A common technical culture of telegraphy: the Telegraph Union and the significance of technological standardization 1865-1875

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Abstract — **The Telegraph Union, founded in 1865, was the *first supranational organization* to link different countries with the aim of regulating a public service. Its objectives were: technological standardization, a set of regulations and the adoption of uniform international tariffs. The paper aims to establish how the Telegraph Union influenced the technical standardization process of the international network in the second half of the XIX century.**

Index Terms — **Telegraph Union, Standardization, Telegraphy, Morse, Hughes, technicians, engineers.**

I. THE TELEGRAPH UNION

Already in the 1840s, many Western countries had started to create the first national telegraphic networks. From the 1850s, the installation of the first submarine cables linked up continents and started the first transcontinental telecommunication network. A long series of bilateral and multilateral treaties then signed by the European States led to the establishment of the Telegraph Union, which, partly for this reason, preserved the statutory characteristics already present in the Austro-German Telegraph Union (1851) and that of Western Europe (1855). The Telegraph Union can therefore be considered the natural offspring of preceding conventions and treaties [1].

The Telegraph Union was founded in 1865 after the Conference of Paris, and was the *first supranational organization* to bring together different countries with the aim of regulating a public service [2]. In the beginning, all the countries in which the telegraph service was run under a state monopoly took part, so excluding nations of primary importance like Great Britain[1] and the United States [3]. The main aim of the Union was to guarantee international telegraph communications, something which could be done only through technical standardization, regulatory uniformity and a mutual agreement on international tariffs. It was therefore essential for the various states to exploit their periodic conferences and decide which machinery and telegraphic materials to use on the international lines, which standards to adopt for domestic and supranational telegraph services and, finally, what tax to apply to a telegram sent from one state to another. At that time, these conferences were indeed a novelty because for the first time all the European states gave up a part of their national sovereignty in the name of the development of a service which was becoming indispensable for commercial, economic and diplomatic relations [4].

The main procedural tools of the Telegraph Union were conferences, with delegates called from all member countries. The first four conferences, held between 1865 and 1875, were called "plenipotentiary" because the delegations that took part had been granted full powers by their countries to stipulate international treaties (such as telegraph conventions). The delegations were not, however, only formed of diplomats but, given the high technical know-how required for drafting the standards for international telegraph service, experts were drawn in from the various telegraph administrations, too.

Following the 1875 Conference of St. Petersburg, only "administrative" conferences were held with telegraph administrations alone taking part. Given that no diplomatic powers were present, the only documents that continued to be produced contained regulations and tariff formulas[2].

Besides the periodic telegraph conferences, the Telegraph Union set up a permanent organ to represent it in the months between one conference and another: the *Bureau International des Administrations Télégraphiques* (1868). On paper and in the intention of the various administrations, this organ was to have a purely administrative role and none of the sanctioning powers that secretariats of the main governmental organizations have today. However, its ongoing mediatory activity, vital in carrying out its duties, ensured that it had direct contact with all national administrations and could influence technical and regulatory decisions concerning the international telegraph network [5].

Starting from the 1903 Conference of London, the Union took on itself the international regulation of the telephone service. In 1906, following the diffusion of radiotelegraphy, the first Conference of the International Radiotelegraph Union was held in Berlin, which shared with the Telegraph Union the same permanent organ (i.e. the International Bureau of

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[1] Great Britain took part in the Conference of Paris in 1865 on behalf of the Indian colonies. In 1869, the British government nationalized the telegraphic service and, from the 1871 Rome , took part in the meetings of the Telegraph Union as representing its own metropolitan area.

[2] While the international treaties had and still have to be ratified (i.e. converted into law by legislators following parliamentary debate), the regulations did not have the formal nature of international treaties and the single national governments simply needed to approve them for them to become executive in the various states. Until 1875, the telegraph conferences drew up the Conventions which were international treaties and regulations with attached tariff formulas. Since St Petersburg was the last plenipotentiary conference, the convention has remained unchanged. In subsequent conferences, all administrative in nature, only documents which did not have the value of an international treaty, such as regulations and tariff formulas, could be approved.

Telegraph Administrations), and the magazine published by the latter (the well-known *Journal Télégraphique*). At the 1932 Madrid Conference, the two Unions merged, so giving birth to the International Telecommunications Union (ITU). After the Second World War the ITU became an affiliate of the United Nations and for this reason its headquarters were transferred from Berne to Geneva [6].

II. THE SECONDARY IMPORTANCE OF TECHNICAL STANDARDIZATION

Specialist literature has studied the Telegraph Union mainly as a supranational political organization, generally taking little notice of aspects concerning the standardization of the service [7]. Consequently analyses have concentrated on organizational features and diplomatic equilibriums and issues about technology have been put aside.

