmienda al artículo 15 del acuerdo de explotación relativo a la Organización Europea de Telecomunicaciones por Satélite (Eutelsat)," adopted in Paris on February 21, 1996; "Protocolo de privilegios e inmunidades de la Eutelsat," Paris, February 13, 1987, and "Declaraciones a formular por España."
25. Of note is the breadth and complexity of the economics and financing of satellite communications, which ranges from planning the enterprise and analysis and financing of the investment to issues of government policy, dual-use technologies and national security and defense (Hertzfeld 2013: 221-238).

over cables, other aspects that are not exclusive to either of the two communications methods such as flexibility, durability, reliability, and lack of delays have made the two systems complementary, guaranteeing redundancy in the case of possible breakdowns.

Table 1
Annual costs of operation of transoceanic communications systems, 1968 (percent of cost of capital)

Item	Cable	Satellite
Operation and maintenance	3	10
Depreciation	5	10
General and administation	1	1
Interest	6	6
Total	15	27

Source: Mackay *et al.* (1968: 189).

SPAIN IN THE WORLD COMMERCIAL SYSTEM OF SATELLITE TELECOMMUNICATIONS

The incorporation of Spain into the world commercial satellite telecommunications system took place when Intelsat was created and, after 1965, through the agreement on the establishment of a provisional regime. A little earlier, a ratification instrument went into effect between the governments of Spain and France with the objective of installing a satellite telemetry and remote control station on the Canary Islands.[26]

The original partners of Intelsat were western countries with different levels of industrialization, as well as Australia and Japan. In addition to the 15 principal investors included in Table 2, other signatories of the original agreement were Denmark, Norway, Portugal, Ireland, and the Vatican. Later, new countries were incorporated such as Brazil, Argentina, Peru, and the Philippines. Peru's quota in this mega world organization was 1.00% in 1995. Spain, situated between Italy and Canada, occupied the sixth position in the group of the largest investors in the Intelsat consortium, a considerable distance from the top, with an initial quota of 0.94% that, due to financial adjustments to the project, grew to 3.28%.[27]

26. *BOE* (05/18/1965, 118: 6.995-6.996; 12/03/1965, 289: 16.366-16.371).
27. The percentage cited by CTNE was 3.09% of the quota (11/04/1973; CTNE 1973).

Table 2
Principal countries-investors in Intelsat, 1970 (in percentages)

Country	%
United States	42.31
United Kingdom	11.48
Japan	4.83
France	3.95
Canada	3.68
Spain	3.28
Italy	2.92
Australia	2.88
Brazil	2.10
Argentina	1.94
Switzerland	1.33
Philippines	1.27
Belgium	1.16
Greece	1.06
Israel	1.04
Peru	1.00

Source: CTNE (1972: 73).

In the behind the scenes conflict between supporters of cables and satellites, CTNE began to give priority to traditional methods, confident that this would result in adequate investment during their service life. With time, global communications needs turned to core areas, places such as the Canary Islands, which had not yet achieved the role they merited in the great transnational routes. COMSAT set its sights on the islands and requested authorization to install a ground station in Maspalomas in order to facilitate direct communications with the Apollo project. In August 1965, the ambassador of Spain in Washington brought the matter to CTNE for mediation by the delegate of the government. CTNE opened negotiations with COMSAT, which resulted in an agreement in principle. Evidently, the matter was of such importance that it required the involvement of the government. The approval of the Ministry of Foreign Affairs enabled NASA to become involved in the negotiations phase, and it sent a representative to negotiate with CTNE in May. According to the proposed project, CTNE committed to providing communication services through two twin stations, one of them experimental, in Maspalomas, and another commercial, in Griñón.[28] Both used U.S. technology, which guaranteed rapid and successful project implementation in time for service provision to start in September 1965. Of course, the manufacture of equipment in the United States was at a highly advanced stage at the time of the negotiations. In compensation for the high cost, which reached US$ 3.16 million, an annual quota of 65 million pesetas was requested. The financing of the stations would be achieved through a loan provided by the Export-Import Bank, directly or through the mediation of ITT. A representative of the board proposed that commitments to provide payment not be subject to the obtaining of credits.

