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The role of government in the innovation process: Guglielmo Marconi and the radio.

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INTRODUCTION

This work has as its object the historical analysis of the relationship between the governments and the private actors in the development of innovation. Moreover, it is analysed the case of the radio development, carried out by its inventor Guglielmo Marconi, in relation with the role taken by the British and Italian government in this innovation process.

The aim of this work is to fill the gap between literature and history, demonstrating how many times normative theories result not linked with the reality, and consequently with what happened throughout history, creating in this way a mismatch between theory and reality.

Trying to fill this gap, I opted for a historical analysis in which no judgements or suggestions are given. I reconstructed what happened using some theories as a lens to understand why it happened, contextualizing the events in the historical period and geographical area, without taking anything for granted.

Specifically, the first chapter deals with the issue of innovation from a theoretical point of view, analysing the meaning of the word innovation and the different theories about the role of the government in the innovation process.
The different approaches used by scholars throughout history have been discussed and compared in order to understand why some of them have been abandoned in favour of others.
The case of Marconi is presented to get the reader ready about the issues that will be discussed in the following chapters and even to begin to fill the gap with the literature.

The second chapter regards the character of Guglielmo Marconi, revisiting his life and in particular the relationship that have helped him to develop his innovation. The moments, the choices and the actors involved in the development are analysed to understand why the Italian inventor decided to undertake a path rather than another.
In this chapter are also compared the two lives of Marconi, the young innovator at the

beginning and the politician later, up to his accession to the Fascist party.
It is useful to understand the mentality of the protagonist and the context in which he operated in order to be ready for the reading of the letters in the next chapter which underline, and moreover give consistency, to the research made about him.

The last chapter represents the climax of this dissertation, analysing the letters written by Marconi. In this chapter are discussed and analysed the two cases that significantly marked the radio development: the "Hill Experiment" and the "Big Thing".
Using these moments, the relationship of Marconi with the two governments that represented the main partner in the development process, the British and the Italian one, is revisited.
The analysis is enriched by some letters (kept at the Accademia Nazionale dei Lincei) exchanged between Marconi and some officials of these two governments. Using these sources, I compare the strategy of the Italian innovator with the main theories of innovation, discovering that reality is not always in accordance with literature.

CHAPTER 1

THE ROLE OF GOVERNMENT IN THE INNOVATION PROCESS

1.1 Introducing the case.

Nowadays speaking about innovation has become almost ordinary. There are magazines, TV shows, blogs and many, many people dealing with this argument. It has become clear that innovation can represent an important opportunity for the whole of society in terms of growth and development.

Governments have realised that innovation can be a source of improved wellbeing and for this reason they encourage and support innovators, both private and public, who are involved.

However, it was not always like this.

Many scholars have argued that governments should leave the duty of producing innovation to the authentic innovators in the private sector, comprising entrepreneurs and workers, to build the economy.

It was believed that the market was a self-regulating system without any need for regulation, or to be addressed, because of this inherent property. This was stated by Adam Smith with the concept of the "Invisible Hand" in the 18th century.

Karl Polanyi, two centuries later, and also John Maynard Keynes, proposed a new and different theory in which the role of the government was not just as a mere spectator but it had the responsibility of maintaining the equilibrium of the market and collaborating with the private sector in order to foster the cooperation useful for growth.

This theory has been the forerunner of the innovation policy used nowadays which allows our societies to grow very quickly and increase their wellbeing.

What I discovered during the research made to the writing of this dissertation is that

the majority of writings regard the way in which things should be done, without considering what happened in reality.

A great amount of literature regards the normative discussion, proposing different approaches according to which the governments should help the creation, and subsequently, the propagation of innovation through the research and development of knowledge.

The historian's point of view instead is a bit different. Historians study the history in order to analyse what happened over the course of time by linking practical cases with theories, without wondering why something occurred and moreover without proposing solutions for past situations.

From this perspective, the Marconi case can help a lot because of its strong relationship with the theory and the great number of available sources to reconstruct the timeline of the development of the radio.

