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Economics and politics in submarine telegraph cables (XIX[TH] and XX[TH] centuries). A global perspective between history, heritage and preservation
edited by Andrea Giuntini and Ana Paula Silva

STORIOGRAFIA

THE DEPLOYMENT OF SUBMARINE CABLE ON THE BRAZILIAN COAST AND THE DEVELOPMENT OF BRAZILIAN LANDLINES

The first electric telegraph trial in Brazil

Like in Europe, Brazil had already set up an optic telegraph network before the very first electric telegraph lines were installed. The optic telegraph stations mainly ran down its coast to communication with vessels regarding their cargo, destination, and whether there was a disease on board. The telegraph optic adopted in Brazil was the Maryath system, which was based on a flame code[1]. The telegraphs optics started to be installed in 1809, a year after the arrival of the royal family in Brazil.

The context of the electric telegraph beginning in Brazil is related to the situation of internationally trafficked slaves. Great Britain forbade such trafficking in 1807. During the period of Napoleon, the Portuguese royal family went to Rio de Janeiro, and allowed commercial transactions between Brazil and the «friendly nations», mainly England. In 1810, the Brazilian government signed a commercial agreement with England. This agreement set the theme about the trafficking of slaves, and its prohibition. However, no resolution was actually taken to avoid such trafficking. In 1827, D. Pedro I renewed the accord made in 1810 to end trafficking once and for all, but, once again, nothing definitive was achieved. The Brazilian empire's economy was essentially an agricultural monoculture, mainly revolving around coffee and sugar, and was based on slave work. In addition, the whole imperial society had its pillar in slavery, which meant that it would be hard work to change from a society of slavery to one of wage earning.

Between Great Britain and Brazil, there was a commercial agreement that was quite favorable to the British; since 1810, whose products

[1] There was a small telegraph optic line going inward from downtown to the imperial farm in Rio de Janeiro province.

had to pay only 15% tax, against 24% for another countries, and 16% for Portuguese products sold in Brazil.

In 1831, the minister of justice, Diogo Antônio Feijó, forbade slave trafficking in Brazil, but again without any practical effect. In 1844, the Brazilian government, during what was known as the Regency period (1831-1840), issued the Alves Branco tax, which ended English's tax advantage. Great Britain responded with the Bill Aberdeen law, issued in 1845, which allowed British ships to arrest slave vessels from any country. The quarrel increased when some Brazilian ships were arrested in Brazilian harbour, at the end of 1840s.

In 1850, the minister of justice, Euzébio de Queiroz (1812-1868)[2], issued a law that forbade the trafficking slaves. To guarantee application of the law, Queiroz arranged the installation of an electric telegraph so as to aid police control.

After the failure of the first trial, which was conducted by the physician Francisco de Paula Candido (1805-1864), Guilherme Schüch de Capanema (1824-1909) was charged by Queiroz to carry out this task. Capanema was a physics professor at Escola Central[3], and had already performed some experiments using electric telegraphy in his laboratory.

On 11 May 1852, the first electric telegraph line was opened in Brazil. A subterranean cable linked São Cristóvão Palace, where the emperor D. Pedro II (1825-1891) lived, and Central Quartel, and was around 4 km in length. This line was, in fact, an experiment to test the electric telegraph. Following the success of this line, several Morse devices and wires were bought in Germany. These devices were installed in Rio de Janeiro downtown, linking public offices, police departments and fortresses around the Guanabara Bay.

Meanwhile, during the period from the first electric telegraph experiment, in 1852, and the purchase of the telegraph devices and equipment to set up the first telegraph network in Rio de Janeiro, slave traffic decreased. Even without any participation of electric telegraph, the slave traffic had finally finished, mostly by the England pressure and their powerful squad. Table 1 shows the number of slaves landing in Brazil from 1849-1852.

[2] Eusébio de Queirós Coutinho Matoso da Câmara.

[3] An engineering faculty that, a few years later, turned into the Escola Politecnica, inspired by the École Polytechnique in France.

Table 1 – *Number of slaves landing in Brazil, 1849-1852*

Year	No. slaves
1849	54,000
1850	23,000
1851	3,000
1852	700

Source: S.B. DE HOLANDA, *Raízes do Brasil*, São Paulo 1995[26], p. 76.

The numbers shown in Table 1 aid understanding as to why so few telegraph lines developed in Brazil. More than ten years after the first telegraph transmission, the length of all telegraph lines totaled nearly 100 km. The furthest telegraph station, which was around 60 km from Rio de Janeiro city, was located in Petrópolis, a small village where the emperor spent his summers; this was opened in 1857. There were around ten telegraph stations in operation, even most of then in bad conditions.

The electric telegraph was installed to facilitate the police action against slave traffic. Thus, once the trafficking ceased, the electric telegraph became useless. It must be understood that at the very beginning of electric telegraph installation in Brazil, the technology was not perceived as a telecommunications device, but rather as a police instrument or a fireman's tool (as a fire alarm).

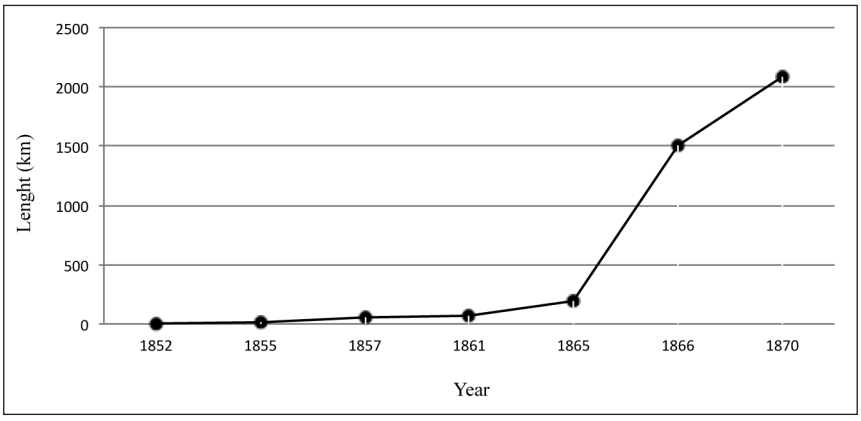
A query involving all countries in South Brazil frontiers to control the navigation of Prata river and definition about borderlines, resulted in war statement of Brazil and its allies Uruguay and Argentina against Paraguay. This war gave another goal to telegraphy development which was still until then. Capanema was contacted by the ministry of justice and demanded to build one telegraph landline from Rio de Janeiro city to the south side of the empire to enable communication between the central power and the front. By typical strength made during the wartime, the landline was built with help from local people, such as farmers and the mayors of small cities along the path. The workers from the General Telegraph Office[4], were also helped by slaves from farms crossed by the telegraphs lines. In addition, the private country owners borrowed animals to transport equipment and poles that usually were caught from nearby forests. The local government also contributed materials and financial resources.