The governments of Spain and the United States reached a final agreement in 1966 which provided for continuity in functioning and allowed for the expansion of the space monitoring station in Maspalomas in the Canary Islands. The following year, NASA and CTNE signed a contract that obliged the latter to provide six voice and data channels and two teletypes. Going into operation in 1967, the function of the Maspalomas station was to increase the circuits of NASA's monitoring base to the space control center in Houston through Intelsat satellites.[29]

THE CONTRIBUTION OF TELEFÓNICA

With the construction of a new series of satellites, the Apollo project offered greater circuit capacity and multiple and simultaneous access to various ground stations. This opened up new opportunities that were not wasted and provided the convenience of rapid incorporation into the group of pioneering countries. The urgency was connected to the requirement that the Spanish station start operations at the end of the year. CTNE decided to ask ITT for a ground station that had the capacity to simultaneously transmit telephone, telegraph, and television signals. The cost of the equipment plus spare parts, additional equipment, and a microwave radio link connection to Madrid was astronomical and similar to that charged by other international companies that built these types of stations. The project formed part of a scenario of optimal satellite communications prospects for the future, based on growth in capacity and security, the elimination of payment for transit rights,

28. *LACA* (13/01/1971). In 1961, various countries, including Spain, made a commitment to NASA through a cooperation agreement to provide ground terminals for the reception and transmission of voice and television signals (Smith 1976: 135). When asked about the reasons for installing satellite stations on the Great Canary Island and excluding Tenerife, the president of CTNE alluded to purely technical reasons to justify the choice.
29. *BOE* (29/04/1966, 102, Jefatura del Estado: 5.154-5.156); NASA and CTNE (1967). On the Apollo project see: Compton (1989).

improvement in the quality of communications with the Spanish-speaking Americas, and reduction in the cost of international telephone calls.[30]

The beginning of the 1960s brought important new developments in the space race starting with U.S. President John F. Kennedy's announcement of manned flights to the moon. Eight years later, NASA achieved its goal with the flight of Apollo XI. Between 1968 and 1970, two stations jointly built by CTNE and ITT were put into operation in Buitrago. The first was designed to operate through the Intelsat II satellites between Spain and the United States (San Miguel et al. 1970: 393ff.).[31] After the Canary Islands satellite station began operations and as part of the NASA program, tests were started at the Telefonica emission and reception centers in Griñón and Pozuelo. In addition, five circuits of the Buitrago satellite station were leased to the United States for US$ 1 million. When Intelsat III started operations in 1968, the U.S. multinationals ITT and RCA provided 48 kilobytes per second channels from Robledo and Canberra to Greenbelt. The three stations formed the vertex of a triangle and were indispensable to maintaining communication through a quarter million miles of space from earth to the moon. Once the circuit between Robledo and Greenbelt was built, it started to be used by NASA, which put all its efforts into eliminating all possibilities of error in the transmission of the signal from Robledo, Canberra, and Goldston to Greenbelt, using the Station Conferencing and Monitoring Arrangement (SCAMA) system, a voice communication station that provided NASA with 12 transoceanic channels. Knowing that any eventuality could cost them dearly, the top executives of AT&T, ITT, and CTNE formalized personal contacts with the PTT (Postal, Telephone and Telegraph) in all of Europe in order to have 12 lines at their disposal through opportune disconnections and redirections to Spain, a task that required coordinated action by eight agencies in as many countries. Various problems in the Intelsat systems resulted in Robledo being of key importance for the success of the moon mission because it was the only station that would be visible from the moon at the moment the lunar landing was to take place. Eliminating the option of Buitrago as a link via Early Bird, the second key piece in the operation that was feasible was SCAMA, which was declared to be operative at the required time by NASA, thus guaranteeing the viability of the mission and its final success.[32]