The lack of standardization studies is also partly justified by the fact that as a first examination of primary sources shows, technical standardization appears to have been considered the least important of the three main functions of the Union. For example, only two of the 63 articles of the 1865 Paris Conventions concerned telegraph technology (art.1 regulated the width of the wires and art.3 established Morse to be used on the lines). Most of the articles in the Convention and its Regulations dealt with homogenizing the norms. In other words, the delegates at the Telegraph conferences preferred to standardize rules for communication rather than the technical means for carrying it out [8].

Furthermore, the minutes taken at the Conferences show very clearly that most of the discussions were taken up with fixing a uniform international tariff. For example, four of the fifteen sittings of the 1865 Paris Conference (4th-8th) witness the delegates in bitter debates over articles 30 and 31 which established the basic criteria for the calculation and application of international charges [9].

The fact that more space and time were taken up in the Regulations with the standardization of norms and questions of tariffs can be easily explained by the nature of the Telegraph Union.

On one hand, the telegraphic conferences were made up of dual delegations of diplomats and technicians. Normally the technicians were the top managers and officials of the telegraph administrations of the countries taking part, often with a scientific rather than legal training, interested mainly in the regulation of a public service. So it is not surprising they prioritized the standardization of norms and not the materials and technologies needed for the transmission and reception of telegrams [10].

On the other hand the participants at the conferences were delegations from the single states, all trying to maximise their own national interests at the cost of others. In fact as the telegraph administrations were run directly by the state, their revenue was an interesting source of state income and

therefore well worth the struggle to determine the criteria for the tariffs.

Lastly, the causes for the scarce importance attributed to technical standardization are also to be sought in the technological nature of the telegraphs of the time. First of all, by the mid-sixties almost all the continental telegraph networks had reached a high level of national standardization. Then both the material and construction techniques of the lines and the apparatus used in the offices tended to converge on the models held to be the most efficient: Morse for the apparatus, ceramic rather than glass insulators, iron rather than brass wires [11]. Secondly the technology for land telegraphy was not expensive, differently from what had to be done to build, lay and run submarine cables [12]. It follows that unlike the sector of the submarine water cables, the industries producing land telegraphy did not form powerful economic lobbies capable of influencing the decisions of the governmental delegations, at least not until the 1890s. Thirdly, even if the lobby's interests had emerged, they could not have held sway, given that the Bureau's task was to coordinate the single administrations though it had no coercive power. In other words, the Bureau could not impose the use of any particular technology.

III. THE REAL IMPORTANCE OF TECHNOLOGICAL STANDARDIZATION

If analyzed in depth beyond the most apparent features, the primary sources allow the question of technological standardization to be viewed with greater precision

Two characteristics regarding the technological standardization of telegraphs up to the 1850s need to be taken into consideration: 1) there was an evident convergence on transmission apparatus and material for building the lines, as illustrated above; 2) on an international level technical homogenization could only take place for two elements: the wires along the lines and the apparatus in the offices.

The existence already of a high level of technical standardization meant that it was not perceived as a priority when the Telegraph Union was being set up, though it probably was at the moment of the first bilateral and multilateral treatises.

The technical standardization led by the Union was limited to a definition of the wires to be used in the construction of the lines and the apparatus to use in transmission. In reality it was tied to the nature of the telegraph lines, which were composed basically of three elements: wires, posts and insulators. While iron wire turned out to be the best material irrespective of weather conditions, there were many variants in posts and insulators, according to geographical morphology and cultural situations. For example wood was always used for the posts as it was the poorest low-cost conductor. Nevertheless, different states, regions or provinces used the most easily obtainable reasonably-priced wood. For insulators, ceramic was preferred to glass, but according to the posts used and the

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techniques adopted for laying and drawing the wires, shapes could vary considerably. So posts and insulators depended on the territory where the lines were being built and no international standard could possibly be imposed. [13].

A. Telegraphs and wiresi

The 1865 Paris Telegraph Conference established in art.3 the use of the Morse on international lines, while art.1 advised but did not impose the use of a large diameter iron wire for direct lines between the big cities. In reality the convention project, drawn up by the French as the conference hosts, foresaw a precise width for direct lines, but many delegates including Curchod, the influential Swiss delegate, were against it [14]. The question was taken up again and finally inserted in the convention at the following 1868 Vienna Conference, where it was established that a standard five millimetres diameter be used for direct international lines[15].