[4] The General Telegraph Office was opened in 1855, and Capanema was elected chairman of it.

The landline was finished in 1866, successfully linking the central power of the empire to the southern boundaries of the country. During the war, the length of telegraph landline increased from 60 km to 2,000 km. Nevertheless, the quality of communication was poor: some wires got caught up on trees, while others touched the ground. The small submarine cables that crossed the rivers needed to be substituted due to flaws in their manufacturing, as recognized by *the Siemens and Brothers Company*, but even this was not sufficient; some of the cables later had to be replaced by aerial lines, which changed the path of landline telegraphy, and entailed searches for locations at which the width of the river was shorter[5].

Another problem affecting telegraph communications was that there was no time to train staff to operate the telegraph system or maintain the telegraph stations. This turned from a simple problem into a big one, which took a long time to solve and halted communications for a long time. Despite all of these problems and the intermittent communication, however, telegraphy proved its value in telecommunications. When Luis Alves de Lima e Silva, the marquis of Caxias, took over the Brazilian army, he urgently demanded a telegraph at the front. The first front telegraph landline was built by an engineer lieutenant

Figure 1 – *The length of Brazilian telegraph landlines, 1850–1870*



Source: Ministry of Justice annual reports from 1852 to 1864, and Ministry of Agricultural and Public Works annual reports from 1864 to 1870.

[5] *Brasil. Memória Histórica A Repartição Geral dos Telégrafos*, Rio de Janeiro 1907.

named Álvaro Joaquim de Oliveira, and ran from Tuyuty to Passo da Pátria. During the period of Curutaity occupation, the command orders were transmitted by telegraph. In headquarter reached to be sent nearly 100 telegrams daily.

Before the war, the telegraph was viewed by some critics as a physics experiment, but after the war it gained a new status and started to be viewed by authorities as a powerful tool of governmental control. From the end of the war onwards, in 1870, the landlines expanded to the north of the empire, linking all of the coastal provinces.

The turning point

The success of the telecommunications system during the war changed the government's attitude in terms of telegraphy investments. Up to the beginning of the armed conflict, landlines had not received any special attention, and was considered a lower priority for investments compared to, for instance, railways. From the end of the war on, the government decided to invest in implementing a telegraph system from Rio de Janeiro to the province of Pernambuco, in the north of Brazil. Recife, the capital of Pernambuco, was the first capital of Brazil in colonial times, and was still economically and politically influential.

In fact, the idea was to link every coastal province capital and the most important cities along the way to Pernambuco. After this accomplishment, it would be possible to keep all of the coastal provinces in touch with Rio de Janeiro, the capital of the empire, in which all of the ministries and the parliament, as well as the Emperor, were located. The interest in telegraphy after the war demonstrates its new relevance to the central power.

By the end of war, the decision to implement telegraphy along the coast had already been made, but some doubt arose about how to do it. The main points of concern related to whether the telegraph should be developed by the government's General Telegraph Office, which would build as many landlines as the annual budget allowed, or foreign companies, which would lay a submarine cable along the coast from north to south. Capanema advocated building of the telegraph landlines by the General Telegraph Office, since these would be technologically easy to construct, and cheaper than submarine cables. Several politicians also defended private investments by foreign companies, especially British ones, which controlled the worldwide telegraph submarine cable market. To help understanding the different

options, it is helpful here to consider the advantages and disadvantages of each to Brazil.

The technology involved in submarine cables was very new at that time. In the 1860s, Great Britain was the only country that had developed the technology to send electrical signals over long distances via submarine cables[6]. This meant that if Brazil chose to lay submarine cables, it should give the work to British companies. In addition, as British companies had already laid thousands of kilometers of submarine telegraph cables around the world, it was likely that telegraph communication could be rapidly achieved throughout the coastal provinces. However, granting the work to a foreign submarine telegraph company meant permitting strangers to control private and official communications. Obviously, this was a concern for the government. Another problem was that the submarine cables would only have reached specific spots on the coast, thereby reducing the number of cities that would be served by the new technology. The amount of financial resources required for the submarine option was significantly higher than the landline version.

Telegraph landlines, on the other hand, could be built in parts, for instance, several hundred kilometers per year, as the annual budget allowed to be done by the General Telegraph Office, the telegraph office of government. It would also avoid leaving national communications in foreign hands, a concern that many Europeans countries had already demonstrated.

The technology to construct landlines was already fairly established, and was already in use in the southern landlines. There were also several dealers to choose from, in terms of which one offered the best conditions under which to purchase the wires, isolators and telegraphs devices. As a public service, the landline would be more relevant than submarine cables. As the wire would run above land, it would be possible to serve all large and small cities and places along the line. The submarine cables, conversely, could only be installed where economically feasible.

[6] Besides the technology issue, the telegraph submarine enterprise required a huge amount of financial resources. This meant that only the government and private companies with a great deal of capital could be afford this kind of investments. Germany was in the unification process of its territory, and involved in a boundaries dispute against France; at the very beginning, the USA were not interested in investing in telegraph submarine technology. The American entrepreneur Cyrus Field had to go to England to raise capital for the first transatlantic telegraph submarine cable in the 1850s.