30. LACA (18/05/1966). "Ocupación de terrenos para el proyecto Apolo en Navalagamella y Fresnedilla (Madrid), con destino a la ampliación de las instalaciones de seguimiento de vehículos espaciales" (*BOE* 07/05/1966, 109, Ministerio del Aire: 5.634). For a more general analysis of space missions see: Schmitt (2005), Johnson (2006), and Sadeh (2002).
31. Of the 25 experiments that the United States carried out in 1968, five were directly related to communications (United States Space Science Program 1969: 135-137).
32. See the exceptional testimony of the preparation of the Apollo mission in Kimberly (2004: 1). Luis Terol, another privileged witness from Madrid, played an outstanding role in the negotiations and contacts.

In 1969, the increase in the capacity of the Buitrago station made it possible to establish a transatlantic circuit of 48 kilobytes per second in binary speed for the transmission of data at a high velocity between Robledo and Washington as well as direct, high quality communication with six Latin American countries. The following year, the Export-Import Bank approved a loan to finance the Buitrago II and Canarias satellite station[33] and, in 1971, the Agüimes satellite station was inaugurated. When the equipment for Buitrago was being purchased, Nippon Electric Co. was contacted but it was proved impossible to reach an agreement with this firm. Consequently, negotiations were started with ITT Space Communications (ITT-SPC) for the provision and installation of Spade equipment in the Buitrago station at a cost of approximately US$ 330,500.[34]

In 1971, it was decided to move one of the small antennas from the Maspalomas Station to the one in Buitrago at a cost of approximately 10 million pesetas. The transfer did not take place until 1974. Assigned as it was to the Apollo project, CTNE helped NASA in the operation of the launching of Apollo XVI in April 1972.[35] In 1975, the Buitrago ground station aided the ship of the Russian-U.S. Apollo-Soyuz, serving as a link between NASA's ATS satellite, the Apollo capsule, and the Goddard Space Flight Center (U.S.). At the same time, it participated in tasks related to linking the Goddard center and the U.S. Navy ship, Vanguard, as part of the Viking program, which was responsible for sending twin unmanned spacecraft to Mars. Starting in 1975, this antenna supported radioelectric space research missions as part of a collaborative program between the European Space Agency, NASA, and European and North American universities.[36]

In 1971, an agreement in principle was agreed upon regarding the utilization of satellites, and included an important innovation. Up until then, activities were channeled through the Ministry of Foreign Affairs, with the consequent delays. Sometimes, this led to double agreements: one with the government, with the Ministry of Foreign Affairs acting as the official negotiator, and another with operative entities, whose negotiator was CTNE.[37]

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33. See: *LACA* (19/04/1967, 21/02/1968, 16/09/1970); CTNE (1969: 34, 1973). The Ministry of Information and Tourism was very interested in satellites as a way of facilitating television links with the Canary Islands because of the positive effects on costs (*LACA* 11/03/1970). As part of the agreement between Spain and the United States Air Force (USAF), in the spring of 1966, the first four long distance circuits (2400/4800 bits per second) with ITT modems commenced operations for data established by Telefónica, which linked the Rota base to the Pentagon. These were not the first, because some years earlier, CTNE had carried out tests on some Madrid-Barcelona and Barcelona-Palma circuits with IBM 1001 equipment, in response to a request by IBM, which was committed to a project for La Caixa (Martín Tardío 2006). For more information on the presence of ITT in Latin America see: Ledbetter (2007: 524-537).
34. *LACA* (19/05/1971, 23/02/1972). For information on various issues regarding telecommunications in Latin America see: Martínez (2008).
35. *LACA* (17/05/1972).
36. *LACA* (16/06/1971); CTNE (1975: 13).
37. *LACA* (14/07/1971).

