Chapter 8

Submarine Telegraph Companies: Technology, Risk, Asset Partitioning

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The electric telegraph was the high-tech sector of the middle decades of the 19th century. As such it deserves a chapter in this book that analyzes how technology related risks affected the organization of businesses. The telegraph built upon the growing and accumulating scientific understanding of electricity that took place over the 18th and early 19th century. Telegraph development depended on understanding in both physics of electromagnetics and mechanical engineering of instrument building and cable production. Its electric side required understanding of electric flow of currant, electric resistance of wire and electromagnetics of relays, switches, sound and needle movement. It required coding letters into electric signals, decoding and printing. It required the productions of functioning and durable lines and cables, end units and transition stations. Dozens of patents were registered in the first half of the 19th century in fields related to telegraph in Britain, the US and Germany.[1]

The first two practical electric telegraphs were patented in 1837 by the British inventors William Fothergill Cooke and Charles Wheatstone (based on needle movement) and by the American

[1] Ben Marsden and Crosbie Smith, *Engineering Empires : A Cultural History of Technology in Nineteenth-Century Britain* (Houndmills, Basingstoke, Hampshire: Palgrave Macmillan, 2005), 187-89; Richard Noakes, "Industrial Research at the Eastern Telegraph Company, 1872–1929," *The British Journal for the History of Science* 47, no. 1 (2014): 119-25.

inventor Samuel Morse (based on sound). From that point things started unfolding rapidly. Initially telegraph lines were installed on poles along railway lines and then in cities. Next cables were laid in shallow water across the English Channel to France and other European countries. The final and most challenging stage was putting cables deep in the oceans, across the Atlantic to Canada and the US, and to India via underwater route via the Mediterranean and the Red Sea.[2] This chapter will focus on this submarine stage, and on the companies that constructed the Atlantic and Eastern suboceanic lines.

Despite some similarities between the global expansion of transportation networks and telecommunication networks, there were significant difference between the organization of overseas railway companies and telegraph companies that justify the devotion of a full and separate chapter to each. Along this chapter I will occasionally turn to a comparison between the two sectors. In the conclusion I will elaborate on the differences between the two sectors and the resulting organizational differences.

The telegraph was an exogenous cause of globalization and at the same time endogenous product of globalization. In other words, globalization created demand for speedy communication for which telegraph was the solution. Once available telegraph facilitated new types of communication and generated new demand. Communication in political military and trade news had long history before the telegraph, the new technology only made the communication faster and more intensified.[3] For examples it took the news of the outbreak of the "Indian Mutiny" in 1857 six weeks to get to London. A decade and a half later similar news could reach London within two

[2]Kenneth George Beauchamp and Engineers Institution of Electrical, *History of Telegraphy* (London: Institution of Electrical Engineers London, 2001), 31-32.
[3] YrjÖ Kaukiainen, "Shrinking the World: Improvements in the Speed of Information Transmission, C. 1820–1870," *European Review of Economic History* 5, no. 1 (2001).

days at the most. Reuter began his news agency in 1851 with the early telegraph connections between Europe and Britain, and in 1865 incorporated the Reuter's Telegram Company Limited. On that year it was the first to report in Europe the news on Lincoln's' assassination. Other uses of the telegraph were intrinsic to industrialization and the development of multinational corporations. Such were the use of telegraph for signaling on railway lines in Britain and overseas and the reporting on the prices of shares in stock markets that allowed investors to put their money on companies that were listed on far away exchanges and for companies to be cross-listed in stock exchanges in different continents.[4] The following Table 1.1 shows the speed of overseas communications to London before and after the introduction of Telegraph.

Table 1.1 – Speed of overseas communications between 1820-1870

	1820	**1860**	**1870**
Alexandria	*53	10	2
Madeira	30	14	2
Cape Town	77	39	4
Bombay	145	26	3
Calcutta	154	39	2
Hong-Kong	**141	54	3
Sydney	140	53	4
Valparaiso	121	47	4
Buenos Aires	97	41	3
Rio de Janeiro	76	28	3

[4] Gordon M. Winder, "London's Global Reach? Reuters News and Network, 1865, 1881, and 1914," *Journal of World History* 21, no. 2 (2010); *The Railway Record*, (1847), 598; Beauchamp and Institution of Electrical, *History of Telegraphy*, 80.

Barbados	46	21	4
Havana	51	19	4
New Orleans	58	19	3
New York	32	13	2

Notes: *1830, **1840; Source: (Kaukiainen, 2001)

The telegraph fascinated not only contemporaries but also many historians. There is a growing literature on how telegraph connected the globe and changed the conceptions of distance and time. There is a voluminous academic and popular literature on the scientific and technological history of the development of the telegraph. This literature only mentions in bypassing companies and their capital. The literature which focuses on the organization of telegraph, which is where the endogenous and exogenous aspects meet, is sparse. This limited literature only briefly touch upon the legal and corporate aspects of the telegraph. This chapter fills up the gap. My investigation shows how submarine telegraph companies detached themselves from the control of the State and how the use of numerous companies for constructing cables in the same route provided a device for spreading technologically related risks.

Avoiding the State - From Landlines to Submarine Cables

Overland telegraph in Britain was initially connected to railways in two senses, and because of this also to the British State. It was constructed on poles alongside railway lines to solve the right of way problem. Among its main clients were railways that used the telegraph to coordinate signals, traffic and passenger and freight services. Like railway in Britain telegraph was regulated. When the telegraph technology was in its infancy, the government reserved the right to choose to which companies they will grant a concession to lay the telegraph cables within the country's

territorial borders. The concession was given under the condition that the British government will be involved in determining the prices of telegraph services (both for the state and civilians) and involvement in making professional decisions such as the subcontracting companies with which they will enter a contract. Another reason the companies depended on the government initially was the help that the British governments gave, which manifested itself in assistance with means and technology for conducting experiments and creating a learning process that includes the best experts. With the progress of the telegraph project, three central processes helped the Companies' growing independence: (1) they acquired the knowledge and ability (2) as a result, risks were reduced (3) in addition, the number of companies with the knowledge and ability to lay the telegraph was reduced. The dependency of the government on companies can be seen in the decrease in supervision and government involvement in the conduct of the companies and the transformation of the telegraph field into a field controlled by a monopoly. This process is particularly interesting because of the British government's attempt in the first years to prevent a situation where exclusive for specific overland destinations were granted to a single telegraph company. Unlike railway (which was nationalized will into the 20th century) overland telegraph was actually nationalized at an early stage – in 1868 due to the inability to regulate it effectively.

The Telegraph Act of 1868 gave the government, via the Post Office, the option, that it immediately exercised, to nationalize all eight domestic companies. Under the Act the companies were to get a compensation that equals twenty times the net profit for the year ending June 30th, 1868.[5] In July 1869 a bill was introduced authorizing the Post Office to spend £7,000,000 carrying out the 1868 Act. A 10-member committee was formed from the post office's Accounts department

[5] The Telegraph Act 1868 (31 & 32 Vict. c. 110)

in order to ascertain the precise amount of net profits for that year. The result of the recalculation was the reduction of the sum being claimed by the companies from £7,000,000 to £5,715,000.[6]

The Act excluded the Atlantic Telegraph Company and the Anglo-American Telegraph Company, Limited (Anglo-American) to which we will turn below, from the nationalization because their main activities were international, connecting Britain and North America through a submarine cable. In fact, all future submarine telegraph companies were not subjected to the Act and thus to the possibility of immanent nationalization.

The nationalization of overland telegraph made submarine telegraph the leading option for private British entrepreneurs and investors. Submarine telegraph, being laid in the bottom of oceans, on the high seas, outside the scope of British or any other sovereign power could not in practice be expropriated or regulated, except for its coastal terminals. These could to an extent be moved around to avoid tougher governments, The causes mentioned above, for the inability of the government to effectively regulate overland telegraph, which eventually led to its nationalization, were further enhanced when submarine telegraph expanded, but this time without a viable possibility of nationalization.

The nationalization of the landline telegraph had a positive effect on the ability to raise capital for the submarine telegraph in Great Britain and as a result also in the development of telegraphic technology. Not only new money had now only one option, submarine telegraph, but also the compensation, estimated at £8,000,000 received by shareholders of the overland companies and sought for new venues of investment was diverted to oceanic telegraph.[7] The government also

[6] Parliament Great Britain and T. C. Hansard, *Hansard's Parliamentary Debates* (T.C. Hansard, 1869), 1216.
[7] Daniel R. Headrick and Pascal Griset, "Submarine Telegraph Cables: Business and Politics, 1838-1939," *The Business History Review* 75, no. 3 (2001): 559-60.

assisted submarine telegraph in thee additional ways that will be elaborated elsewhere, the joint public-private committee that gathered useful information and legitimized the prospects of the industry, guaranty for minimum income on some strategic lines and the initiation of an international convention for the protection of submarine cables.[8] The government leaned this support without insisting on regulation in return.

How were telegraph companies incorporated?

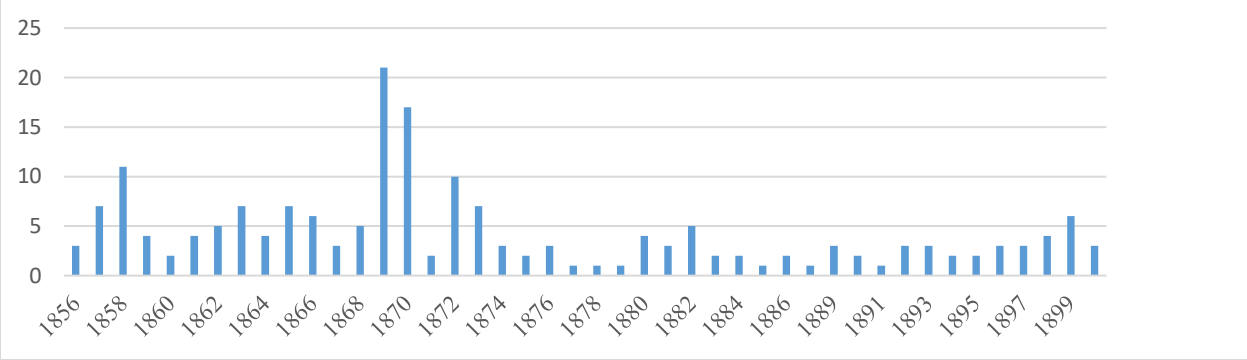
General incorporation became available in England just seven years after the patenting of Cooke and Wheatstone's electric telegraph and as lines along railways began expanding rapidly. The first electric telegraph company was formed in 1845, a year after general incorporation.[9] This seemed to be an opportunity of telegraph companies to avoid reliance on state incorporation in the form of specific Acts of Parliament or Royal Charters that were subjected to the discretion of the government. Nevertheless, telegraph companies, domestic and submarine, were formed in their first two decades, in a variety of modes, before registration based on general incorporation acts became the exclusive mode.

Incorporation by registration based on of the Companies Act of 1844 was only one choice. There was a notion that overland telegraph companies that followed the routes of railway companies and provided them with service were supposed to be incorporated like railway companies by local acts of parliament and follow the same procedure and conform to the same Standing Orders and the same clause Consolidation Acts.[10] On the other hand there was a view that submarine cable

[8] See Convention for the Protection of Submarine Telegraph Cables (Paris, Mar. 14, 1884)
[9] The Electric Telegraph Company, the first electric telegraph company in Britain, was provisionally registered in September 1845.
[10] For example, in 1846 Parliament passed an Act for forming and regulating the Electric Telegraph Company and to enable the said company to work certain letters patents. See Electric Telegraph Company's Act 1846 (9 & 10 Vict. C. xliv)

companies, because they were involved in foreign trade, or the colonies, or the high seas and navigation, were considered as falling within the Crown's prerogative, and not that of Parliament, and as such as requiring a Royal Charter.[11]. Yet the proximity to the first General Incorporation Act of 1844 tempted telegraph promoters to use this easy and low cost registration procedure, either as an initial and interim stage, until a local act or a charter will be secured, or as the ultimate way for incorporation.