The government had to decide which system to adopt. The central question seemed to be whether to privatize telegraphs in Brazil. Many statements from ministers of the empire supported submarine telegraphy, by highlighting the advantages and omitting disadvantages such as friction with coral damaging the cables, shellfish eating the gutta-percha, and damage from dragging anchors (for example, teredo navalis and shellfish, as well as boats that dragged their anchors, had damaged a submarine cable in Guanabara Bay, which had to be replaced). In light of these problems, submarine telegraphy could not reasonably be considered better or more durable than landlines. The omission of these problems in ministerial statements gave rise to suspicions that the decision had already been made.

Although it was a good time for submarine telegraphy after the success of the Atlantic Cable in 1866, many other difficulties had been faced during the various undertakings. It is worth remembering that the first attempt to cross the Atlantic Ocean, from Great Britain to North America in 1858, failed, with much money spent. Even the attempt to reach Algeria from France, which was started in 1853, was only completed in 1870.

As the Brazilian government was quite anxious to implement telecommunications quickly, they ultimately decided to invest in both options: they contracted foreign companies to lay submarine cables along the coast, and developed their own telegraphy landlines via the General Telegraph Office, as well as a link between South America and Europe that connected Portugal to Recife. The decisions made by the government from 1869 onwards highlight the importance of telegraphy by the end of the Paraguayan war.

Building telegraph landlines. Developments from 1870 to 1889

The long telegraph landline that connected the province of Rio de Janeiro to the province of Pernambuco was built in many separate parts by workers of the General Telegraph Office, with help from the municipality. Step by step, these short sections of landline were built as the annual budget allowed. These parts were then joined, and were finished in 1875. By the middle of the 1870s, Brazil had implemented its own telegraph from the southern boundary to the northeast, linking the coastal provinces and many cities along the way.

To build their own landlines, the government had to overcome many difficulties. One of these was acclimatization of equipment,

which generally came from Europe. The isolator broke frequently due to dilatations provoked by the high temperature during the tropical summer. On this subject, in 1873, Capanema patented his own isolator, in Great Britain, which was adapted to tropical conditions[7]. Other problems in building the landlines included the lack of roads, most of which were in poor repair. This represented an extra challenge for transporting wires and poles, for which mules were usually used. A special model of metal pole was used to make transporting via mule easy. This could be separated into three parts, so that both sides could be loaded onto the mule's back.

The training of staff was always a concern for Capanema. Since the beginning of telegraphy in Brazil, he arranged teachers from military schools to teach basic electricity and fundamental telegraphy operating and maintenance. Capanema also wrote an instructional booklet for students to use during lessons. Despite these efforts, it was not easy to find people that were interested in working in telegraphy. The low salaries paid by the General Telegraph Office did not attract skilled or professional people, and a career in the Office was not considered stimulating for the most qualified workers. Often, even the lowest-skilled workers had no difficulty in finding other jobs in which they could earn more.

The tropical climate also caused problems. Heavy monkeys often hung on the wires, and birds would use the wires in place of sticks. One particular species of bird, called *João de Barro*, built their nests, made of clay, on top of the isolators, thereby complicating the electric isolation process. Venomous animals, such as snakes and spiders, as well as savage animals, specially ounce, were all very common across the territory, and also served to complicate the work of the General Telegraph Office when installing and maintaining the landlines. To make matters worse, farm workers would shoot at the isolators, either for fun or to practice their aim.

Weather conditions were also often adverse for telegraphy in the tropics. On the coast, strong winds, hard rains and lightning are very common. All of these, of course, are terrible for electricity signals, and often interfere with it – for example, lightning often reduces the isolation of the telegraph cables. Trees falling on the wires due to hard rains or winds were also a problem[8].

[7] G.S. Capanema, *Specification of Guilherme Schüch de Capanema Isolators. No. 4171*, London 1874.

[8] Although there was no comparative research at that time, nowadays Brazil

Figure 2 – *Map of Brazilian telegraph stations, and the years in which they opened*

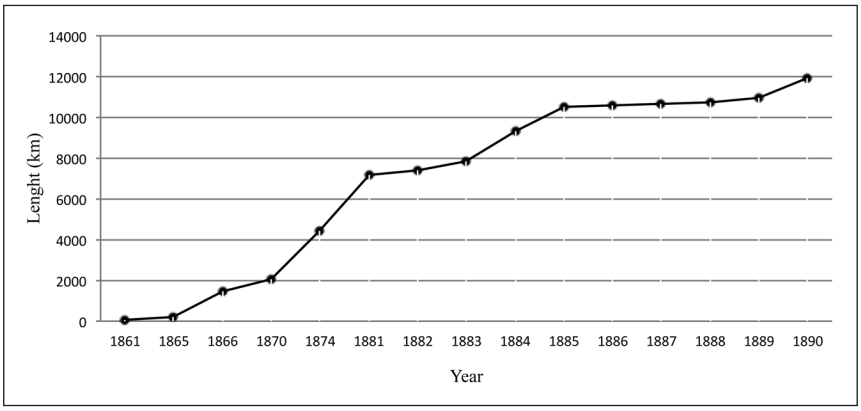
Source: Brazilian National Archive, F4 map 560.

After Pernambuco, the next provinces to receive telegraph lines were Paraíba and Rio Grande do Norte, in 1876. After Rio Grande do Norte's station opened, others had to be postponed due to a lack of qualified people. In 1879, among 20 provinces of the empire, 13 had already installed telegraph stations. In 1881, a telegraph was opened in Fortaleza, the capital of the Ceará province. In 1884, some telegraph stations were also opened in the province of Maranhão. Figure 2 highlights several telegraph stations, and the years in which these opened.

By means of international agreements, Brazil set up a telegraph connection with Argentina and Uruguay through the southern border,

receives the most lightening of any country in the world, according to http://www.oseto-reletrico.com.br/web/a-revista/edicoes/90-ranking-de-incidencia-de-descargas.html.