A third ground station was soon needed in Buitrago to serve as a means of diversifying the routing of traffic and facilitating the restoration of undersea cables. In a public request for tenders in Portugal for the construction of three stations, the winning bid was presented by ITT-SPC, the builder of the CTNE stations. Market conditions and a far from negligible homogeneity with existing material made it advisable to turn to ITT-SPC. A feeler was put out about the possibility of getting a price similar to that offered Portugal, probably because of the high number of stations, and negotiations were opened with ITT-SPC for the provision, installation, and spare parts necessary at a cost of US$ 2,647,500, equivalent to 170,763,750 pesetas.[38]

The satellite stations were a powerful instrument in the development of television transmissions, with an unquestioned impact on the globalization of communications and on forging closer links among the Spanish-speaking community. CTNE cooperated with TVE in the implementation of coaxial cable television by means of a contract in which it committed to carrying out the technical installations necessary for the distribution of cable television in exchange for a rental charge and maintenance for ten years, renewable for another ten.[39] On the international level, the Buitrago satellite stations made it possible for the first time to transmit television between Japan and Panama. Starting in February 1974, CTNE and Mexico employed a channel via the Atlantic Intelsat A satellite through Buitrago and Agüimes. Mexican use of this channel represented a risk to emissions from the Canary Islands. RTVE (Spanish Radio and Television) decided to use the channel only for itself which made it necessary for CTNE to negotiate a rental agreement with Intelsat. In 1975, satellite telephone communication between Spain and the Dominican Republic commenced.[40]

Significant competition over artificial satellites took place in Europe once Great Britain decided not to repeat its experience with telephone cables when it came to satellites, and instead opted in favor of a commonwealth of satellites with the creation of the European Launcher Development Organization (ELDO) (Nixon 1970: 380-385). This led Spain to join ESRO. Created in 1964 and concerned primarily with scientific satellites and sounding rockets, ESRO launched seven scientific satellites that carried out 50 experiments with the participation of 20 research institutions in nine countries. Later, it participated in NASA's space launches while including wide band communications, radio broadcasting, and meteorology as part of its activities. ESRO and EBU (European Broadcasting Union) studied the viability of a satellite for television broadcasting for several years. In 1969,

38. *LACA* (12 /07/1972).
39. *LACA* (21/06/1972, 12/07/1972). In 1975, 185,463 minutes of television were transmitted by the Buitrago and Agüimes stations. For the contributions of satellites to television see: Newman (1972).
40. *LACA* (24/11/1971, 25/06/1975).

the European Space Conference, ESRO, and CEPT (European Conference of Postal and Telecommunications Administrations) were charged with studying a similar application for a telephone network. In 1971, ESRO arranged for three international consortiums of communications companies and aerospace industries to carry out three independent studies of the ECS System (European Communication Satellite). In these studies, Standard Telephones and Cables led a group of ITT companies in association with the aerospace consortium MESH - Engins Matra (France), Erno (West Germany), Saab-Scania (Sweden), and Hawkey Siddeley Dynamics (United Kingdom). Finally, in 1975, ESRO and ELDO, its twin, merged to form the ESA (European Space Agency) which made the decision to forge ahead with the European industry.[41]

When the idea of a European satellite was under consideration, CTNE started conversations with officials from the Spanish Air Ministry. The fact that CTNE would assume part of the expense of launching the satellite was a decisive argument for establishing a tracking station in Spain.[42] Subscriptions to 150 shares in Eurosat led to the choice of CTNE, together with three other companies, to carry out maintenance on the tracking stations of the space segment of the Darmstadt satellite (Germany). As an additional advantage, it was invited to contribute to the research program of the four European satellites, something that was of interest because of possible compensation such as installing satellite tracking stations in Spain, which would increment the volume of traffic.[43]