Figure 1.1 – Number of telegraph companies incorporated by registration based on the general companies act between 1856-1900



Source: Based on search National Archives BT 31 for word "Telegraph" in company name in the year range 1856-1900. Records of 4 other telegraph companies, which are still active, are held at Companies House.

Altogether 48 telegraph companies were registered between 1844 and 1856 based on the 1844 Companies Act. As can be seen in Figure 1.1, an additional 191 telegraph companies were registered between 1856 and 1900 based on the 1856 Companies Act. Local Acts of Parliament formed 11 telegraph companies between 1845 and 1870, 1 in 1840s, 8 in 1850s and 2 in 1860s.

[11] For example, the Submarine Telegraph Company was granted a charter in 1851; See Joseph Chitty, "A Treatise on the Law of the Prerogatives of the Crown : And the Relative Duties and Rights of the Subject," (1820): 36-37.

Royal Charters were used for incorporating 5 companies, all of which between 1851 and 1853.[12] The reliance on incorporation by Acts of Parliament and Royal Charters subsided over time. The sector moved to incorporation by registration based on the general companies act as the main road to incorporation. This was another manifestation of the distancing of submarine telegraph companies from the state.

High Risks led to Assent Partitioning

The expanding range of telegraph connections, from overland, to shallow water across the Channel, to deep water oceanic cables posed new challenges and required new technological solutions. One set of issues related to the transmission and processing of electric signals, which became weaker and more amorphous as distances grew from kilometers to thousands of nautical miles. Another set of problems related to the construction of insulated and strong cables that would survive the tough salinized and moving submarine environment. Another, the laying these heavy and sturdy cables in one piece at the bottom of deep oceans by specialized cable-laying ships. These technological challenges meant that the telegraph was a high-risk sector with periodic failures.

The chapter focuses on submarine cables in two regions, the Atlantic, connecting Britain and Ireland with Canada and the United States, and the Eastern, connecting Britain with Egypt, India and Australia. As can be seen in Figure 1.1 above, over 250 companies were formed in the telegraph sector. Unlike railway companies whose number was large because they were involved in constructing lines over all continents and many lines, the large number of telegraph companies

[12] Registered companies are based on a search in the National Archives BT 31 and BT 41 for the word "Telegraph" in the company name; The Privy Council Office, List of Charters Granted, 23-24; Companies incorporated by Local Acts are based on a search in Chronological Table of Local Acts under the UK Legislation government website.

clustered around a handful of trunk lines. As will be seen below, telegraph lines in each of the two regions involved dozens of companies. The chapter will argue that telegraph was organized through series of interconnected companies. Why series of interrelated companies and not “stand alone” companies as some scholars believe was the model in railways? What was the functional, governance and financial relationship between these companies? I shall argue that high technological risk was a major concern that impacted the organization in this sector. In order to establish this point we will start in the halfway point of the historical narrative, in the aftermath of big failures and before the ultimate successes of the oceanic telegraph lines.

In the wake of the failure of the first Atlantic cable in 1858, followed two years later by the even costlier collapse of the Red Sea and India line, oceanic submarine telegraphy came to be widely seen as a great failed technology. In this context the Board of Trade appointed the Joint Committee to Inquire the Construction of Submarine Telegraph Cables. This was a committee composed of four members from the Board of Trade and four members of the Atlantic Telegraph Company. Why was such an exceptional public-private committee formed? The official goal of the committee was to inquire into "the best form for the composition and outer covering of submarine telegraph cables". Notice that the committee was not requested to investigate the role of the state in the construction of submarine telegraph, or to identify those in charge of previous failures and place guilt upon them. To the contrary, the role of the Board of Trade was limited to assistance in pooling together information from various private companies and individuals. The idea was to improve the understanding of the causes of failure, to identify the best technologies for each component of the overall project and to resurrect the reputation of the sector in order to lure new investors.

The committee, which surveyed all submarine telegraph lines that were constructed to that date, operated for over a year, interviewed dozens of witnesses and its final report was over 600 pages

long. The bottom line of the survey was that “at the present time 11,364 miles have been laid, but of these little over 3,000 miles are actually working”. In the wake of the failure of the first Atlantic cable in 1858, followed two years later by the even costlier collapse of the Red Sea and India line, oceanic submarine telegraphy came to be widely seen as a great failed technology.

It then analyzed the failed lines in order to identify the exact technical reasons for the failure of each of these.

In its concluding recommendations the committee was at the same time tacitly critical of previous construction methods and technology deployment and optimistic as to the future prospects: ”The whole subject of submarine telegraphy may be yet said to be in its infancy, and all that has been done has been rather the result of bold though successful tentative processes than of the application of any well ascertained data to the ends to be obtained”. [13]

Compared to other sectors discussed in this book telegraphy was risky because it combined several new technologies, each of which very new and the combination of all never tried before with unchartered bottom of the ocean environment. In response to the risks that became clear in the Atlantic projects, the India project was constructed through several interrelated companies. Separate companies were created on three levels: (1) geographical segments as in the India line, functional separation between constructing of cables (2) laying them in the ocean and operating them as was exhibited already in the Atlantic project (3) companies and trusts which were created

[13] "Submarine Telegraphs: Report of the Committee Appointed by the Lords of the Committee of Privy Council for Trade to Inquire into the Best Plan for the Construction of Submarine Telegraph Cables," in *19th Century House of Lords Sessional Papers* (1860), V-VI, XIII.

at a stage in which numerous telegraph companies already existed, in which investors passively invested, which in turn invested themselves in "real" active companies.

Separate companies were created in order to form asset partitioning so as to raise investments to distinct pools and isolate risks. Asset partitioning is a theoretical structure in organizational law that was formulated by Hansmann and Kraakman (and later also Squire) to explain why related business projects are separated into distinct corporations.[14] The idea was that a failure of one segment, or one operation, will not bring down the entire project by turning it to insolvent. In some modern sectors asset partitioning is being used in order to isolate third party tort liabilities. This is the case with activities ranging from oil tankers to New York City yellow cabs, to polluting factories. Telegraph is in no way analogous to these because as we shall see it was not subjected to third party tort (or mass tort) liabilities. It did not rely on debt finance, and thus did not resort to asset partitioning in order to separate liabilities to different contractual creditors, as is the case with modern special purpose vehicles (SPVs) used in the financial sector (as was the case with mortgage securitization before the 2008 crisis). There are some similarities between the use of asset partitioning in modern startups and oil exploration, and the telegraph sector of our chapter, each being performed by a separate corporation in order to separate risks and better price and monitor them. There are similarities with the way in which ship ownership was conducted in previous generations, having each ship as a separate entity having numerous part-owners. But there was a difference, while ships were owned separately during their lifetime, as the risks were pending,

[14] Henry Hansmann and Reinier Kraakman, "The Essential Role of Organizational Law," *The Yale Law Journal* 110, no. 3 (2000). "Organizational Law as Asset Partitioning," *European Economic Review* 44, no. 4 (2000); Henry Hansmann, Reinier Kraakman, and Squire Richard, "Law and the Rise of the Firm," *Harvard Law Review* 119, no. 5 (2006).

telegraph merged once construction was complete and there is no evidence for the influence of part-ownership of ships on the organization of telegraph.

As we shall see, the Atlantic line entrepreneurs and investors learned the advantage of this model in the hard way of failure, challenges and learning by doing. Those involved in the India line learned the lessons from the Atlantic projects and from the start organized using asset partitioning as a means to mitigate risks. We will focus on how these enormous risks, as they were perceived by 1860, affected the organization of telegraph companies. We will analyze the organization and finance of companies that were involved in two major projects, the connection of the British Islands with North America via the Atlantic Ocean, and the connection of Britain with India and Australia via the Mediterranean Sea and the Indian Ocean. For the sake of space, we will jump over the shorter connections of Britain to Ireland and Europe and we will mention only briefly the first abortive attempts at connections with North America and India.

Connecting Britain and America - The Atlantic Telegraph Company

The first submarine telegraph companies were incorporated between 1845-55 and aimed at the easier task of constructing short range shallow water connections with Western Europe and Ireland.[15]

The idea of connecting Europe and America by telegraph gained popularity in the early 1850s. Engineers asserted that the preconditions for a successful laying of a submarine cable were slow currents and flat bottom of the Atlantic Ocean. A geographical survey concluded that the best preconditions existed in a route that goes from Ireland to Newfoundland. The Newfoundland

[15] With companies such as General Oceanic & Subterranean Electric Printing Telegraph Company, The Electric Telegraph Company, Channel Islands Telegraph Company, and International Telegraph Company

Legislature incorporated in 1854 the New York, Newfoundland, and London Telegraph Company (New York, Newfoundland, and London), the first of a sequence of related companies whose aim was to establish a line of telegraphic communication between America and Europe and ultimately succeeded in the task twelve years later.[16] Initial incorporators included Charles Bright, John Watkins Brett and Cyrus Field. The Company also obtained in May 1854, an exclusive charter from the government of Prince Edward's Island, and afterward from the State of Maine, and a charter for telegraphic operations in Canada.[17]

The Company in the first instance commenced operations by proceeding to connect St. John's, Newfoundland, with the widely ramified telegraph system of the British North American provinces and the United States. On the Irish side, lines of telegraph were already being for a time in operation throughout the country and were connected to England and the Continent by submarine cables. The only remaining link in this electric chain, required to connect the two hemispheres by telegraph, is the Atlantic cable.[18]

The Failed Attempts at Laying Cables

In 1856 a project was launched by the Atlantic Telegraph Company, Limited (Atlantic Telegraph Company) for the connection by submarine cable between Ireland and Newfoundland. The Atlantic Telegraph Company was incorporated in October 1856, as a Joint Stock Limited

[16] An Act to Incorporate a Company under the Style And title of the "New York, Newfoundland, and London Telegraph Company. April 15th, 1854 (17 Vict., C.2).
[17] "Canadian Merchants' Magazine and Commercial Review, Volume 1," 1857, 302.
[18] Beauchamp and Institution of Electrical, *History of Telegraphy*, 147-48.

Company constituted under the Joint Stock Companies Act, 1856, by a Memorandum of Association.[19]

The Atlantic Telegraph Company was formed in alliance with the New York, Newfoundland, and London, based on an agreement by which they mutually bind themselves to connect the wires and cables exclusively for fifty years. An Act of the Newfoundland Legislature had passed in 1857 permitting the consolidation of the two companies, whenever they shall see it for their mutual interest.[20]

In 1857, the work of laying the cable began but after more than, 380 miles an accident occurred and the cable was lost in the ocean. In 1858 a second attempt failed. A third attempt was completed successfully on the 5th of August 1858.[21] The mission to make telegraph communication between Europe and America seemed to be completed and the first messages were sent eight days later, these included congratulations between Her Majesty Queen Victoria and President Buchanan of the United States, between the Corporations of London and New York and from Whitehall to the Canadian colonies. However, a few days later the telegraph malfunctioned and after few attempts trying to identify and fix the breakdown it was concluded that the cable was not repairable. The cable project was a total loss, and the original capital of £460,000 in the Atlantic Telegraph Company appeared to have been swept away in the Atlantic Ocean.[22] In retrospect, it is clear that the first Atlantic cable failed not just because of the three failed attempts in laying it in the bottom of the ocean that may have damages segments of the cable, and because jolts from a high current

[19] Senate, Congress. "The reports of committees of the Senate of the United States, for the First Session of the Thirty-Fourth Congress", S. Rept. 35-313
[20] Atlantic Telegraph Act, 1857 (20 & 21 Vict., C. cii)
[21] John Mullaly, *The Laying of the Cable, or the Ocean Telegraph* (NEW YORK: D. Appleton, 1858), 313.
[22] George Saward, *The Trans-Atlantic Submarine Telegraph: A Brief Narrative of the Principal Incidents in the History of the Atlantic Telegraph Company* (1878), 34. Saward was the secretary of the Atlantic Telegraph Company.

produced by the massive induction coils that led to electric failure once the cable was complete, but rather because of a combination of more general factors: excessive haste, poor design, hurried manufacture, inadequate testing, rough handling, improper storage, and generally sloppy management. This analysis demonstrates that telegraph was a new, experimental and evolving technology subject to high risks of failure.