Figure 3 – *The development of Brazilian telegraph landlines during the Second Reign*



Source: Ministry of Justice annual reports from 1852 to 1864, and Ministry of Agricultural and Public Works annual reports from 1864 to 1890.

in the Rio Grande do Sul province. From Porto Alegre city, the capital of the province of Rio Grande do Sul, a landline was stretched to Uruguaiana, a city on the west border of the province that connected with Argentina. Uruguay was connected by Jaguarão, and also by Uruguaiana Station.

The São Luis do Maranhão station was opened on 14 December, 1884. The day before its opening, Capanema invited the chairman of the Oriental Telegraph (Uruguay's Telegraph Office), Eduardo Jones, to test the transmission between São Luis do Maranhão and Montevideo. The 33-word message was received by the president of the province and the general consul of Brazil. The answer was sent to Emperor D. Pedro II, who was in downtown Rio de Janeiro. The transmission was successful. It took six minutes from the moment when the message started to be typed in São Luis do Maranhão, to the correct signal being received in Montevideo to São Luis do Maranhão, and then sent to Rio de Janeiro. The length of telegraph landlines from São Luis do Maranhão to Montevideo, and from there to Rio de Janeiro, was 9,700 km. This remarkable transmission gives an idea of the success of the landlines, which ran along almost the whole Brazilian coast.

The last capital to receive a telegraph station during the Second Reign was Belém, in Para province; this was opened in 1886. At the

end of the empire, in 1889, all coastal province capitals had telegraph stations. The landlines reached 10,755 km, and the length of wires 18,488 km. Figure 3 shows the development during the analyzed period of time.

Granting and installing the submarine cable in Brazil (1873-1875)

In 1869, the government gave a British engineer, Charles Tilston Bright, a grant to link almost all coastal provinces by submarine cable, including Santa Catarina, Paraná, São Paulo, Rio de Janeiro, Espírito Santo, Bahia, Sergipe, Alagoas, Pernambuco, Paraíba, Rio Grande do Norte, Ceará, and Piauí e Maranhão. In 1872, entrepreneur Irineu Evangelista de Souza, the Baron of Mauá, gained a grant to set up a transatlantic submarine cable from Brazil to Portugal[9]. In the following year, John Pender, the most important submarine-telegraph-cable entrepreneur of the nineteenth century, and owner of dozens of telegraph companies spread all over the world, bought the grants from Charles Bright and Mauá. Pender opened the *Western and Brazilian Telegraph Company* to implement the coastal cable, and the *Brazilian Submarine Telegraph Company* for the transatlantic cable.

The first cable was installed from Recife to Belém by William Thomson and Fleeming Jenkin. On 6 September, 1873, the submarine telegraphy service was opened in Brazil; this used long submarine cables. The day was one of celebration. Many messages were sent at both ends of the cables. The presidents of the provinces, as well as politicians, sent messages of congratulations on the great achievement, and highlighted the importance of the new technology in the development of their provinces.

The submarine cable from Portugal to Brazil was laid by the *Telegraph Construction and Maintenance Company*, and opened on 22 June, 1874, linking Recife to Cabo Verde, São Vicente island, Madeira island and Carcavellos in Lisbon.

The South section, from Recife to Rio de Janeiro, was laid *by Siemens and Brothers Company* and opened on 1 January, 1875. From

[9] The Baron of Mauá was the most important entrepreneur during the Second Reign. Among his accomplishment were: the first industry in Brasil, the Mauá shipyard, in Niterói, in the seashore of Guanabara Bay; the first railway construct in Brazil; the first gas company, which provided gas to the first public gas illumination in Rio de Janeiro downtown; a bank which was the most creditor of Uruguay.

Rio de Janeiro to the south of Brazil, and to Buenos Aires and Montevideo, the *Western and Brazilian Telegraph Company* hired the *London Platino Brazilian Company* to carry out the link. It only linked Santos to Florianópolis and Rio Grande do Sul. All of these opened in 1875. It is worth emphasizing that when the government contracted Charles Bright to lay submarine cables along the Brazilian coast, many telegraph stations were foreseen, which were to serve almost all of the coastal provinces. However, when the grant was sold to Pender, only a few spots – considered the most profitable by the British company – were connected. This serves as evidence that the private companies' interests, coming from the most powerful country in world, easily overcame national concerns.

The submarine telegraph cables business was one of the tools of imperialism, as shown by Headrick[10]. The link between Brazil and Portugal, and from there to Great Britain, must be analyzed with reference to the international context of telegraph submarine cables. South America was the last continent to receive submarine cables, and Great Britain had many economic interests in the region. Among these, the importation was coffee from Brazil and meat from Argentina, and the exportation of countless British products, not to mention the political interest in preserving influence in the region. Thus, the telegraph connection between Brazil and Europe did not merely represent the private interest of British companies or Brazilian government concerns, but, above all, Great Britain's aims.

The dispute between foreign and national telegraph companies

After obtaining the relevant grants, the British telegraph companies *Western and Brazilian Telegraph Company* and *Brazilian Submarine Telegraph Company* made an agreement, on 30 June, 1873, by means of they would change one third of theirs invoice to retransmit international telegrams between Europe and South America. This meant that when someone in Europe sent a telegram to Brazil, Argentina or Uruguay, they would have to indicate which route on the Brazilian coast his telegram was to follow, after crossing the transatlantic telegraph cable of the *Brazilian Submarine Telegraph Company*. The choice was between the *Western and Brazilian Telegraph Company's* submarine

[10] D. Headrick, *The Tools of Empire Technology and European Imperialism in 19th century*, New York 1981.

cable, or the General Telegraph Office's landlines. One interesting fact is that, at the time this agreement was signed, there was only one means by which to send telegraph message, which was by submarine cable through the *Western and Brazilian Telegraph Company*. Nevertheless, the landlines built by the General Telegraph Office were still growing in the north of the empire, and the dispute between foreign and national companies was merely a question of time. The British companies foresaw the dispute arising, and thus created the agreement.