At the Vienna Conference it was also decided to consider the Hughes telegraph as suitable for international transmission alongside the already established Morse. Whatever, far more important than the final result was the discussion which led to it, from which it emerged clearly that for many delegates *reaching a technological standardization was one of the basic functions of the Telegraphic Union*. The debate was born when some delegates presented an amendment calling for the Hughes telegraph to be added to art.3 of the Paris Convention. The Belgian delegate was very much against it: «M. Vinchent does not think that the Conference has the qualifications to gauge the merit of apparatus: its role must be limited to mentioning those generally consecrated by usage in international service». According to the Belgian delegate, the conference was to interpret society's needs and decide to adopt the telegraphs already being used. In other words the Union was not to impose a standard but value what emerged naturally from society. Not all were in agreement, and in fact some were against using Hughes because it was too expensive while others preferred to adopt multiple telegraphs of a different type. Substantially, however, many delegates were of the opinion that the conference had the power and the duty to go for the best standard [16].

There were, however, very few discussions over technical questions during the conferences. Nevertheless, the need for a technical standardization emerged very clearly in the need felt by numerous telegraph managers to establish a professional training common to all officials of the administrations belonging to the Union.

B. The culture and training of telegraph officials

The Union and the Bureau in particular attempted constantly from the 1850s onwards to encourage directly and indirectly the development of a technical and professional culture common to all telegraph officials in the countries involved. To this end was published the *Journal Télégraphique*, the Union's official review edited directly by the *Bureau*. The *Journal* presented a collection of scientific, technical and administrative articles on practical cases and suggested solutions to concrete questions concerning the telegraphic service. These articles greatly encouraged comparisons between the techniques and norms adopted in the different countries and led indirectly to attempts to standardize knowledge about the subject. Secondly the Bureau incentivized and added fuel to inquests on themes concerning the telegraph service. These inquiries began with a manager's request for information on a precise issue: staff pension conditions, women employees, techniques for building lines, etc : [17]. In order to supply a complete answer, the Bureau head forwarded the requests to the managers of the various telegraph administrations, collected their answers and summarized them in a single document which functioned as a final answer and was often published in the *Journal Télégraphique* [18].

The episode which revealed most clearly the growing need to create a cultural basis common to all telegraph engineers and officials was the attempt by the head of Italian telegraphs to create an international telegraph school.

«It has come to mind to the Italian Administration that all Offices require telegraph engineers capable of treating technical questions of a high order involving indepth know-how. Each Administration can, it is true, turn to engineers from other branches of applied science or to the intelligence heads of their offices. But the former do not usually have the specialized knowhow and the latter the general knowledge so essential for electrical engineers. As each State only needs a relatively small number of such these officials it cannot organise a school for them alone. But what is difficult for a single State to do by itself, the association of different States can do for the benefit of all associates […] Italy's idea was to attach to the International Bureau an institution it was setting up.» [19].

With these words D'Amico presented his project for an International school officially at the St Petersburg Conference. It was an idea that the Italian manager had been working on since 1871, when before the Rome Conference he had tried to set up a survey among European managers to verify the feasibility of his proposal [20]. However he was overtaken by illness and had to put off his proposal until St Petersburg. Meanwhile, between 1872 and 1874, he started an intense diplomatic activity to convince his foreign colleagues to back his proposal for an International telegraph school for high officials. Initially there was almost total opposition to the project, including that of the director of the Bureau, Charles Lendi. After his death he was succeeded by Louis Curchod who, a fervent promoter of the idea, revived the Italian proposal, and commissioned a second survey, which brought to the official presentation at St Petersburg. [21].

In reality, many administrations were against the idea of an international school, probably convinced that their own education systems could best meet the needs and training of their telegraph engineers. Yet, it must be remembered though that in the period there were no university courses or

equivalent able to give specific training to telegraph engineers and officials.

In 1875 at St Petersburg, Curchod, now director of the Bureau and Hammar, director of the Swiss telegraphs, attempted to defend D'Amico's proposal and turn it to their advantage. In fact when faced by objections over costs, the languages to use for instruction and the seat of the school, they suggested opening a course at Zurich's Polytechnic. The costs would be low because it would take place at an already existing university. Secondly, language would not be a problem because Switzerland was traditionally multilingual and all would be content with the seat because it would be in a neutral nation which hosted the permanent organ of the Union [22].

In the end the international telegraph school never came into being. Whatever, the projects, inquiries, and debates which developed around the subject showed very clearly that telegraph officials felt very acutely the need to standardize their own culture and practical know-how.

IV. CONCLUSION

In the early years of its life, the Telegraph Union had neither enough force or tradition to impose international technical standards, a function well present in contemporary technical international organizations. Nevertheless, technical standardization, understood as a wider concept embracing both the awareness of the importance of using compatible techniques and the need for a common technical culture was a an issue very much in the upper minds of the officials taking part in the Union. It may very well be that their presence on the editing board of the *Journal*, setting up surveys and taking part in the conference debates contributed to spreading a sense of a culture common to telegraph officials, which was not identical to that of electric engineers, who were gaining in status, thanks to the first professional organizations [23].