The Challenges of Raising Capital After Repeated Failures

Following the registration of the company, on November, 1856, a prospectus was issued by the Atlantic Telegraph Company, with a nominal capital of £350,000, represented by 350 shares of £1000 each, and within one month the entire of the capital had been subscribed for, and the first installment of £70,000 paid up.[23] The high nominal capital of each share and the small number of shares suggests that the intention was to raise capital from friends in a private placement rather to go public by raising money from the general public through the London Stock Exchange. It was agreed by the leading entrepreneurs that three-fourths of the stock will be subscribed for in England and the remaining fourth will be taken for distribution in America. Field was greatly disappointed that other American investors subscribed for only £27,000 of the £88,000 allocated to American investors and he had to meet himself the calls for the remaining balance of £61,000.[24].

It was soon realized that the capital raised was not sufficient for completing the laying of the submarine cable. The company decided that rather than going through the process of re-registration under the Companies Act it would be easier to turn to Parliament for re-incorporation based on

[23] John Watkins Brett, *On the Origin and Progress of the Oceanic Electric Telegraph, Etc* (London : W.S. Johnson, 1858), 48-49.
[24]. Saward, *The Trans-Atlantic Submarine Telegraph: A Brief Narrative of the Principal Incidents in the History of the Atlantic Telegraph Company*, 8-9.

specific act, in order to empower it to raise more capital from the public. This was done in The Atlantic Telegraph Act of 1857, which empowered the company to increase its Capital by a vote receiving two third majority from £350,000 to £1,000,000. The nominal capital of each share could be set at no more than £1,000 or less than £20 each. The lowering of the nominal value of each share indicated the intention to go public. The act also allowed the Company to determine that the original Shares of £1,000 shall each be subdivided into 50 shares of £20 each. The Atlantic Act of 1857 also made it lawful for the Company to borrow on Mortgage or Bond any Sums not exceeding the whole One-Third of the Capital of the Company.[25]

Following the failures in laying the cable in August of 1857 and again in the June and August of 1858 laying that was completed but misfunctioned, and the need to raise more capital for another attempt at laying the cable, the company returned to Parliament. This exemplifies the shortfalls of parliamentary incorporation compared to incorporation by registration. Every change in the capital structure could not be achieved by amendment of the company's memorandum or articles by the shareholders but rather had to go through the cumbersome and expensive process of passing a bill through Parliament, The Atlantic Act of 1858 was amended to authorize the issuing of additional £128,060 in shares of £20.[26] The Atlantic Act of 1859 was passed to authorize the Company to issue additional capital of £600,000 in 120,000 preferred shares of £5 each bearing annual dividend of 8%.[27] By then the company had "old capital" of ordinary shares of £1,062,860. Following the enactment, in July 1859 the Atlantic Telegraph Company published a prospectus for issuing the newly authorized capital. This indicates the understanding of the managers and their financial and legal advisors, that no one will invest in ordinary stock, on equal terms with the original investors,

[25]Atlantic Telegraph Act, 1857 (20 & 21 Vict., C. cii)
[26] Atlantic Telegraph Amendment Act, 1858 (21 & 22 Vict., C. cxlviii)
[27] Atlantic Telegraph Amendment Act, 1859 (22 & 23 Vict., C. xxiii)

after three failures. The lower nominal face value of each share also indicates the need to turn to wider and less affluent circles of investors. According to the terms of the new offer, once the 8% were paid to the new investors in the preferred shares, the old capital of ordinary shares received 4% dividend, and then the rest of the profits, if any, would be distributed on a pro rata basis between the old and new shares. [28] Unlike debt finance, in the form of debentures/bonds preferred shares were not entitled to any payment as long as the Atlantic Telegraph Company did not make profits and could not take to company to insolvency and winding-up proceedings. A failure of the next attempt would mean total loss for the new investors because the British government guaranteed the dividend but only if the cable would operate successfully.[29]

In August 1865, a fourth attempt to lay the transatlantic cable was ended with another failure. This failure made the raising of additional capital from the public an almost impossible task. In order to meet the challenge, the directors had to be very generous to the new investors, in a manner that would disadvantage the investors of the first two rounds and deprive them of almost any share in the expected profits. The Directors called an Extraordinary General Meeting of Shareholders, on the 14th of September, 1865. On the one hand, they threatened existing shareholders that without new investment their shares would be worthless. The high expectations created before the raising of the preferred shares in 1859 were gone. The holders of these shares and of the ordinary shares are about to lose their investment in full. In order to save the project and the existing shareholders the management explained that it was “compelled to offer an inducement to those who are willing to come in and assist to place in that position the Company's, at present, sinking property”. The managers needed the preferred shareholders on their side, they had to vote and approve the

[28]. "Notices," *The Economist*, July 2 1859, 751.
[29] Saward, *The Trans-Atlantic Submarine Telegraph: A Brief Narrative of the Principal Incidents in the History of the Atlantic Telegraph Company*, 43-44.

issuance of the new prospectus. Thus the directors said that the perceived sacrifice is not a real sacrifice as “it can be ascertained by any one who will take the trouble to make a small calculation… the traffic, after paying the dividend charges of 12, 8, and 4 per cent. Respectively… would leave an enormous balance for paying further dividends or bonuses on the Company's total capital, both ordinary and preferential". This was according to the management a win-win situation, in which favorable terms for the new investors would make the older shares profitable again.[30]

Following the General Meeting in October 1865, the Company published a prospectus for raising the needed capital from the existing shareholders and the public for the fourth effort at laying the cable. The prospectus was full of optimism as to the ability of the company to meet the challenge. It was Backed by the Bank of England as the lead banker and Freshfield as solicitors.

The interest offered in the prospectus was exceptionally high, 12%, indicating despair rather than optimism. The preferred shares were convertible into consolidated Stock in priority over all the existing capital of the Company, and equal participation pro rata. in all other dividend and bonuses after payment of 8%. to second preference and 4%to the old stock.[31]

However, before the capital was raised the Attorney General ruled the company had no right to issue 12% preferred stock ranking over the older preferred stock and that the matter would have to be enacted by parliament. The likelihood of the company to meet this high pay was uncertain, the ability to pay and dividend to the original shareholders was very doubtful.

[30] Sir William Howard Russell, "Report of the Directors to the Extraordinary General Meeting of Shareholders," (London1865), 115-17.
[31] "Notices," *the Economist*, Oct. 14 1865, 1262.

The challenge of raising more capital for the same company after the first four failures seemed to be insurmountable. Many investors lost confidence in the technology, while others lost confidence in the management of the Atlantic Telegraph Company. Even those who believed that the laying of transatlantic submarine telegraph cable could be done, and that the demands to its services was sufficient, realized that it doesn't make sense to invest more in the same company, the Atlantic Telegraph Company. Even the investors who did not understand this themselves could learn it as early as September 1865 from the *Economist*:

"Should the Atlantic Company be unsuccessful in recovering the second cable, and succeed in laying a third, they would have to pay dividends upon upwards of three times the capital of this Company; or one cable must pay dividends on the cost of three, to say nothing of the difference in expense of working. It must necessarily follow that this Company, being able to adopt a much lower tariff than the Atlantic Company, would always command preferential and full employment".[32]

In other words, the Economist advised its readers that if they believe in transatlantic telegraphy they should not invest in the Atlantic Telegraph Company but rather in another unrelated company because this will have to pay dividends only on the capital invested in one attempt rather than spreading the same dividend on a three times larger capital invested in three attempts by the same company. Such a new company will be more competitive with customers of telegraphy services, being able to offer a service for a lower price and yield higher dividends to its investors.

The leading figures behind the Atlantic Telegraph Company changed their approach. through learning by doing, they realized that conducting the project as a whole within one company is not

[32] "Allan's Transatlantic Telegraph Company Limited," *The Economist*, Sep. 30 1865, 1200.

wise. They started slicing and separating the project. In other words, they started partitioning the assets and activities in a way each company would bear a distinct and separate risk.

Cable Production

A key application of that insight that different functions should be organized in separate companies, and that payment can be made in stock that offers future dividend rather than cash, can be seen in Atlantic Telegraph Company's relations with The Telegraph Construction and Maintenance Company (TELCON). TELCON was formed in April 1864 by the merger of Gutta Percha Company with the partnership of Glass, Elliot and Company. John Pender (who had just been elected director for the Atlantic Telegraph Company), who initiated the merger was appointed its Chairman, and Richard Glass, its Managing Director. The new corporation provided a full-service of cables manufacturing and laying. The Atlantic Telegraph Company made an agreement with TELCON for the manufacture of a cable approved by the Scientific Committee, and for laying it across the Atlantic from Ireland to Newfoundland. As the Atlantic Telegraph Company was short of cash after the previous failures of laying the cable and the growing difficulties of raising capital from investors the payment was made only partly in Cash (£350,000), while the rest in Preference Shares (£250,000), Mortgage (£100,000) and if the cable became operative also ordinary shares (£137,140). The high price tag for the manufacturing and laying of the cable large, far over any reasonable market price, resulted from the inability to pay fully in cash, as the efforts of the Directors in England, and of Field in America, had failed to raise more than £315,000, and

the Company had to pay for the risk assumed by TELCON by accepting the shares and bonds of the Atlantic Telegraph Company.[33]

Before concluding the construction contract with TELCON, an eminent counsel provided an opinion that the issuance of such high dividend preferred shares was not authorized by the Atlantic Telegraph Company Act. The Directors were compelled to return the deposits which were paid upon these shares. Subsequent negotiations with the shareholders and TELCON led to the conclusion that the only way in which the undertaking could be completed in 1866 was by the creation of a new Company subjected only to the general Companies Act of 1862, to act as the agents of the Atlantic Telegraph Company.

That new company, the Anglo-American Telegraph Company, Limited (Anglo-American), was incorporated in London, on 3 March 1866 under the Companies Act, 1862with a capital of £600,000. Its capital was provided, an agreement between the new company and TELCON was concluded, and the cable was manufactured.[34]

The financial arrangements between the Companies for splitting the earnings of the new cable were as follows: The shareholders of Anglo-American were entitled to £125,000 a year out of the earnings of the Atlantic Telegraph Company lines, and £25,000 a year out of those of New York, Newfoundland, and London for through business, together £150,000 a year upon a capital of £600,000, making a lucrative 25%. Annual return.[35] Under this agreement Anglo-American held possession of the cables as security for the deduction of £125,000.

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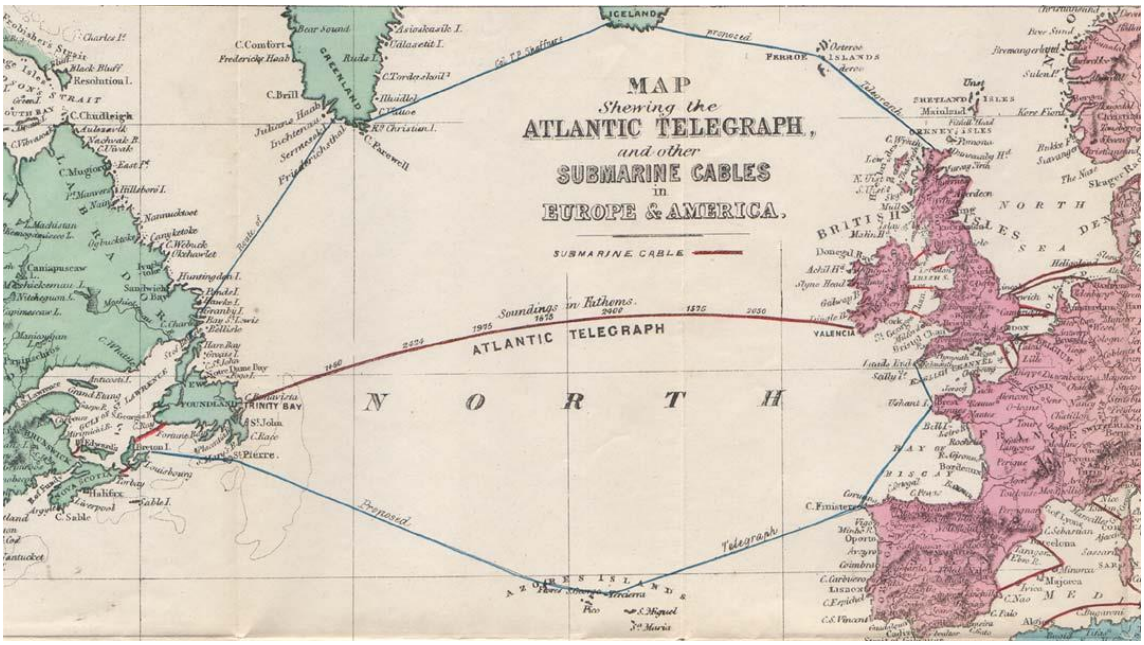
[33] Saward, *The Trans-Atlantic Submarine Telegraph: A Brief Narrative of the Principal Incidents in the History of the Atlantic Telegraph Company*, 53-54.
[34] "Anglo-American Telegraph Company, Ltd." *Economist*, March 17, 1866, 344
[35] J. W. Blundell, *The Manual of Submarine Telegraph Companies* (London, 1871), 14.