When the sender did not mention which route he wanted, the telegram, after arriving in Recife having crossed the Atlantic Ocean, would be retransmitted using the coastal submarine cable of the *Western and Brazilian Telegraph Company*. In fact, even when the sender did choose the landline, there was no guarantee that the choice would be respected, since there was no inspection of the *Brazilian Submarine Telegraph Company* at Recife telegraph station. The agreement with the British companies was highly unfavorable for telegraph traffic via Brazilian landlines, and consequently for the receipt of the General Telegraph Office, as will be demonstrated below.

Even after the agreement was put in place, the British companies tried to stop the landline from growing to the north, claiming that the government had stated that they would not provide any grants for the service. The Brazilian government's agents argued that it did not make any sense for the government to give grants to itself, so the British demand was rejected.

The fee charged by *Western and Brazilian Telegraph Company* was 5 francs per word. The St Petersburg Convention, held in 1875, stipulated 1 franc per word. As Brazil was a signatory of this convention, the Brazilian landlines had to charge this fee. Therefore, the fee charged by *Western and Brazilian Telegraph Company* was five times higher than that of Brazilian landlines. In 1878, the *Western and Brazilian Telegraph Company* asked the Brazilian government to match their higher fees. The application was rejected. The *Western and Brazilian Telegraph Company* then started to charge the same landline fees, but only in cities that the landlines had already reached. In cities that had only submarine cables, the fees remained higher.

In the meantime, the *Western and Brazilian Telegraph Company* began a campaign through the International Telegraph Administration in Europe and in Brazil to defame the landline. The *Western and Brazilian Telegraph Company* reported a circular to all telegraph directors that stated: «The senders should not trust at all in transmission

through Brazilian landlines, because this communication is usually interrupted»[11].

Despite the constant reports of interruptions in landlines, the submarine cable was out of operation even more frequently than the landlines. For instance, during 1879 the coastal submarine cable was interrupted for 120 days, against only 32 days for landlines. In addition, the longest period for which the submarine cables were out of operation was 31 days, in comparison to seven days for landlines (Table 2). This demonstrates the falsity of the claims that the submarine telegraph service was better than that of landlines.

Table 2 – *Days out of operation for coastal submarine cable and landline in 1879*

Month	Cable	Landline
January	0	1
Febuary	0	6
March	0	7
April	1	3
May	31	1
June	22	2
July	7	0
August	0	6
September	12	1
October	2	2
November	30	2
December	15	1
Total	120	32

Source: Agricultural and Public Works Ministry report of 1879.

The original submarine cable used along the Brazilian coast by the *Western and Brazilian Telegraph Company* did not seem to be suitable for that condition of work. Since it was laid in the ocean bed running along the coast, the message transmissions started to fail in 1875, between Bahia and Pernambuco. At the end of 1875, the cable between Recife and Belém failed as well, and in February of 1876 this cable fell completely out of operation. During the next three years, communications between Pará and Pernambuco were continuously

[11] *Brasil. Memória Histórica A Repartição Geral dos Telégrafos*, Rio de Janeiro 1907, p. 28.

interrupted. The section between Bahia and Rio de Janeiro was also out of work for seven months. The repairs to the submarine cable could not guarantee the satisfactory operation of the cable; despite being repeatedly fixed, it was never long before it failed again.

To avoid spending lots of money substituting the cable, in 1882 the *Western and Brazilian Telegraph Company* tried to sell the coastal cable to the Brazilian government, but the deal did not go ahead. The agreement between the British companies represented a loss for the General Telegraph Office, due to the fact that much revenue from international telegrams traffic was missed by the Office. As a result, Capanema proposed that *Western and Brazilian Telegraph Company's* chairman buy the submarine cable, merely to get rid of the disloyal competition. The intention was to buy and discard the cable, since the landline was quite capable of handling the national and international telegrams traffic. Capanema's idea was to buy the cable without spending money on the deal: the *Brazilian Submarine Telegraph Company* would continue to give one third of its revenues to *Western and Brazilian Telegraph Company*, which was now owned by the Brazilian government. The General Telegraph Office would charge for international telegrams transmitted by their landlines as per the 1875 St Petersburg Convention. One third of the revenues from international telegrams would be given to the *Brazilian Submarine Telegraph Company*, of which part would be given to the General Telegraph Office, and the rest to *Western and Brazilian Telegraph Company's* shareholders, until the debt had been covered. The advantage for the *Western and Brazilian Telegraph Company* would be that they would not have to invest any capital in another cable, and it would be refunded by an useless one. The *Western and Brazilian Telegraph Company* chairman went to London to present the proposal to the shareholders, but he did not come back with a reply.

In 1882, the *Western and Brazilian Telegraph Company* decided to substitute 500 miles of submarine cable between Fortaleza and Belém. In the next three years, 200 additional miles of cables were substituted. The submarine cable, laid by the London and *Platino Brazilian Company*, from Rio de Janeiro to the south of the empire, did not encounter any serious problems, except for in a few specific spots and commonly in connections with continental stations. In 1884, the second transatlantic submarine telegraph cable was laid between Brazil and Portugal. This doubling of the transatlantic cable had already been foreseen in the grant given to the *Brazilian Submarine Telegraph Company* when the telegrams traffic achieved 300 messages per day.

The agreement between the British companies was successful. In January of 1885, the president of *Western and Brazilian Telegraph Company* reported that 90% of international telegrams between Europe and South America were retransmitted by the coastal submarine cable. According to the Brazilian Agricultural Ministry report, this represented nearly 375,000 francs of disservice to the General Telegraph Office.