The Bureau and the first telegraphic conferences were therefore privileged places where the idea of a cultural standardization in telegraphic matters was born and gained strength. And in spite of its lack of coercive power, the Union still managed to stimulate standardization, in telecommunications, first in Europe and then in the rest of the world.

REFERENCES

[1] G. Balbi, S. Calvo, S. Fari, G. Richeri, *"Bringing together the two large electric currents that divide Europe: Switzerland's Role in Promoting the Creation of a Common European Telegraph Space, 1849-1865"*, *ICON*, expected in volume 15, 2009.

[2] G. A. Codding Jr., *The International Telecommunication Union. An Experiment in international cooperation*, Leiden: E. J. Brill, 1952.

[3] K. Beauchamp, *History of Telegraphy*, Stevenage: IEE, 2001.

[4] P. Durand Barthez, *Union Internationale des Télécommunications*, Paris : Thèse pour le doctorat en droit, Universite de Paris I – Pantheon – Sorbonne Sciences Economiques – Sciences Humaines – Sciences Juridiques, 1979.

[5] S. Fari, *Una Penisola in comunicazione. Il servizio telegrafico dall'Unità alla Grande Guerra*, Bari: Cacucci Editore, 2008, pp. 467-478.

[6] G. A. Codding Jr., A.M. Rutwosky, *The International Telecommunication Union in a changing world*, Dedham: Artech House, 1982.

[7] Codding, *The International Telecommunication*, cit.; Durand Barthez, *Union Internationale*, cit.; J. Horrenberger, *L'Union Internationale des Télécommunications ou Les exigences techniques comme factor de la cooperation internationale*, Strasbourg : Memoire poir l'obtention du diplôme des Hautes Etudes Europeens, Section des sciences de l'information, Université de Strasbourg, 1976.

[8] *Convention Télégraphique Internationale de Paris 1865*.

[9] Verbaux des Séances 4eme,5eme,6eme,7eme de la Commission des délégués speciaux, in *Documents de la Conference Télégraphique Internationale de Paris*, Parigi : Union Télégraphique Internationale, 1866.

[10] V. Grossi, "Le role International de personalités suisses du XIXe siécle dans le domaine des télégraphes", *Hispo*, October 1984.

[11] S. Fari, "Technology on the wire. Technological changes in the first thirty years of the Italian telegraph experience: achievements and difficulties", in A. Giuntini (edited by), *Communication and its lines. Telegraphy in the 19th Century among economy, politics and technology*, Prato: Istituto di Studi Storici Postali, 2004.

[12] C. MATTEUCCI, *Manuale di telegrafia elettrica*, Torino: Unione Tipografico Editore, 1861

[13] R. S. CULLEY, *A Handbook of Practical Telegraphy*, London: Longmans, Green and Co, 1885.

[14] Verbaux de la 1ere Séance de la Commission del délégués speciaux, 4 mars 1865, in Documents de la Conference Telegraphique Internationale de Paris, cit., p.115-116.On the role and strength of Switerland in directing in international debate at the origins of the Bureau and the Telegraph Union see Balbi G., Fari S., Calvo S., Richeri G. (2011). *The Swiss Influence in the ITU's Decision-Making Process, 1855-76*. Paper presented at Society for the History of Technology conference, Cleveland, 3-6 November.

[15] Art. 1, *Convention Télégraphique Internationale de Vienne 1868*.

[16] *Verbaux de la 1ere Séance de la Commission de délégués speciaux, 13 juin 1868*, in *Documents de la Conference Télégraphique Internationale de Vienne*, Berna : Bureau International des Administrations Télégraphiques, 1868.

[17] ITU Archvies, Ginevra, *Correspondance du Bureau International des Administrations Télégraphiques*, Foulder 90, 1869 and Foulder 83, 1871.

[18] De la participation des femmes au service télégraphique, *Journal Télégraphique*, 2-3, 1869, pp. 9-11 ; Des pensions de retraite dans le service télégraphique*, Journal Télégraphique*, 1871-1872.

[19] *Verbaux de la Quatorzième Séance, 20 juin (2 juillet) 1875* in *Documents de la Conference Telegraphique Internationale de St Petersbourg*, Berna : Bureau International des Administrations Télégraphiques, 1875.

[20] ITU Archives, Ginevra, *Correspondance du Bureau International des Administrations Télégraphiques*, Foulder n° 132/1, 1872.

[21] ITU Archives, Ginevra, *Correspondance du Bureau International des Administrations Télégraphiques*, Foulder 33, 1873.

[22] *Verbaux de la Quatorzième Séance, 20 juin (2 juillet) 1875* in *Documents de la Conference Telegraphique Internationale de St Petersbourg*, Berna : Bureau International des Administrations Télégraphiques, 1875.

[23] P. Dunsheath, *A history of Electrical Engineering*, London: Faber and Faber, 1962.