On the opening of the Atlantic cable for traffic on the 28th of July 1866 a telegraph link was established between Valencia Ireland and Newfoundland. The lost cable of 1865 was also successfully recovered and operated this time. The length of each of these cables was about 1,890 miles. Both of these cables were worked by the Anglo-American as agents to the Atlantic Telegraph Company.

Map 1.1 – Illustration of the Atlantic routes in 1865



Source: Atlantic-Cable website

A large revenue soon flowed into the coffers of the Anglo-American. The Atlantic shareholders had spent all their paid-up capital on the erection of stations and other permanent works and the cost of repairs to the 1866 cable (which was broken several times). In addition, they had to meet the debt to TELCON, and take bonds issued to the latter in part payment for the cable of 1865 out of the Company's revenue. This meant, that while the shareholders of Anglo-American were making profits, the Atlantic shareholders we still looking to return the companies debts.

The Board of the Atlantic Telegraph Company tried to raise the capital for purchasing the interest of the Anglo-American, or else, to complete the amalgamation of the two Companies. The Anglo-American, who secured ex-ante a 25% return refused to sell or merge. The Atlantic Telegraph Company, therefore, applied to Parliament in 1867 for the necessary power to raise additional capital. The Atlantic Telegraph Amendment Act of 1867, gave the Company the power to increase its capital, up to £3,500,000, subject to a vote of approval by 75% of the shareholders.[36]

In January 1868, a prospectus was issued by the Atlantic Telegraph Company, offering to the public in 10% preferential shares a capital of £1,300,000 of which £100,000 was to be applied to the redemption of existing mortgages, and the remainder to the purchase of the interests of the Anglo-American Company. Upon the appearance of this prospectus, an organized opposition was immediately directed against it by the Anglo-American Telegraph Company. In addition to addressing circulars to the shareholders of Atlantic Telegraph Company, a few gentlemen of large capital began purchasing the original stock of the Atlantic Telegraph Company, which was then at a low figure, to enable them to control an authorization of a new capital as the Act of 1867 required the assent 75% of the shareholders. From thereon the Board of the Atlantic Telegraph Company were obliged to accept the best terms they could obtain from the Anglo-American Company. From April 1868, and until November 1870, the two Companies were administered by a Joint Committee. A complete amalgamation of the Stocks of the two companies took place in February 1870.[37] A new stock was issued to the amount of £1,675,000, of which £1,200,000 was to be given

[36] The Atlantic Telegraph Amendment Act, 1867 (22 & 23 Vict., C. xxiii)
[37] Saward, *The Trans-Atlantic Submarine Telegraph: A Brief Narrative of the Principal Incidents in the History of the Atlantic Telegraph Company*, 77-80.

to the Anglo-American shareholders, £375,000 to the Atlantic shareholders, and £100,000 to the Atlantic debenture holders.

Table 1.2 – Conversion rate of stocks from the Anglo-American and Atlantic Telegraph to the amalgamated company

New Stock of the amalgamated company	Old Stock	Conversion Rate
£20 of new Stock	£10 Share of the Anglo-American	2:1
£43 of new Stock	£100 8% Pref. Stock of Atlantic	43:100
£16 of new Stock	£100 Original Stock of Atlantic	16:100

Source: (Saward, 1878)

Connecting India and Beyond – Eastern Telegraph Company

Establishing a route to India

The Indian rebellion of 1857 intensified the understanding that connection between London and India cannot settled for the speed of mail steamers, but should rather move forward and use the new and much faster telegraph technology. The Abyssinian crisis of 1864-68, unfolded in the slow pace of exchange of letters between Ethiopia, London and Bombay, and it took many months to send a large contingency of the Indian Army in the form of Expedition to Abyssinia, in order to fight a British colonial war in Africa. This was a second reminder for the essentiality of a telegraph line between London and Bombay.

Following the successful completion of the North Atlantic telegraph connection in 1866, Pender, one of its architects, turned his attention to the other trunk line of the British Empire, the route to India. Attempts to connect Britain and India began even before the Indian Mutiny and Pender's interest in this route, by resorting to the technologically simpler overland lines, via Russia and then Persia and via the Ottoman Empire and then either Egypt and the Red Sea or Iraq and the Persian Gulf. Various groups competed for concessions from rulers along the way. Some of the groups also lobbied for British governmental guaranties for their investment and returns.

John Brett, whose Mediterranean Electric Telegraph Company had obtained exclusive concessions, for 50 years, from France and Sardinia, and offered in 1855 to build a line from Cagliari to Malta and then to extend it to Alexandria and on to India via the Red Sea. In 1858, the entrepreneurs Lionel and Francis Gisborne obtained a concession from the Ottoman and Egyptian governments to lay a cable from Egypt to India via the Red Sea. The cable broke in the Red Sea before a single message could be sent to India. The Prussian firm Siemens & Halske incorporated its London Branch as Siemens Brothers and Company, Limited, in 1865, and in 1868 established the Indo-European Telegraph Company (Indo-European) as a privately owned and operated subsidiary with headquarters in London. The idea was to connect London with India via Europe, Russia and Persia, offer telegraph services both to public clients in Whitehall and to private clients in the City of London. Indo-European obtained a Russian concession in 1867 and a Persian concession in the following year. Soon after, the Company circulated prospectuses throughout Europe and ultimately raised capital of £450,000, mostly in London and Berlin and also in St. Petersburg. The entire route was completed in 1870, and the British government initially welcomed it. However, the Abyssinian crisis and the intensification of the "Great Game", the rivalry between Britain and Russia over influence in Afghanistan and Persia, and the "Eastern Question" the future

of the Ottoman empire, were a reminder to the British government that overland connections, even though some of them were operated by British companies and run by British directors, could be interrupted by foreign powers whose territories they passed, the Ottoman Empire and the Russian Empire, who could be Britain's adversaries in the next diplomatic crisis or major war.[38] In 1868 Daniel Gooch took over the chairmanship of TELCON, leaving Pender time to form the group of companies that were to link England with much of the rest of the world in the 19th and 20th centuries. Pender retained his stock holding in the company, and the two worked closely later to build the Eastern Telegraph cables network.

Between 1868-1870 Pender and his associates registered four separate cable companies. Their goal was to create a route from Britain all the way to India, which will pass only British territories and the open sea. Why split the project between four geographically distinct companies rather than doing it all in a single company? To spread the financial risks, one company was established for each segment of the overall line. How did this work? We can at this stage only answer this question based on theoretical insights until direct evidence for the motivations of Pender and his fellows will be found. It allowed to raise the needed capital in smaller chunks. It allowed investors to choose in which segment to invest based on the perceived risk, based on depth and currents of the Mediterranean Red Sea or Indian Ocean. It allowed better monitoring of the execution of each segment by the investors in it. Even though these companies were independent to minimize financial risk, they had interlocked directorships and once they were operating at a profit, Pender

[38] Beauchamp and Institution of Electrical, *History of Telegraphy*, 140-42, 65-67.

and his associates looked to consolidate them into a larger entity so the route would be fully operated by a single company.[39]

The first company incorporated as part of Pender's submarine line to India project was the Anglo-Mediterranean Telegraph Company (Anglo-Mediterranean) which was incorporated in May 1868. The capital of the company was £260,000 divided into 26,000 shares of £10 each.[40] The company took over older concessions awarded to the Levant Telegraph Company and the Mediterranean Extension Telegraph Company and hoped to use their cables as a starting point. The cables faced repeated failures and Anglo-Mediterranean decided to put an end to the lease and lay a new cable. It purchased new cable from TELCON and the installation was completed in October 1868. By the end of 1868, the company had control of the whole route from the French border to Suez.[41]

As mentioned above, the cable to Alexandria to India was initiated already in 1858, the laying of the cable was completed but only a few messages went through before the telegraph malfunctioned and was announced in 1860 as a failure. Pender approached the same project a decade later with a new company. In January 1869, British-Indian Submarine Telegraph Company (British-Indian Submarine) was registered. A decision to raise sufficient private capital unassisted by public investment was made. The first stage was a private placement, as about £380,000 were subscribed by about a dozen of Pender's friends as chief promoters. Next a prospectus was circulated, it stated that the object was to lay a submarine cable from Suez through the Red Sea to Aden, and on to Bombay. The capital of the company was £1,200,000 divided into 120,000 shares of £10 each.

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[39] Daniel R. Headrick, *The Invisible Weapon : Telecommunications and International Politics, 1851-1945* (New York: New York : Oxford University Press, 1991), 35-36.
[40] "Anglo-Mediterranean Telegraph Company, Limited," *The Economist*, May. 16 1868, 582.
[41] Hugh Barty-King, *Girdle Round the Earth: The Story of Cable and Wireless and Its Predecessors to Mark the Group's Jubilee, 1929-1979* (London: Heinemann, 1979), 26; Joseph Wagstaff Blundell, *The Manual of Submarine Telegraph Companies* (London: Joseph Wagstaff Blundell (published by the author), 1872), 35-36.

Pender invested heavily in the company, giving his personal guarantee, which encouraged others to invest in the enterprise. The timing of the prospectus was perfect, as the nationalization of the British domestic telegraph companies in 1868 compensated shareholders in the domestic companies with £8,000,000. These shareholders now found themselves with liquid capital looking for investment opportunities. Some of them may have had a predisposition to invest in telegraph enterprises thus Pender was able to raise the £1,200,000 without difficulty.[42]

TELCON was contracted to manufacture and lay the submarine cables for £1,000,000, £540,000 in cash and £460,000 in company shares (of which 15,000 shares were reserved until the cable laying was completed). An additional £37,500 in shares was paid for laying the landline from Alexandria to Suez via Cairo. On March 22, 1870 the entire line from Suez to Bombay was completed and began providing regular service. A second landline route from Alexandria to Suez via Benha and Zagazig was laid in September 1871. [43]

In July 1869, Pender incorporated the Falmouth, Gibraltar & Malta Telegraph Company, Limited (Falmouth, Gibraltar & Malta). The capital of the company was £760,000 divided into 76,000 shares of £10 each. The company was formed to lay and operate a submarine cable from Malta via Gibraltar and Carcavelos to London, thus eliminating dependence on the French and Italian landlines for communication. Originally it was intended to make the starting point at Falmouth, but it was found that Porthcurno was more suitable for landing a cable. The company received the rights from the British government to exclusively use an already-placed landline cable from

[42] Headrick and Griset, "Submarine Telegraph Cables," 560; J. C. Parkinson, *The Ocean Telegraph to India: A Narrative and a Diary* (Edinburgh: W. Blackwood, 1870), 17-19; Blundell, *The Manual of Submarine Telegraph Companies*, 42; "The Bankers' Gazette," *The Economist*, Jan. 30 1869.
[43] Headrick and Griset, "Submarine Telegraph Cables," 548, 60; Parkinson, *The Ocean Telegraph to India: A Narrative and a Diary*, 17-19; Blundell, *The Manual of Submarine Telegraph Companies*, 42-43; "The Bankers' Gazette."