In order to stand up to the competition from the British companies, the Brazilian government had to implement another connection within the international telegraphy network. In theory this connection already existed, in the form of a submarine cable to Buenos Aires, and from there to Chile, crossing the Andes Cordillera. From Chile it ran to the United States via submarine cables, touching some spots on the south-western American cost, and down through the Central American countries. This long way from Brazil to the United States, and from there all over the world, meant that there were too many spots that could fail, especially in the Andes. In fact, this route received little use, and was eventually discarded by the government as an alternative means of international telegraph communication. This meant that other routes had to be analyzed to enable a connection between the north of Brazil and the United States; the connection between Recife to Senegal, already foreseen in the grant to Baron of Mauá that later was transferred to *Brazilian Submarine Telegraph Company*, but the British company did not accomplish; and the link between Buenos Aires to Portugal.

In 1882, in an attempt to solve the problem, the government contracted the *American Telegraph and Cable Company* to link Fortaleza, the capital of Ceará province, to the United States. This grant was especially interesting because the main shareholder was Jay Gould, the competitor of John Pender and James Scrymser for central and south American telegraph communication. This meant that by means of this grant Brazil would become involved in the international dispute that was growing in the American continent. In this context, which entailed a great deal of pressure from powerful countries on small and weak nations, the *American Telegraph and Cable Company* was not able to get the permission it needed to link some Central America countries via their cable. Without the connection in those countries, this submarine telegraph cables could not be profitable, from the entrepreneur point of view. In addition, the company had difficulty in getting financial support for the undertaking, so it had to give up its grant.

Meanwhile, the *Brazilian Submarine Telegraph Company* were

protesting the government's attempts to establish other telegraph lines through which to communicate with Europe. The protest was accepted by the Trading Section Empire State Council in 1884. The decision meant that it would be forbidden to implement another way by which to communicate telegraphically with Europe until to end of the contract with the *Brazilian Submarine Telegraph Company*, in 1892.

The link between Brazil and the United States would only be accomplished after the Proclamation of Republic, in 1889; the French companies *Société Française des Télégraphes Sous-Marins* and the *Societé Générale dês Téléphones* obtained the grant in 1890. This submarine telegraph cable was opened the first of September 1892. However, the French companies did not operate the telegraph cable as they should have been done. The cable was commonly out of commission, and telegrams to Central America and North America had to be sent via the cable of the *Brazilian Submarine Telegraph Company*; this involved crossing the Atlantic Ocean twice, first from Brazil to Europe, and then from Europe to North America.

The high fees charged in telegraph correspondences by the British companies between Europe and South America was not merely a Brazilian problem, but one faced by all countries interested in getting in touch with South America. The International Telegraph Conference, held in Berlin in 1885, had the goal of reducing and standardizing the fees charged by all telegraph offices in the member countries. The majority of European countries advocated that the fees would have to decrease; there was some natural resistance to changing the fees, but over the next few years the fees were actually reduced. At the Conference, where Brazil was represented by Capanema, France, Spain and Portugal protested against the high prices charged by the British companies in Brazil, and proposed the installation of another submarine telegraph cable between Europe and Brazil to compel the British companies to reduce their fees. Nevertheless, the British companies showed indifference to the request.

In 1892, when the grants from the British companies ended, the Brazilian government started to charge a tax for each message sent. In addition, some grants were given to foreign companies to provide other routes within the worldwide submarine telegraph cable system. All of these were installed after the period of the Second Reign in Brazil analyzed in this essay, and included the French submarine cable mentioned above, the cable to Africa via Senegal, and the cable to Spain.

Some financial aspects of the Brazilian Telegraph Office and traffic via telegraph landlines

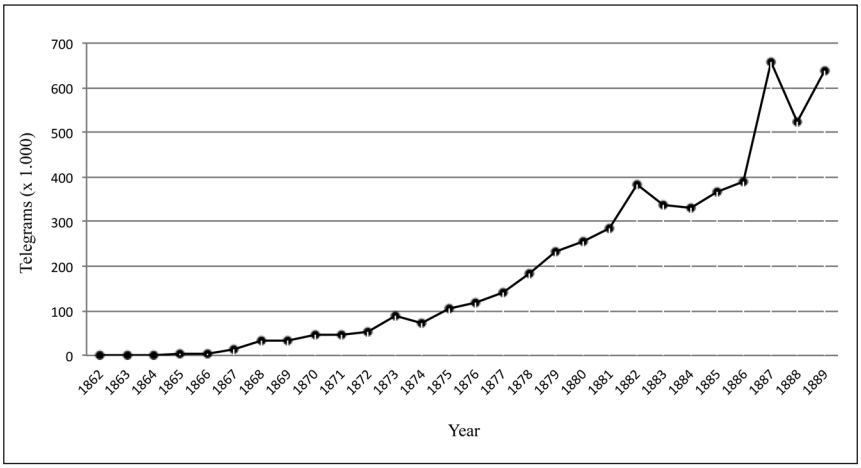
The reduction of the fee charged by the *Western and Brazilian Telegraph Company*, from 2,000 to 400 réis, which matched the fee charged by the General Telegraph Office for their landlines, was only possible due to the agreement between *Western and Brazilian Telegraph Company* and the *Brazilian Submarine Telegraph Company*, made on 30 June, 1873, by means of they would change one third of their invoicing.

According to Capanema, the *Western and Brazilian Telegraph Company* could not afford these expenses exclusively through revenues from messages transmitted by their own cables. The Capanema estimation for the *Western and Brazilian Telegraph Company* expenses in 1886 was over 500 contos[12]. He used an example to demonstrate that in spite of the fact that both the General Telegraph Office and the *Western and Brazilian Telegraph Company* charged the same fee for a message, the British company received much more than the Brazilian one. The fee charged by the *Brazilian Submarine Telegraph Company* between Brazil and Portugal was 4,550 réis per word. The *Western and Brazilian Telegraph Company* charged 400 réis per word. The companies had to change one third of their invoicing according to the agreement. This meant that the *Brazilian Submarine Telegraph Company* had to give 1,517 réis to the *Western and Brazilian Telegraph Company*, and this one had to give 133 réis to the *Brazilian Submarine Telegraph Company* for each word transmitted. To conclude, the *Western and Brazilian Telegraph Company* received 267 réis, which was the difference between the 400 réis charged and the 133 réis transferred to the *Brazilian Submarine Telegraph Company*, and the 1,517 réis paid by the *Brazilian Submarine Telegraph Company*, totalling 1,784 réis for each word[13].