Later, CTNE formed part of a Conie delegation that attended a meeting of the board of directors of the Telecom program in Paris which dealt with the issue of a ground station that would be a receiver in the experimental propagation program of NASA's ATS-6 satellite to commence in August 1975. The result meant approval for the installation of a station in Buitrago, a proposal that was sponsored by CTNE.[44]

Finally, in 1975, the Buitrago ground stations took part in the docking of the Apollo-Soyuz capsules, providing a highly sophisticated service in expectation of large profits, estimated at some 18 million pesetas.[45]

41. See: Council of Europe (1967: 718); *Comunicaciones Eléctricas* (1974: 330-337); Bonnet and Manno (1994: 47); Dorado (2008); Dorado *et al.* (2002).
42. *LACA* (13/12/1972). In 1968, ESRO had three satellites. After a first world agreement in 1971, three projects began in 1973, the year that ESA was established – Spacelab, Arianne, and Marot. See: Russo (1993, 1994); Tedeschi (1989); Collette (1992: 83-93); Krige and Russo (1994); Kimberly (2004: 1); Compton (1989).
43. *LACA* (20/12/1972).
44. *LACA* (26/02/1975).
45. *LACA* (16/07/1975).

It is worth asking if Spain would have had the option of its own satellite without previously participating in international projects, which were a source of information on management and financing. What is true is that Spain was in a different position than countries such as Italy that had their own space agency. Without doubt, part of the task of this non-existent agency would have had to be taken on by the private sector or entities with extensive government participation, as was the case of Telefónica.

It was under these conditions that the Hispasat project was created, financed by 20,000 million pesetas by the corporation of the same name – made up of Telefónica de España, Retevisión, and the Caja Postal – and, with fewer shares: INI, CDTI, and INTA. Finally, prestigious institutions – the European Investment Bank, to be more precise, provided long-term loans. The total budget of Hispasat (1A and 1B) and the Sencosat ground station reached 57,000 million pesetas with a useful life of 10 years. The Ministry of Defense provided some 3,000 million pesetas of this total between 1989 and 1992, the year in which the satellite was launched. It had three functions: providing television to the Americas, fixed services, and a governmental mission for the Ministry of Defense.[46]

Finishing the project required negotiations with the administrators and operators of the satellites involved through the ITU. In this way, everyone concerned could benefit from the 31° West orbital position that this international organization awarded to Spain in 1977 for a national radio broadcasting satellite system (Martín Marín 2002b: 157-165).[47] For the purposes of this article, it is very important to point out that the Hispasat program was part of a cooperative scheme in the form of a corporation, a joint venture, and in the necessary technical activities in diverse operations. In addition, cultural and linguistic affinities had a undoubtable influence in the determination of the geographical area where the project was to be implemented, which corresponds with one of the favored propositions of the Uppsala School (Martín Marín 2002a: 185-193, 2002b: 160).

Telefónica provided 25% of the total capital of the Hispasat project, which would provide services to France and Southern Europe, the Canary Islands, and the Spanish-speaking countries of Latin America (Huurdeman 2003: 430; Telefónica 1989: 7). The last years of the 1980s could not have been more significant since they coincided with the beginning

46. Archive of the Congress of Deputies (*Diario de sesiones del Senado*, Comisión de presupuestos 17/11/1992; "Solicitud de comparecencia de la Secretaria General de Comunicaciones, ante la Comisión de Industria, Obras Públicas y Servicios, para informar sobre los aspectos técnicos de la puesta en funcionamiento del satélite Hispasat," 09/02/1974).
47. INTA incorporated the needs of the Ministry of Defense and Post and Telegraph Office (Caja Postal las de Correos y Telégrafos). In 2001, Eutelsat became a shareholder of Hispasat.

of Telefónica's direct investment in Latin America, a step that would play a decisive role in the future of the company. The period of large-scale expansion by Telefónica coincided with the internationalization of Hispasat, which would quickly add to its fleet the Amazonas 1 satellite, located in the orbital position 61° West and the first satellite planned and designed for all of the Americas and able to offer all types of telecommunications and audiovisual services in the area it covered, which also included Europe and North Africa (Hispasat 2008: 21).