Porthcurno to London. The cable laying was operated by TELCON and by July of 1870 the entire stretch of cable had been laid.[44] This submarine cable, together with the former 1868 Malta–Alexandria cable and the 1870 Suez–Aden–Bombay link would complete the all-sea route (except for the relatively short landline section from Alexandria to Suez) from Britain to India.

The French government was looking for quick telegraph access to Algeria, rather than transiting through Italy, and a connection to the submarine cable to the East was also of interest. In February 1870 the Marseilles, Algiers & Malta Telegraph Company, Limited (Marseilles, Algiers & Malta) was incorporated in London. The capital of the company was £200,000 divided into 20,000 shares of £10 each. The contract for manufacture and laying was awarded to TELCON. The company constructed two cable routes from Marseilles to the Port of Bona (Annaba) in Algeria and from Bona to Malta, and both were completed in 1870, creating a North–South British owned and operated connection across the Mediterranean.[45]

[44] Blundell, *The Manual of Submarine Telegraph Companies*, 28.
[45] *The Manual of Submarine Telegraph Companies*, 34-35; "The Bankers' Gazette," *The Economist*, Feb. 12 1870.

Map 1.2 – Submarine and overland telegraphs connecting Britain to India in 1875

Source: (Headrick, 2012).

On May 1872, after the completion the various segments of the submarine cable, and the dramatic reduction of the risk of failure, Pender called an Extraordinary General Meetings of the shareholders of the four companies he initiated and set out to their shareholders the benefits of amalgamating these companies into a single company holding and operating the entire route to India. The shareholders gave their approval and the proposal was adopted by the four companies.[46]

On 1 June 1872 Pender registered the Eastern Telegraph Company, Limited (Eastern Telegraph Company), which embraced all four companies. The capital of the company was £3,800,000 divided into 380,000 shares of £10 each.[47] The holders of shares of these four companies respectively received fully paid-up shares in the new company.

Table 1.3 - Conversion rate to Eastern Telegraph Company shares from the old companies

New Stock of the amalgamated company	Old Stock	Conversion Rate
10 Eastern Telegraph Company (£100)	20 Anglo-Mediterranean shares = (£200)	1:2
	12 Falmouth, Gibraltar & Malta shares = (£120)	100:120

[46] The four companies that were amalgamated into Eastern Telegraph Company were: the British-Indian Submarine, the Anglo-Mediterranean, the Falmouth, Gibraltar & Malta, and the Marseilles, Algiers & Malta. The Anglo-Mediterranean already acquired earlier the Mediterranean Extension Telegraph Company and the Malta and Alexandria Telegraph Company which is why some sources claim that Eastern Telegraph Company was composed of six preexisting entities.

[47] Emile Garcke, *Manual of Electrical Undertakings and Directory of Officials* (Electrical Press Limited, 1896), 404.

	10 Marseilles, Algiers & Malta shares = (£100)	1:1
	12 British Indian Submarine shares = (£120)	100:120

Source: (The London Gazette, Nov. 8, 1872, 5324-5326)

At its foundation Eastern Telegraph Company possessed by far the largest and strategically most important telegraphic system in the world. Based on its first six months, the formation of Eastern Telegraph Company proved to be successful. The combined revenues of the four separate companies up to 30 September 1871 increased by 19% despite the rate for messages to India being reduced from 4 10's to 4.[48]

Establishing a route to the "Far East" and Australia

By then Pender was already working on the expansion of the submarine telegraph network further east. Between 1869-1870 Pender formed three companies to create each a segment of the route connecting India to Australia, TELCON was contracted to construct all the segments.

The British-Indian Extension Telegraph Company (British-Indian Extension) was incorporated with a capital of £460,000 to operate a submarine cable from Madras to Malaysia via Singapore. This segment was completed by December 1870.[49] Next, Pender incorporated the China Submarine Telegraph Company, Limited (Chine Submarine) with a capital of £525,000 to operate a cable from Singapore to Hong-Kong via Saigon. This telegraph segment was completed by June 1871.[50] Next was the British-Australian Telegraph Company, Limited (British-Australian) which

[48] Barty-King, *Girdle Round the Earth*, 47.
[49] Blundell, *The Manual of Submarine Telegraph Companies*, 48-50; "The Bankers' Gazette," *The Economist* 23/10/1869, 15.
[50] Blundell, *The Manual of Submarine Telegraph Companies*, 51-52. "Notices," *The Economist*, Dec. 11 1869, 1488.

was incorporated with a capital of £660,000 in order to complete the route in the Far East by connecting Australia to Singapore via Java Island.[51]

As the Far East cable system was operational and began to return a profit, Pender moved forward with his masterplan. Just as he did with the line from Britain to India, by merging four companies into the Eastern Telegraph, so did he intend to do here. He convinced the shareholders of these companies that consolidation of the three companies was in their best interest. In May 1873, these companies were liquidated and their assets merged to form the Eastern Extension, Australasia & China Telegraph Company (Eastern Extension). It was registered with a capital of £3,000,000 divided into 300,000 shares of £10 each.[52] The company also received the benefits of an agreement between the Government of Tasmania and TELCON. The shareholders of these four companies respectively received fully paid-up shares in the new company as followed: (1) the British-Indian Extension shareholders received 69,000 shares (2) the British-Australian shareholders received 66,000 shares (3) the shareholders of China Submarine received 57,750 shares (4) the shareholders of TELCON received 7,000 shares.[53]

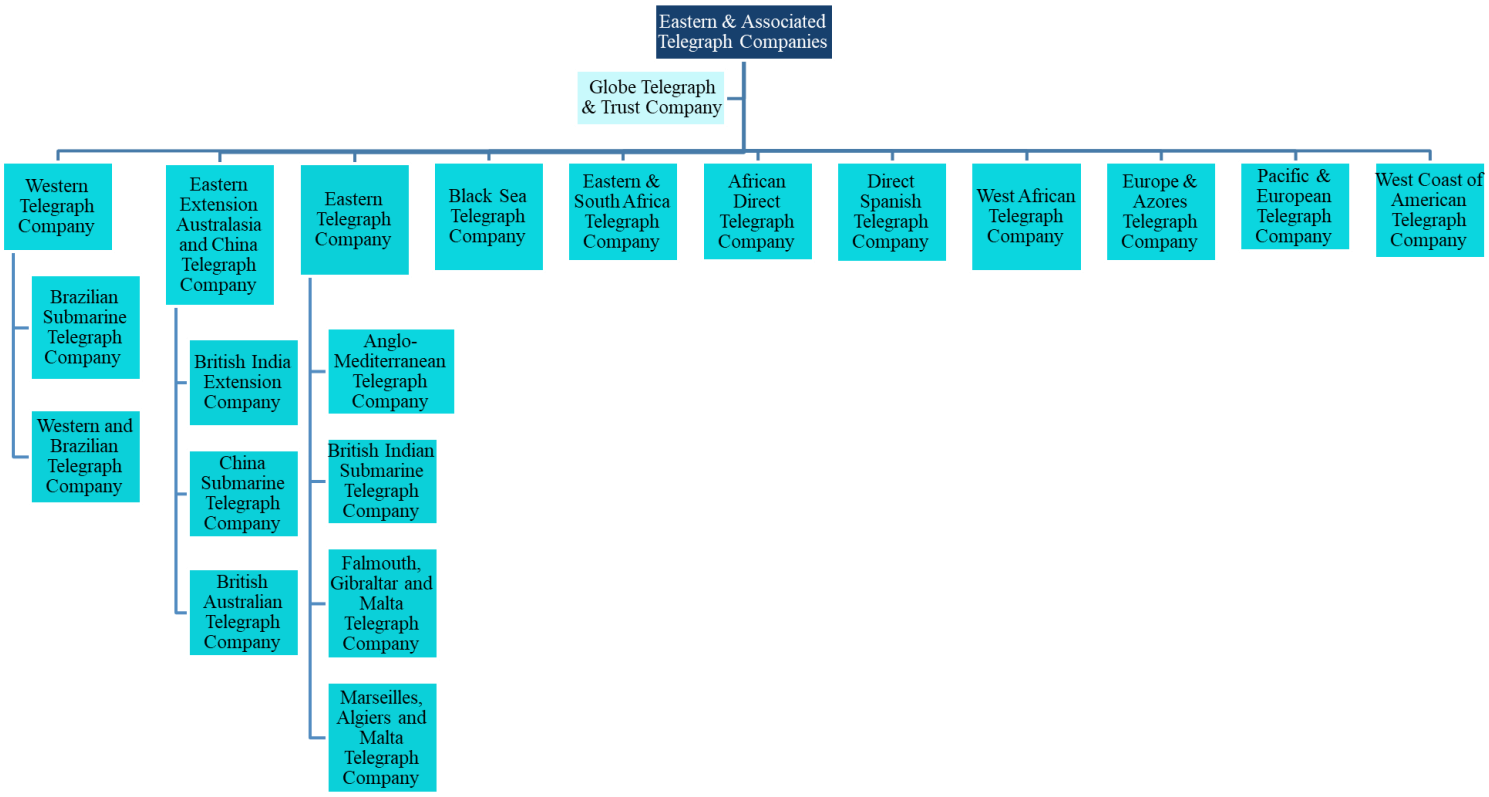
Since its formation, Eastern Extension would continue to duplicate and expand its routes in the Far East. All of the company cables were laid by TELCON and it would create new routes connecting New Zealand and Australia to Africa and Asia via the islands in the Indian Ocean.

[51] Blundell, *The Manual of Submarine Telegraph Companies*, 54-56; "The Bankers' Gazette," *The Economist* 8 Jan 1870, 39.
[52] Garcke, *Manual of Electrical Undertakings and Directory of Officials*, 405. "Railway and Other Companies." *Times*, May 21, 1873, 8.
[53] Ibid., 34.

Connecting Africa and South America

Pender and his associates would continually form new companies to expand in different parts of the world and eliminate new any form of competition. Pender's strategy was to refrain from allocating the construction of new lines to existing companies, but rather to incorporate separate company for the construction of each new submarine cable. Even though these companies were nominally separate, they had cross-directorships which allowed Pender and his associates influence over the whole entrepreneurial side of the submarine cable business.

Chart 1.1 - the organizational structure of the Eastern & Associated Telegraph Companies.



As can be seen from Chart 1.1 Eastern Telegraph Company (to the right of the center) and Eastern Extension (to the left of the center) formed the centerpieces of the Eastern & Associated Telegraph Companies (Eastern & Associated Companies or Eastern Group) and their global system. In the

next stages of the development of the group, to which we now turn, the Black Sea and African companies (on the right) and the American companies (on the left) were incorporated.