For instance, if someone sent a single word from Salvador, the capital of Bahia province, to Portugal, he could choose for the message to go to the *Western and Brazilian Telegraph Company* station or the General Telegraph Office station. At both, he would pay 400 réis to send his single-word message to Recife, and more than 4,550 réis to transmit from Recife to Portugal. Although the *Western and Brazilian Telegraph Company* charged the same fee as the General Telegraph

[12] 1 conto = 1,000,000 réis.
[13] *Brazil. Agricultural and Public Works report*, 1886, p. 33.

Figure 4 – *Quantity of telegrams sent by Brazilian telegraph landlines during the Second Reign*



Source: Ministry of Agricultural and Public Works reports.

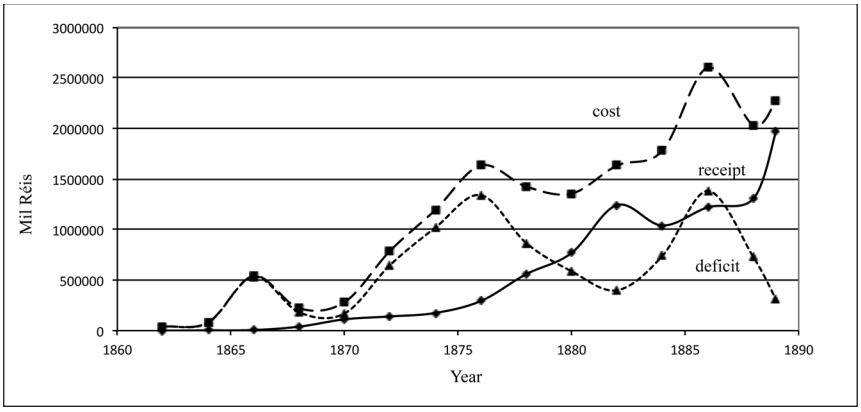
Office, the British company received four times as much as that stipulated by the St Petersburg International convention. The subsidized condition of the *Western and Brazilian Telegraph Company* by the *Brazilian Submarine Telegraph Company* made it difficult for the General Telegraph Office to try and dispute fee reductions, because the *Western and Brazilian Telegraph Company* would always be able to reduce its fees even more.

After becoming aware of the agreement between the British companies, the Brazilian government protested that the agreement harmed the General Telegraph Office. This was met by apologies from the British companies, but they argued that they were not aware of the government's intention to take the landlines to the north. When the agreement was signed, in 1873, the landlines went from Rio de Janeiro do Espírito Santo province, and linked Recife to the south of Maceió, among other small parts built along the way to the north[14].

In the face of the impossibility of getting its own submarine telegraph cable, the Brazilian government would have to wait until the end of the British grants to concede to other foreign companies the right to lay submarine cables. Getting other submarine telegraph

[14] *Ministry of Agricultural and Public Works report*, 1886, p. 29.

Figure 5 – *Financial movement of the Brazilian Telegraph Office during the Second Reign*



Source: Ministry of Agricultural and Public Works reports.

cables connections would reduce the fees charged for the Brazilian and South American international messages, and raise the telegraph traffic through the landlines.

Even with most of the international messages going via submarine coastal cable, the landline telegraph traffic grew during the Second Reign, as Figure 4 shows.

Notwithstanding the frequent increases in the telegraph traffic via the landlines, the General Telegraph Office's financial situation meant that it was always in a deficit, as shown in Figure 5.

A deep analysis of the General Telegraph Office deficit is outside of the scope of this paper. Nevertheless, some aspects that contributed to the deficit will be presented and analyzed below. Part of the cost presented by the General Telegraph Office was, in fact, investments in telegraph devices, wires, poles, and all kinds of equipment required for the telegraph system's operation, including the construction of the new buildings[15]. From Figure 5, the cost decrease after 1885 can be seen. The last provincial capital that received a telegraph station was Belém, Pará province, in 1886. When the landline stopped increasing, the cost was reduced.

In the second half of the nineteenth century, Brazil had a small population spread mainly on the coast. In this vast area, there were

[15] It was not possible to determine what percentage of the cost was an investment.

nearly 15 province capitals, and only a few big cities. It is worth mentioning that the Brazilian coastal length is nearly 8,000 km. The General Telegraph Office workers usually stretched hundreds of kilometers of wire on the top of the poles until arriving in the next village. A typical small village had a square in front of a church, and only a few houses. Sometimes, the villages did not even have this. The large majority of people were illiterate, which meant the General Telegraph Office had to spend a lot of money to provide telegraphs where financial return was usually not expected.

A government policy determined that all official messages would have priority. Each day, private and press correspondence had to wait to be sent until all official telegrams had been transmitted. This was the main reason why the press preferred to transmit via the *Western and Brazilian Telegraph Company's* coastal cable for national correspondence, sometimes even paying more than if their message had been sent by landlines. The press was one of the most important clients for all telegraph offices around the world. Thus, Brazil's policy of granting priority to official correspondences, with no criterium, kept off an important financial resource to General Telegraph Office.

The telegraph service had to be fast, otherwise it would lose its main function. Without the press telegraph traffic, there remained a very little private traffic in Brazilian landlines. All over the world, the press and business world were most responsible for private telegraph traffic. The Brazilian economy was basically supported by coffee and sugar plantations, and some other agricultural products; it had no large industries or diversified market. Therefore, the situation faced by the General Telegraph Office in relation to telegraph traffic was very difficult, with no perspective of improving.

A decision taken by the government to at least protect Brazilian interests was to forbid official telegrams to be sent by the *Western and Brazilian Telegraph Company* cable between two stations served by landlines[16]. In fact, the decision avoided increasing expenses, but it did not guarantee revenue since the official telegrams were free.