Without going on at length, there is one matter that should not be ignored here and that is the cooperative aspects of the launching of this satellite and its subsequent tests. The Syracuse program of the French Ministry of Defense put its equipment in France at the disposal of the Hispasat satellite for tests of its payload (the above-mentioned telecommunications functions of the satellite).[48]

Nobody doubts the importance of Hispasat in the expansion of telecommunications services in Latin America. To start with, the company deployed its capacities, guaranteeing landing rights in 21 countries, with two that were still being negotiated at the end of 2002. In a joint venture with the Brazilian telecommunications operator Telemar, Hispasat developed the Amazonas satellite, whose 63 equivalent transponders made is possible to provide traditional telecommunications services as well as broadcast of content, access to the internet, and broadband services.[49]

In 1995, the Nahuel Satellite System, operated by Nahuelsat, S.A., a private capital enterprise allied with international satellite operators, was able to enhance its capacity through the incorporation of 27 MHz in the bottom half of the No. 18 transponder of the Hispasat 1B satellite.[50]

48. Archive of the Congress of Deputies ("Solicitud de comparecencia de la Secretaria General de Comunicaciones, ante la Comisión de Industria, Obras Públicas y Servicios, para informar sobre los aspectos técnicos de la puesta en funcionamiento del satélite Hispasat," 09/02/1974).

49. Landing rights were obtained in the following countries: Argentina, Guatemala, Belize, Guyana, Bolivia, Honduras, Brazil, Canada, Nicaragua, Chile, Panama, Colombia, Paraguay, Costa Rica, Peru, Cuba, Suriname, Dominican Republic, Uruguay, Ecuador and El Salvador; Mexico and Venezuela are in the process of negotiation. The orbital position of Amazonas is 61° West (Chislett 2003: 206-207).

50. Comisión Nacional de Telecomunicaciones, Resolución 1789/95 (Buenos Aires 29/09/1995; *Boletín Oficial de la República Argentina* N° 28.261, 01/11/1995, p. 6). Nahuelsat S.A. was initially made up of Daimler-Benz-Aerospace (Germany), Aerospatiale (France) and Alenia Spazio (Italy), and then added new partners: International Finance Corporation (IFC, World Bank), General Electric and, from Latin America: Publicom (Telecom Argentina Group), Banco Provincia Group, Bisa and Antel Group (Uruguay).

CONCLUSION

This article resolves the apparent contradiction between cooperation and competition in the world telecommunications sector. The most rational manner of participating in the very large projects that led to global communications was, without doubt, cooperation between international bodies and enterprises.

This perspective begins with the propositions of the Uppsala at the same time as it challenges them, above all because of the special characteristics of the sector being studied. There seem to be few doubts that international cooperation has the unequivocal characteristics of internationalization, despite the fact that it does not fit very well into current ways of thinking such as those of the aforementioned school of thought.

The complexity, magnitude, and territorial scope involved mean that progress in the creation of large infrastructures or global networks require continuity in cooperative efforts and, thus, that the types of arrangements put into practice in the second half of the 19th century will continue.

In the case discussed here, Telefónica coexists with other Latin American operators and representatives of their respective governments in the organizations of the world communications system. This provides the company with information on the market, the idiosyncrasies of the sector, and economy of experience, if not necessarily comparative advantages – many other firms are also involved; but at least, Telefónica avoids comparative disadvantages.

The direct intervention of Telefónica in large communications infrastructure projects created exclusively with Spanish capital – Hispasat – demonstrates a clear inclination for Latin American space; nevertheless, it would be futile to look for a linear relationship with the internationalization undertaken by Telefónica at the end of the 1980s with its entry into Chile, and was clearly strengthened when it entered the Peruvian market five years later.

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