On way of expansion was by taking over companies that offered branching off the main Eastern line. The Direct Spanish Telegraph Company was originally registered in 1872 with a capital of £130,000, with an object to connect England and Spain. Subsequently, in 1884 the Eastern Group acquired the company.[54] The Black Sea Telegraph Company was formed in 1874 to lay a cable from Constantinople to Odessa on the northern shore of the Black Sea. Pender seized the opportunity of the political instability of the region and in 1878 purchased it for the bargain price of £74,000.[55]

Next the group decided to expand to the South Atlantic, opening opportunities both in West Africa and South America, In April 1893, Pender formed the Europe and Azores Telegraph Company, in order to lay the first cable between Lisbon and the Azores Islands which also enabled the Azores connection to Eastern & Associated companies' system to Britain, Africa, the Far East and South America.[56] The Western Telegraph Company was formed in 1899 as a result of an amalgamation of two companies. The first company was the Western and Brazilian Telegraph Company which was formed in 1873 with a capital of £1,350,000 in order to connect Brazil to Argentina and was acquired after few decades by the Eastern Group. The second amalgamated company was the Brazilian Submarine Telegraph Company, Limited. which was incorporated Pender's associates, Viscount Monk and James Anderson in 1873 with a capital of £1,300,000 in order to connect Portugal to Brazil. The company received exclusive concessions for 20 years to lay and operate

[54] *Telegraphic Journal and Monthly Illustrated Review of Electrical Science*, (1885), 317.
[55] *The Electrician*, (James Gray, 1878), 154-57.
[56] Headrick, *The Invisible Weapon : Telecommunications and International Politics, 1851-1945*, 42, 81.

this route from the King of Portugal and the Brazilian Emperor. TELCON was awarded the contract to manufacture and lay the complete system.[57]

Pender obtained a concession from the British government to lay a cable connecting Great Britain to its colonies along the West African Coast, with a subsidy of £19,000 per year, that reflected the prospect that the business prospects of the line were low and the strategic imperial importance higher. For this purpose he formed the African Direct Telegraph Company, which was registered in England in 1885 with a capital of £300,000.[58] In 1886 India Rubber, Gutta Percha & Telegraph Company (India Rubber) a London-based competitor of Pender's group, founded the West African Telegraph Company, which combined the two concessions granted by the French and Portuguese Governments into a project linking all the French and Portuguese colonies along the African West Coast to Cadiz in Spain. This submarine cable also stopped off at the Gambia and the Gold Coast to allow communication with the British Colonies. In 1889 these Companies and their cables were taken over by Eastern & Associated, to form in conjunction with the West African, African Direct and Eastern & Southern Africa companies, a single system in West Africa.[59]

From the South Atlantic the group extended its network to East Africa and Pacific South America. The Eastern and South African Telegraph Company, Limited, was incorporated in 1879 by Pender with a capital of £400,000 was formed to create a new route on the East Coast of Africa.[60] The West Coast of America Telegraph Company had been formed in 1875 by India Rubber. The

[57] Garcke, *Manual of Electrical Undertakings and Directory of Officials*, 404-05; "Brazilian Telegraphs Amalgamation," *Financial Times* 11 Nov 1899, 6850; "The Brazilian Submarine Telegraph Company, Limited," *The Economist* 8 Feb 1873, 184.
[58] LM Archives CLC/B/101/MS24233.
[59] Kenneth Charles Baglehole, *A Century of Service: A Brief History of Cable and Wireless Ltd., 1868-1968, by K. C. Baglehole* (Welwyn Garden City (Herts): Bournehall Press Ltd, 1970), 8-9; Charles Bright, *Submarine Telegraphs; Their History, Construction, and Working.* (London: C.Lockwood and son, 1898), 134-35.
[60] *The Electrician*, (James Gray, 1880), 14.

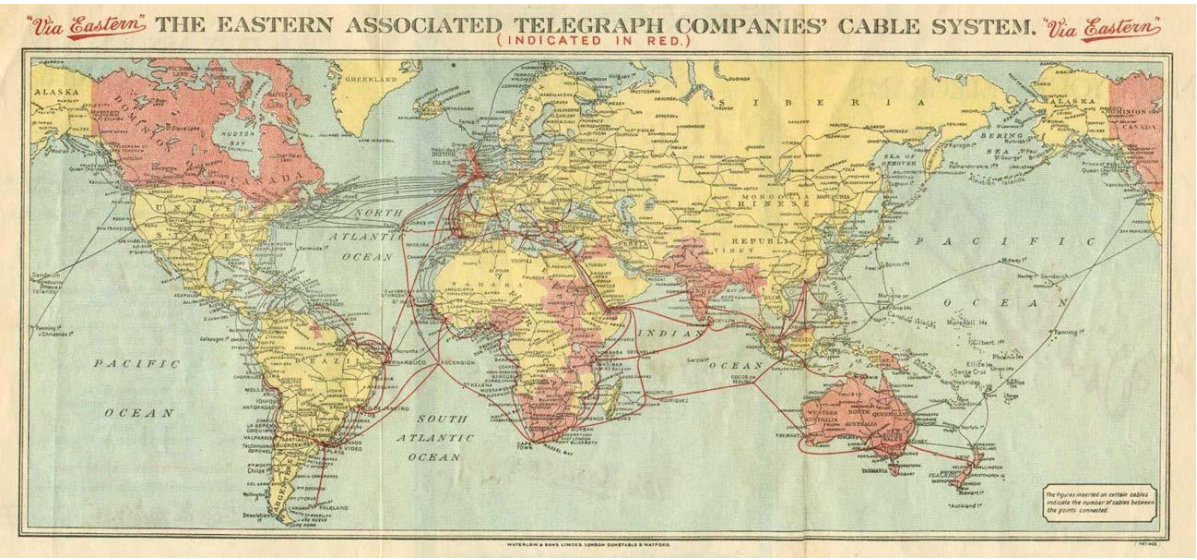
company received a concession from the Chilean and Peruvian governments to lay and operate a submarine cable laid between Valparaiso and Lima. The company encountered financial difficulties and in 1877 it was taken over by Pender's group.[61] The Pacific and European Telegraph Company was incorporated in England in 1892 by Pender with a £100,000 capital. The company was formed after Pender obtained concessions from the Chilean and Argentinian governments to operate a landline cable between Valparaiso and Buenos Aires. This route would connect Chile and Peru to the Eastern & Associated network. [62] By then the group's network covered the West Africa coast, Cape Town, and East Africa, and on the other side, the Atlantic and Pacific coasts of South America.

Eastern Associated & Companies

Within two decades in the late 19th century Pender and his associates completed a global telegraph network. They did this by combining the construction of new cables by companies they incorporated and taking over of preexisting companies. At the end of the process their global cable system was organized in English companies, financed from the City and the London Stock Exchange and managed as a coordinated group, The Eastern & Associated Telegraph Companies, from headquarters in London.

[61] *Engineering Magazine*, (Engineering Magazine Company, 1898), 431.
[62] Barty-King, *Girdle Round the Earth*, 96. ; London Metropolitan Archives CLC/B/101/MS24329

Map 1.3 – The Eastern & Associated Telegraph Companies cable system map in 1924



Source: Atlantic-Cable website

By 1883 the combined Eastern and related companies operated 44 stations, had 18,334 miles of cables, owned 946 land lines and leased 1,812 others. By 1892 it had become financially linked to, and the dominant member of, a large consortium of cable operating companies called the Eastern & Associated Telegraph Companies (or Eastern Group), which operated approximately 113,000 kilometers of cable, nearly 46% of the total length of the world's cables. This process of forming ever larger corporate group reflects the decline of the technology risk involved in submarine telegraph between the 1850s and 1890s and the shift of the center of gravity from construction to operation. In the tradeoff between risk spreading and coordinated economy of scale (or even partial monopoly) the tilt towards the latter is reflected in the organizational changes. By World War I the Eastern & Associated Companies had a joint nominal capita of over £10,000,000 and carried about 2,000,000 messages annually. It operated transatlantic cables to South America, as well as cables to Europe, Africa, the Middle and Far East, and Australasia, held a near monopoly

of lines between Britain and North, Central, and South America, and total control of the Britain-India-Australasia route. During the war the group was involved with the Royal Navy and the General Post Office in the "Cable War" in which it banned Germany from using its lines and cut and seized German submarine cables in the Atlantic. In 1923, when the Eastern group was starting to face serious competition from rival cable operators and radio, it operated over 235,000 kilometers of cable, a global share of nearly 40%. At its peak the group of companies operated 160,000 nautical miles of cables. In the late 1920s, following the introduction of wireless communication, a merger took place of the of both wired telegraph and wireless radio communications in the British Empire into one operating company, initially known in 1928 as the Imperial & International Communications, Limited, and renamed in 1934 to Cable & Wireless, Limited. [63]

Telegraph Organizational Models

This section aims at characterizing the organizational models used in telegraph and in explaining why these models were used in telegraph but not in other sectors that are discussed in other chapters of this book.

A Core Group of Entrepreneurs

A central and unique feature of the organizational model of telegraph, next to the multiplicity of companies, is that the same group of individuals was involved in most of these companies. A handful of individuals, including John Pender, Cyrus Field, James Anderson, William Hay, Daniel

[63] Simone M. Müller, *Wiring the World: The Social and Cultural Creation of Global Telegraph Networks* (Columbia University Press, 2016), 248-51; Headrick, *The Invisible Weapon : Telecommunications and International Politics, 1851-1945*, 206-09; Headrick and Griset, "Submarine Telegraph Cables," 571-79.

Gooch and Emille D'Erlanger were the lead entrepreneurs of many companies and projects. Let's get to know a few of them through short biographies, identify the connections between them and the roles they played in the companies they formed. In the next section we will map the interlocking director positions they held in the various telegraph companies and how they used these positions initially in order to coordinate and then to merge the companies into formal corporate groups.[64]

Cyrus Field (1819-1892) was born in Massachusetts and continued his business career in New York City. Field got interested in the new telegraph technology in 1854 after meeting the pioneering British telegraph engineer Frederic Newton Gisborne, He formed a business venture with Peter Cooper, Abram Stevens Hewitt, Moses Taylor and Samuel F.B. Morse, the so-called *Cable Cabinet* of entrepreneurs, investors and engineers, for laying a telegraph line connecting New York City with Newfoundland and the later with Nova Scotia, The group took over the abovementioned New York, Newfoundland, and London Telegraph Company. The next year Field and his group formed the American Telegraph and began buying up other companies to consolidate a system that ran from Maine to the Gulf Coast. In 1857 Field moved on to establish with his American and British friends the Atlantic Telegraph Company. Field was highly instrumental in connecting the British and American telegraph entrepreneurs. The successful establishment of a transatlantic telegraph made Field an international celebrity. In 1867 Congress awarded him a gold medal, and the Paris Exposition also bestowed on him its grand prize. He was the "Columbus of our time" according to British statesman John Bright, who has, "by his cable, moored the New World close alongside the Old".[65]

[64] See Table 1.4 and Table 1.5 and the text surrounding them.

[65] Philip B. McDonald, *A Saga of the Seas: The Story of Cyrus W. Field and the Laying of the First Atlantic Cable* (New York: Wilson-Erickson, Inc., 1937); Richard R. John and Susan Ware, "Field, Cyrus West (1819-1892), Financier and Promoter of the Transatlantic Cable.," in *American National Biography Online: the Life of a Nation is Told by the Lives of its People* (New York: Oxford University Press, 2010).

The telegraph pioneer John Pender (1816-1896) was the British (three years older) cohort of Field. He was a leading initiator, financier, shareholder, director and Chairman of both Atlantic and the Indian route telegraph companies. He was the designer of the organizational model of separating projects into distinct companies. In 1851 he joined the board of directors of the English & Irish Magnetic Telegraph Company. In 1857 he led to a merger with the British Telegraph Company and became the chairman of the new company. When a transatlantic cable was proposed, Pender was among the first investors in the new Atlantic Telegraph Company and in 1856 he joined the company's board of directors. In 1864 he led the merger of Glass Elliot and Gutta Percha Company to form TELCON, which he served as its first chairman, TELCON would, later on, manufactured and laid most of his companies cables. Pender went on to form the Eastern & Associated Companies, the corporate group which absorbed numerous smaller companies operating in Asia and beyond. He served as a member of Parliament for the Liberal Party and was knighted in 1888. Over his business career Pender formed no less than 32 telegraph companies. [66]

Sir James Anderson (1824-1893) was the captain of the SS Great Eastern when the ship laid a Transatlantic telegraph cable in failed 1865 and successful 1866 attempts. He was knighted for this achievement, gave up the position of a mariner and turned into a cable entrepreneur and right-hand man to Pender. Anderson held several important positions in the Eastern & Associated companies such as Chairman, Managing Director and Director. In British news, Anderson was the most visible of the cable actors.[67]

[66] Müller, *Wiring the World: The Social and Cultural Creation of Global Telegraph Networks*, 258-59; Anita McConnell, "Pender, Sir John (1816–1896), Textile Merchant and Telegraph Entrepreneur," (Oxford University Press, 2004).
[67] Müller, *Wiring the World: The Social and Cultural Creation of Global Telegraph Networks*, 52-53.

Daniel Gooch (1816–1889), began in 1860 a set of associations that was central to the construction of the first Atlantic telegraph connections. He combined skills in engineering, finance, and organization. He was chief engineer of the newly formed TELCON that constructed and laid the first successful transatlantic telegraph cable, using the ship SS Great Eastern (1865/66). He was rewarded with a baronetcy in November 1866. He retained an interest in telegraphic communication and succeeded Pender as the chairman of TELCON, a position he held until his death in 1896. Gooch was the Conservative MP for Cricklade from 1865 to 1885.[68] Because of his engineering abilities Gooch was an important link between the construction and operation sides of telegraph and played a key role in the vertical corporate interconnectivity.