Capanema advocated that the official messages had to be charged for. This would bring important revenue to the General Telegraph Office, and thus reduce the deficit. According to Capanema, the telegraph service was used without restrictions by government employees – there were no rules about who could use it. It is worth mentioning

[16] A.C. da Rocha, *Aviso do Ministério da Agricultura. 3ª seção – no. 11, 19/02/1885*, in *Ministry of Agricultural and Public Works report*, 1885.

that these employees often used the telegraph without having a public reason for doing so; for example, Capanema pointed out examples of presidents of provinces using the service to order dresses for their wives, candies, and other frivolities[17].

Besides the abuse regarding official correspondence transmissions, some government telegrams faced another problem: extension. The were telegrams over 3,000 words. In a single day, more than 5,000 words were sent in official correspondences. These problems generated a derangement in General Telegraph Office that could only transmit private messages after sent all official telegrams. The congestion in the landlines affected anyone who was in a hurry to send his message via submarine coastal cable, even in national correspondence. Hence, two problems could be attributed to the General Telegraph Office: one of not charging for official correspondence, and the other for the loss of paid correspondence.

Two examples demonstrate how large the above problems were[18]. The first relates to January 1889, when the Fortaleza telegraph station sent 348 telegrams totaling 25,054 words. If these had been charged for, they would have yielded 17 contos, or 169,800 réis. The revenue of this station from all private telegrams sent and paid for in this period was 1 conto, or 780,000 réis. The value not collected was thus almost ten times as much as the value received by the General Telegraph Office. The second example related to the fact that the virtual value belonging from the official messages sent by all ministries in December of 1888 would have been 54 contos, or 260,000 réis. If the average annual revenue of the General Telegraph Office had been estimated, it would have been 108 contos, or 684,000 réis. The value not collected in official correspondence by the General Telegraph Office was 50% of all annual average revenues in that month alone. Table 3 gives a general idea of the fees concerning the collection from private telegrams and the revenue if the official telegrams had been charged for.

According to Capanema[19], in the majority of European countries and Argentina there were no free telegrams, except in some countries ruled by kings and queens[20]. In these countries, all telegrams, including

[17] *Ministry of Agricultural and Public Works report*, 1888, p. 32.
[18] *Ministry of Agricultural and Public Works report*, 1888, p. 33
[19] *Agricultural and Public Works report*, 1888, p. 43.
[20] It was not clear whether, when Capanema noted the exception in some countries ruled by kings and queens, he was being ironic and provocative towards the Brazilian government, as he often seemed to be, or whether he was actually criticizing the ways in which some monarchies ruled their telegraph offices.

Table 3 – *Comparison of revenues from private and official messages*

Stations	Official messages	Private messages	Total
R. G. Sul	1:666$600	2:511$920	4:178$520
Porto Alegre	3:933$400	2:832$460	6:815$800
Curitiba	1:106$400	1:002$720	2:109$120
Central	12:183$000	10:757$180	22:940$180
Vitória	955$000	866:620	1:822$520
Bahia	1:143$600	3:329$660	4:473$260
Maceió	674$700	1:377$620	2:052$320
Recife	2:770$200	5:614$920	8:385$120
Paraíba	1:281$400	415$120	1:696$520
Fortaleza	17:169$800	1:791$860	18:961$660
Teresina	1:264$800	99$800	1:464$800
São Luis	1:620$800	919$080	2:539$880
Belém	3:216$400	1:661$540	4:877$940
Total	49:087$000	33:230$440	82:317$440

Source: Agricultural and Public Works Ministry report of 1888.

official ones, were charged for. If the Brazilian government had followed the examples of other countries, that is, avoided giving free telegrams, it would have been possible to at least reduce the General Telegraph Office deficit.

Conclusion

Electric telegraphy started in 1840 in many countries in Europe and the United States. In the following decade, some European countries started to join their telegraph landlines to create the first international telegraph network. In the meantime, Brazil installed its first telegraph landlines in 1852, though only in Rio de Janeiro province, where the Emperor and the central power were established. The Brazilian government took until the end of next decade to perceive telegraphs as an effective means of communication by which to broadcast government decisions throughout the country.

Some aspects that contributed to the development of landlines in Brazil during the Second Reign should be highlighted. For example, remarkable efforts were made by the engineer Guilherme Schüch de Capanema, as director of the General Telegraph Office, to prove that it was possible for Brazil to get his own telegraph system; and the

interests of the emperor D. Pedro II in science and technology, and his friendship since his childhood with Capanema. This link between Capanema and the Emperor helped Capanema to overcome oppositions, mainly from politicians who advocated the idea that the telegraphy should be granted to private companies.

Nevertheless, the biggest contribution to the development of telegraph landlines was the political situation in 1870, after the war. At this time, the political movement for the Republic had grown up. In the 1870s, two republican political parties were started, one in São Paulo province and the other in Minas Gerais province. In addition, the movement towards slavery abolition was supported by the press and the academic sectors. Brazil was still an agricultural country whose main export goods were sugar and coffee. The plantations, and consequently the large part of the country's social structure, was thus supported by slave work. Both the Republican party and the slavery abolition movement, which were happening at the same time and spread across many provinces in Brazil, shook the stability of the government. Following the success of telegraphy during the war, the government woke up to the importance of telecommunications, and how it could be used to keep the empire under central rule. This was important within the decision to channel investments into landline telegraphy after the war. It should not be disregarded, however, that there was international interest in including Brazil in the route of worldwide telecommunication driven by the British. In this way, the government had to accept the British conditions of laying their cables along the Brazilian coast and touching only specifics points, and fight against the British companies to survive in the worldwide telegraphy business.

MAURO COSTA DA SILVA
Colégio D. Pedro II (CPII)

ILDEU DE CASTRO MOREIRA
Universidade Federal, Rio de Janeiro Brazil