Baron Emille D'Erlanger (1832-1911) was a German – French banker and investor. He was one of the most successful financiers of the second half of the nineteenth century. In 1859, he established his own banking house in Paris and in the 1860s moved his business to London. He was involved in investment in American railroad companies. He set up the French Atlantic Cable Company in 1868 and from the 1870s he served as director for several telegraph companies of Eastern & Associated Group.[69]

William Montagu Hay (1826-1911) was Liberal member of Parliament for Taunton from 1865 to 1868 and represented Haddington Burghts in 1878. In that year he also succeeded his brother as the 10th Marquess of Tweeddale. Throughout his life, Montagu-Hay held several important positions in the Eastern & Associated companies. He was the chairman of Anglo-American, Anglo-Mediterranean, Eastern Telegraph, Eastern Extension, Australasia and China, African Direct and

[68] Geoffrey Channon, "Gooch, Sir Daniel, First Baronet (1816–1889), Railway Engineer and Executive," in *Oxford Dictionary of National Biography* (Oxford University Press, 2013).
[69] Müller, *Wiring the World: The Social and Cultural Creation of Global Telegraph Networks*, 255.

Europe & Azores. He was also a Director of TELCON and Globe Trust, which we will encounter in the next section. His connection with the world of railway finance is also a noteworthy one, as he later became the Chairman of the North British Railway Company, besides being at on the Boards of two smaller railway companies.

John Denison-Pender (1855-1929) was Pender's third son. His nutshell biography shows how the group transferred across generations. In 1878 at the age of 23 he began working for Eastern & Associated companies, and four years later, in early 1882 he became a director of the Eastern Telegraph Company. Twelve years later, after Anderson's death, Denison-Pender was elected to succeed him in the role of managing director of the company. In 1896 he was made deputy chairman, and in 1917 became the chairman of the Eastern Telegraph Company, Eastern Extension and Western Telegraph Company until his death in 1929. By holding the three Chairmanships he in fact consolidated the three operational companies of the group. Denison-Pender played a key role in the negotiations for the merger of Eastern & Associated and the wireless telegraphy companies to create Cable & Wireless and Imperial and International Communications, but he died before it was completed.[70]

Interlocking Directorships

This handful of individuals, with a few additional persons, exemplify two important organizational features of telegraph, the serial formation of companies and the interlocking of boards of directors.

[70] S. Ash, *The Cable King: The Life of John Pender* (CreateSpace Independent Publishing Platform, 2018), 363, 400-02; "Sir john Denison-Pender," *The Times*, Mar. 7 1929.

Table 1.4 – Board of directors in the amalgamated operational telegraph companies

		John Pender	James Anderson	William Montagu Hay	Emile D'Erlanger	Cyrus Field	William N. Massey
Amalgamated to Anglo-American	Atlantic Telegraph Company	Director	Director			Founder	
	Anglo-American Telegraph Company			Chairman		Director	
Amalgamated to Eastern Telegraph Company	British-Indian Submarine Telegraph Company	Chairman	Managing Director	Director	Director		Director
	Falmouth, Gibraltar & Malta Telegraph Company						
	Anglo-Mediterranean Telegraph Company			Chairman		Director	
	Marseilles, Algiers & Malta Telegraph Company	Director	Director	Director			
Amalgamated to Eastern Extension	The British Indian Extension Telegraph Company						Chairman
	China Submarine Telegraph Company	Chairman		Director	Director		Director
	The British-Australian Telegraph Company	Director	Director				
Amalgamated to Western Telegraph Company	Western and Brazilian Telegraph Company						
	Brazilian Submarine Telegraph Company		Vice-Chairman				
Eastern & Associated	Eastern Telegraph Company	Chairman	Managing Director	Chairman	Director	Director	Director
	Eastern Extension, Australasia and China Telegraph Company		Director				Vice-Chairman

Table 1.4 (continued)

		George T. Glover	George Elliot	Daniel Gooch	Viscount Monck	George G. Nicol	Alfred Paget	Philip Rawson
Amalgamated to Anglo-American	Atlantic Telegraph Company							
	Anglo-American Telegraph Company			Director	Chairman			
Amalgamated to Eastern Telegraph Company	British-Indian Submarine Telegraph Company	Director				Director		Director
	Falmouth, Gibraltar & Malta Telegraph Company		Director				Director	
	Anglo-Mediterranean Telegraph Company							Director
	Marseilles, Algiers & Malta Telegraph Company							
Amalgamated to Eastern Extension	The British Indian Extension Telegraph Company	Managing Director				Director		Director
	China Submarine Telegraph Company							
	The British-Australian Telegraph Company							
Amalgamated to Western Telegraph Company	Western and Brazilian Telegraph Company							
	Brazilian Submarine Telegraph Company			Director	Chairman			
Eastern & Associated	Eastern Telegraph Company	Director				Director	Director	
	Eastern Extension, Australasia and China Telegraph Company	Managing Director			Director			

As we have seen, the Atlantic cable was more of an ad hoc assortment of several companies that were formed by a specific unfolding process of failure and chance. The telegraph connection between London and India was separated by intention and plan to discrete companies each in charge of the construction of a segment, in order to create asset and risk partitioning. The two cases studied in this chapter involved the registration of dozens of companies. The companies were all registered in Britain, with very few exceptions that resulted from the acquisition of preexisting foreign companies with relevant concessions. As can be seen in Table 1.4, there were many overlaps between the boards of these companies. This facilitated the merger of these companies into the Eastern Telegraph Company and Eastern Extension, after the stage of transition from construction to operation.

Table 1.5 – Board of directors in Eastern & Associated, TELCON and the trust companies.

		John Pender	James Anderson	William Montagu Hay	Emile D'Erlanger	Daniel Gooch	William N. Massey	Viscount Monck	Cyrus Field	George T. Glover	George Elliot	George G. Nicol	Alfred Paget	Philip Rawson
Trust Companies	The Submarine Cables Trust	Trustee	Trustee			Trustee		Trustee						
	Globe Telegraph and Trust Company	Chairman	Director	Director		Director	Director	Director	Director					
Construction Company	TELCON				Director	Chairman			Director	Director		Director	Director	Director
Eastern & Associated	Eastern Telegraph Company		Managing Director	Chairman			Director			Managing Director				
	Eastern Extension, Australasia and China Telegraph Company		Director				Vice-Chairman	Director						
	Western Telegraph Company													
	Direct Spanish Telegraph Company		Chairman	Chairman						Director				Director
	Black Sea Telegraph Company					Director								
	Eastern & South African Telegraph Company		Managing Director											
	African Direct Telegraph Company			Chairman										
	West African Telegraph Company													
	Europe & Azores Telegraph Company			Chairman										
	Pacific & European Telegraph Company													
	West Coast of American Telegraph Company													

Table 1.5 (continued)

		John Denison-Pender	John Wolfe Barry	Albert J. Leppoc Cappel	F..A Johnston	Viscount Midleton	Arthur G. Brodrick	Thomas Fuller	John Cuthbert Denison-Pender	William Jackson (Lord Allerton)	James Pender Bart	B. J. Wolfe Barry
Trust Companies	The Submarine Cables Trust	Trustee		Trustee						Trustee		
	Globe Telegraph and Trust Company	Chairman	Chairman	Director		Director					Director	
Construction Company	TELCON										Director	
Eastern & Associated	Eastern Telegraph Company	Chairman	Chairman	Director	Director	Director			Director	Director		
	Eastern Extension, Australasia and China Telegraph Company						Director					
	Western Telegraph Company				Director	Director						
	Direct Spanish Telegraph Company	Director		Director	Director							
	Black Sea Telegraph Company								Director			
	Eastern & South African Telegraph Company		Chairman	Director		Director						Director
	African Direct Telegraph Company		Director		Director	Chairman	Director	Managing Director				
	West African Telegraph Company							Director	Director			
	Europe & Azores Telegraph Company				Director							Director
	Pacific & European Telegraph Company			Chairman								
	West Coast of American Telegraph Company			Director	Director							

Table 1.5 shows how interlocking boards created a vertical in addition to horizontal coordination as the same directors, served not only in the operational telegraph companies such as the Eastern Telegraph Company (connecting India) and Eastern Extension (connecting East Asia and Australia) and later also Western Telegraph Company (connecting the Americas), but also TELCON the production and laying company, and Globe Telegraph and Trust Company (Globe Trust) which was bot a portfolio investment device and a holding company as we will see below.

Raising Capital from Public Investors

Beyond the inner circle of a handful of investors, often friends of Pender and often Directors in telegraph companies, was a second circle. That circle included a few dozen repeat investors which held a significant stake in new companies. They often purchased these shares through what we term today private placements, in early stages before subscription was offered to the public through prospectuses. These entrepreneurs and major investors often served as directors in numerous companies. Boards of different companies had interlocking directors.

Public investment through IPOs was made often only at advanced stages of the projects, closer to the beginning of cable laying. Some of it was done directly through company prospectuses. The lowering of the nominal face value of telegraph companies shares from £1000 in the very first companies, down to £100, £20 and eventually £10 and even £5 as the standard is a clear indication of effort made by the telegraph entrepreneurs to attract public investment of middle class savers and investors in company shares.

The early 1870s was a time of rapid expansion of submarine telegraph cables, beyond the Atlantic and India, to Australia, East Asia, South America, and Africa. investment in submarine cables had tremendous potential due to the rapid growth of the industry but was also considered a high-risk

investment due to the cable laying failures that had occurred in the 1850s and 1860s. It would have been impossible for Pender to establish the series of companies in the 1870s merely with private placement with a small group of investors.[71]

Telegraph Investment Trusts

Raising capital for specific telegraph companies from public investors was complemented by raising capital for a portfolio of telegraph companies. This was done by the employment of a new device that was recently created in other contexts such as railways, the investment trust. However unlike the first investment trust the Foreign and Colonial Government Trust that invested in government bonds and the Railway Debenture Trust Company that invested in corporate bonds, the Cable trusts, like the Railway Share Trust Company invested in corporate shares. On September 6, 1871, the Submarine Cables' Trust was established by a deed between a group of telegraph entrepreneurs such as Pender, Anderson, Gooch and Hay as the trustees on the one hand, and the solicitor Philip Rose representing the future investors the certificate holders, on the other hand.[72]

Before the formation of the trust a prospectus was issued to invite subscriptions to it. This prospectus stated that there was to be an issue of £1,000,000 in certificates of £100 each issued at £90, which were to bear interest at £6. The prospect also stated that "The trust will consist solely of the stocks, shares, or debentures of submarine cable companies, which offer apart from accidental interruptions the prospect of a high rate of interest … A person desirous of holding Submarine Cable shares can thus by means of this trust at a minimum of trouble and expense

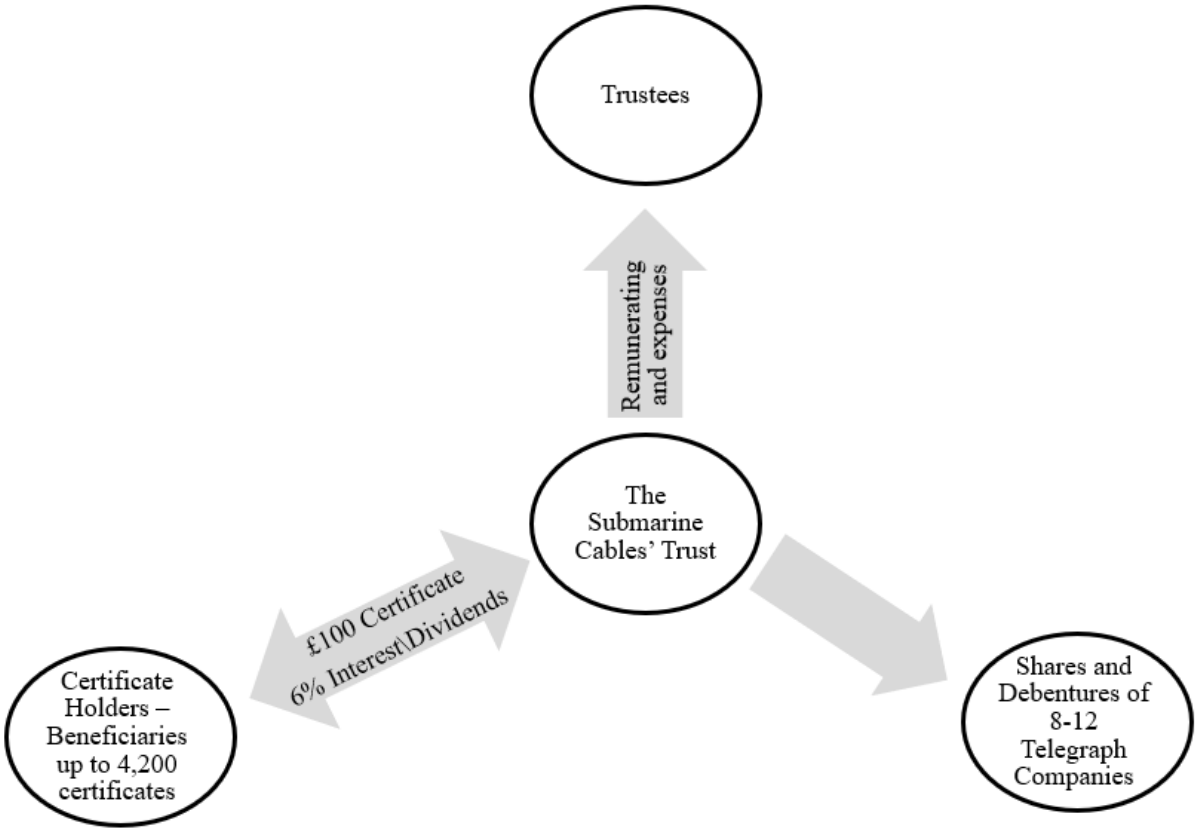
[71] Müller, *Wiring the World: The Social and Cultural Creation of Global Telegraph Networks*, 233-34.
[72] 'Submarine Cables Trust', The Railway News Jun. 10 1871, 784

diminish the risk of investing in any one particular undertaking by spreading his investment over a number of different undertakings, and reserve a portion of the extra interest as a sinking fund to pay off his capital, as for each £90 invested he virtually becomes a holder of pro rata investments in some eight or ten different securities." By 1880, the Trust held stock and shares, of the nominal amount of £400,036, in eleven different submarine telegraph companies.

Unlike other investment trusts, its initiators and trustees were telegraph entrepreneurs and controllers and not bankers and financiers. Unlike other investment trusts they refused to incorporate and went through court litigation to protect its ability to maintain the trust form despite its size. In March 1879, H.R. Smith, a holder of one certificate, on behalf of himself and all other the holders of certificates filed a law suit against the trustees. He argued that the trustees and the holders of certificates were an association of more than twenty persons formed after the passing of the Companies Act, 1862, for the purpose of carrying on business that had for its object the acquisition of gain by the association or the individual members thereof without being registered as a company under the Act, so the trust is an illegal association. The Master of the Rolls Jessel held that the Submarine Cables' Trust was a prohibited association pursuant to the Companies Act, 1862. By that time, all the other trusts had converted to companies and the Submarine Cables' Trust was the only fund to remain a trust. The term investment trust, however, continued to be used by the incorporated investment entities. This insistence may have stemmed from the desire to eliminate any liability of the owners of the certificates, including limited liability, from the investment operation. On appeal, Joseph Chitty QC, on behalf of the Trust, argued the form of organization was not organized for business purposes. Chitty sought to circumvent the prohibition in the 1862 Act by distinguishing between the management of an investment and an organization for business purposes. The Court of Appeal found Chitty's argument convincing. The certificate

holders-were not "associated" together. They were merely independent investors owning equitable interests in a common fund; they were not united for concerted action. The trustees were principals and not agents of the certificate holders. They held property in trust.[73]

Figure 1.2 – Organizational structure of the Submarine Cables' Trust



The Globe Trust was created in 1873 as an alternative or an upgrade on the Submarine Cables' Trust. Its first directors were familiar names: Anderson, Daniel Gooch, Julius Boer, Hay, George Elliot, Massey, Field, Viscount Monck, with Pender as Chairman. The alternative was incorporated under the Companies Act, suggesting that the initiators may have decided to run a more active entity than the Cable trust. Its July 1873 prospectus offered total capital of £3,000,000, three times the capital of the Submarine Cable Trust, divided into 150,000 preference shares of £10 each

[73] Arnon W. Welch, "Analysis of Trusts as to Federal Income Tax Liability," *Tax Magazine* 8, no. 4 (1930): 128-29.; Smith v. Anderson (1880) 15 Ch. D. 247, 257-258, 268, 276-277

bearing 6%. annual return and 150,000 ordinary shares of £10 each bearing dividends based on profits. Investors could decide whether to invest in the riskier ordinary shares or the less risky preferred shares. Bircham, Dalrymple Drake & Co. was the solicitors' firm that designed the legal side including the drafting of the memorandum and articles of the company. Interestingly and uniquely, subscribers could make payments not only in cash but also in shares of telegraph companies. Nine telegraph companies were included in the list, mostly connected to the Atlantic and India lines and to the Field-Pender group, with conversion rate for each company. This reveals the business rationale of the company, which was to hold shares of telegraph companies rather than construct or operate telegraph lines as was the rationale of all other companies we encountered. The idea was to pool together the assets of various telegraph companies in one holding company "by spreading the risk as much as possible over existing telegraph systems running in various directions".[74] Each share in the company included a proportion of shares in all the major telegraph and cable companies, this way the fluctuation in the value of the shares of any specific enterprise was less risky.[75] If in the early days of submarine telegraph the idea was to create asset partitioning so that each investor could choose in which segment or activity to invest here the idea was to offer portfolio investment in a wide set of telegraph companies, practically in the sector as a whole. The Globe Trust was an early form of unit trust which helped telegraph cable investors to spread their risk in what was a volatile market.

In fact, it had another somewhat hidden and not less important objective, to be a holding company that concentrated the share held by Pender and his colleagues in various telegraph companies. This is not just separation of risks or portfolio investment; it is also about control. The company allowed

[74]. "The Globe Telegraph and Trust Company Limited," *The Economist*, Jul. 12 1873, 1559.
[75] Bright, *Submarine Telegraphs; Their History, Construction, and Working.*, 121.

coordination across companies and across shareholders. In particularly it enhanced coordination of Pender's group of companies in the struggle with the competing American-German group over monopolizing global telegraph. Anderson and Pender, directors at the Globe Trust, began to quietly amass a large amount of Direct company shares and by the middle of 1876 they owned a majority of the shares. A new set of directors was appointed to the company and its management integrated with the Anglo-American Telegraph Company. In 1877 a joint purse agreement was arranged.

Chart 1.2 – Organizational structure of the Eastern Group

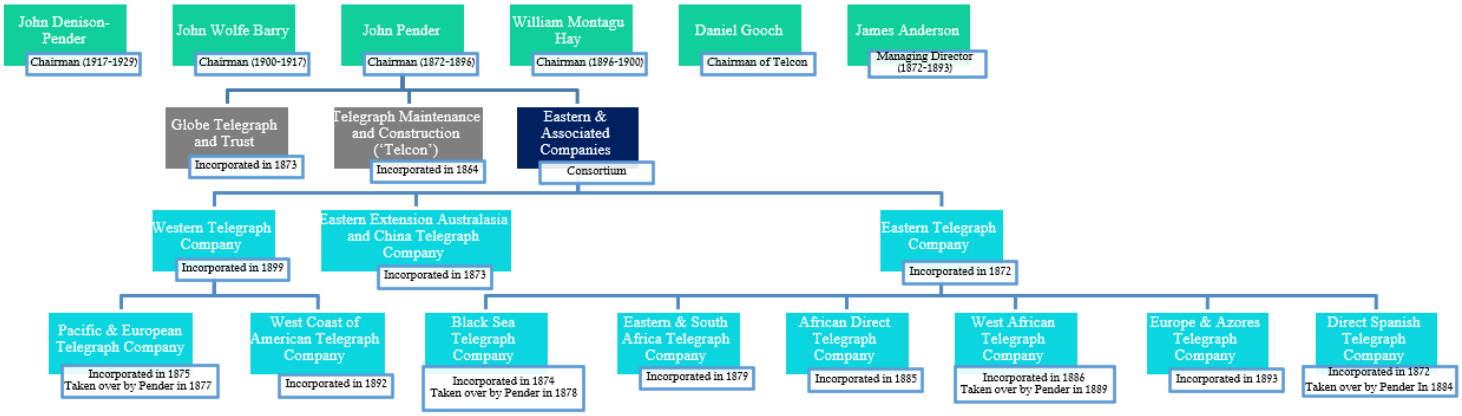


Chart 1.2 shows the organizational structure group as a whole, after the merger of all the operational companies around the globe and including the manufacturing company and investment company.

Conclusion

To conclude, the early stages of submarine telegraph construction, when the laying of cables across the Atlantic and to India were characterized with repeated failures, because the technologies were new and the routes unchartered. The capital needs for lumpsum investment were considerable and risks were particularly high. The organizational solution was to form distinct companies, both vertically, to separate different operational aspects, and horizontally, to separate different

geographical segments. Concerns over expropriation and the use of investor protection devices, which had major effect on the structure of railway finance, organization, and law, were irrelevant in submarine telegraph. They were not replicated in telegraph companies. There was a level of coordination between the companies through overlapping shareholding, interlocking boards and long-term contractual arrangements. As risks diminished and investment needs subsided, the separate companies merged into larger and larger corporate groups. Control was formalized through pyramidal organization.

The concerns of submarine telegraph companies were fundamentally different from those overseas railway companies. So where the corporate and organizational solutions. By the second half of the 19th century railways were not a cutting-edge high-tech sector. The major technological breakthroughs were achieved early in the 19th century and by our time changes were incremental and the knowhow of constructing railway lines was well established. As we have seen, the main risk factor in railways was expropriation and regulation by the host overseas government. Various means were developed in order to deal with this risk, a few in the corporate realm, others in investor protection realm. Another risk factor in railway was the under estimation, or over optimism, about the costs of completing the project. Railway projects could run out of capital in the middle of the construction of the line and before any returns on investment could be materialized. While in telegraph whatever was invested was lost forever as "sunk costs" literary on the bottom of the ocean, this was not the case in railway. In railway whatever was constructed was still on the ground awaiting the completion of the line. In railway one could not incorporate a new company and invest in it because the assets of the original company were essential for the completion and operation of the line. The solution was the issuing of preferred shares or bonds by the original railway company. The investors of the second (sometimes even third) round received fixed and favorable returns but

had to let the original investors keep a share of the expected profits, because the existing assets of the railway were essential. In telegraph the second (and third) round investors did not need the assets of the original cable because these were sunk, at the most they needed the managerial skills of the managers of the first cable project to be on their side, but not any corporate assets. They were lured into the project by an offer of preferred stock yielding high returns. Debt was not used at all in telegraph.

Telegraph was not only a cutting-edge high-tech sector. it was also on the cutting-edge in terms of corporate and financial organization. It tried incorporation by Specific Act of Parliament, Royal Charters and registration based on the General Companies Act. It was organized using numerous companies that were formed based on learning-by-doing. Companies were registered in London and were catered by lawyers, bankers and accountants in the City of London. With maturity of the telegraph sector, well-conceived schemes of segmentation of lines and group creation were planned and implemented. It used various control mechanisms, from entrenching managing directors, to interlocking boards of directors, to pyramid organization, to parent companies, syndics and trusts. It raised capital in rounds, initially private placement, then public offering of ordinary stock and then preferred stock. Unlike the earlier landlines the submarine lines distanced themselves from the British government, both in terms of avoiding regulation and of very seldomly asking for assistance. This level of sophistication was fed by the necessity of dealing with high-risk ventures. It may have been possible due to the high personal level of the telegraph entrepreneurs. Only those who were successful in dealing with complex technological challenges survived in this sector.

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