This case highlights the usefulness of several theories, without any judgment over whether this thesis is correct and others not, while analysing the historical, political and economical situation in which the development of the radio was carried out.

1.2 What is innovation?

One of the most widely recognised definitions of 'innovation' is *"the process of translating an idea or invention into a product or service that creates value, or for which customers will pay"*. [1] In order to be considered as such, this idea has to be replicable and moreover has to satisfy a need of, at least, a certain group of people.

Today innovation is one of the most important drivers for our society because of its huge contribution to the achievement of long-term productivity, economic growth and competitive success. Firms and business in general, in fact, rely a lot on the new inventions which will be the sources of their profits in the future. [2]

Innovation in the last decades has increased its importance thanks to the presence, and moreover the propagation of a new phenomenon: globalization, particularly from the market point of view. This implies the integration of people, cultures, markets and governments in order to create a more uniform world with less inequalities and differences among persons, reducing wars and increasing opportunities for everybody.

This has been possible because innovation is not a limited and circumscribed field, but rather it is a process involving several subjects, businesses and interests; for this reason, nowadays it is one of the most important goals in many political agendas and moreover it operates as a catalyst, routing businesses, governments and universities working together. This fact amplifies the knowledges and creates the possibility of reaching the final outcome and the creation of several inventions, not only for the business world, then tied principally with the aim of profit, but even for the social one in order to have new products or services devised for the social sphere.

Sometimes these two worlds collapse in a "universe" where the interests of the first are often consistent with what is interesting for the second; this is the case of some innovations such as the telegraph, television and insulin, which made the luck of some companies improve, at the same time, the quality of the life, and their GDP, thereby allowing the population to change their standards of living, increase consumption and

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[1] Business Dictionary, Definition, http://www.businessdictionary.com/definition/innovation.html, date of referral 23 August 2016.
[2] M.A. Schilling, *Strategic Management of Technological Innovation*, New York, McGraw-Hill Education, 2013, p. 1.

so provide labour and capital demand with positive consequences for the whole economy.

Timeline of some of the most important technological innovation in the last 200 years.

1800	-	1800—Electric battery
	-	1804—Steam locomotive
	-	1807—Internal combustion engine
	-	1809—Telegraph
	-	1817—Bicycle
1820	-	1821—Dynamo
	-	1824—Braille writing system
	-	1828—Hot blast furnace
	-	1831—Electric generator
	-	1836—Five-shot revolver
1840	-	1841—Bunsen battery (voltaic cell)
	-	1842—Sulfuric ether-based anesthesia
	-	1846—Hydraulic crane
	-	1850—Petroleum refining
	-	1856—Aniline dyes
1860	-	1862—Gatling gun
	-	1867—Typewriter
	-	1876—Telephone
	-	1877—Phonograph
	-	1878—Incandescent lightbulb
1880	-	1885—Light steel skyscrapers
	-	1886—Internal combustion automobile
	-	1887—Pneumatic tire
	-	1892—Electric stove
	-	1895—X-ray machine
1900	-	1902—Air conditioner (electric)
	-	1903—Wright biplane
	-	1906—Electric vacuum cleaner
	-	1910—Electric washing machine
	-	1914—Rocket
1920	-	1921—Insulin (extracted)
	-	1927—Television
	-	1928—Penicillin
	-	1936—First programmable computer
	-	1939—Atom fission
1940	-	1942—Aqua lung
	-	1943—Nuclear reactor
	-	1947—Transistor
	-	1957—Satellite
	-	1958—Integrated circuit
1960	-	1967—Portable handheld calculator
	-	1969—ARPANET (precursor to Internet)
	-	1971—Microprocessor
	-	1973—Mobile (portable cellular) phone
	-	1976—Supercomputer
1980	-	1981—Space shuttle (reusable)
	-	1987—Disposable contact lenses
	-	1989—High-definition television
	-	1990—World Wide Web protocol
	-	1996—Wireless Internet
2000	-	2003—Map of human genome

Figure 1.1

GDP per capita.

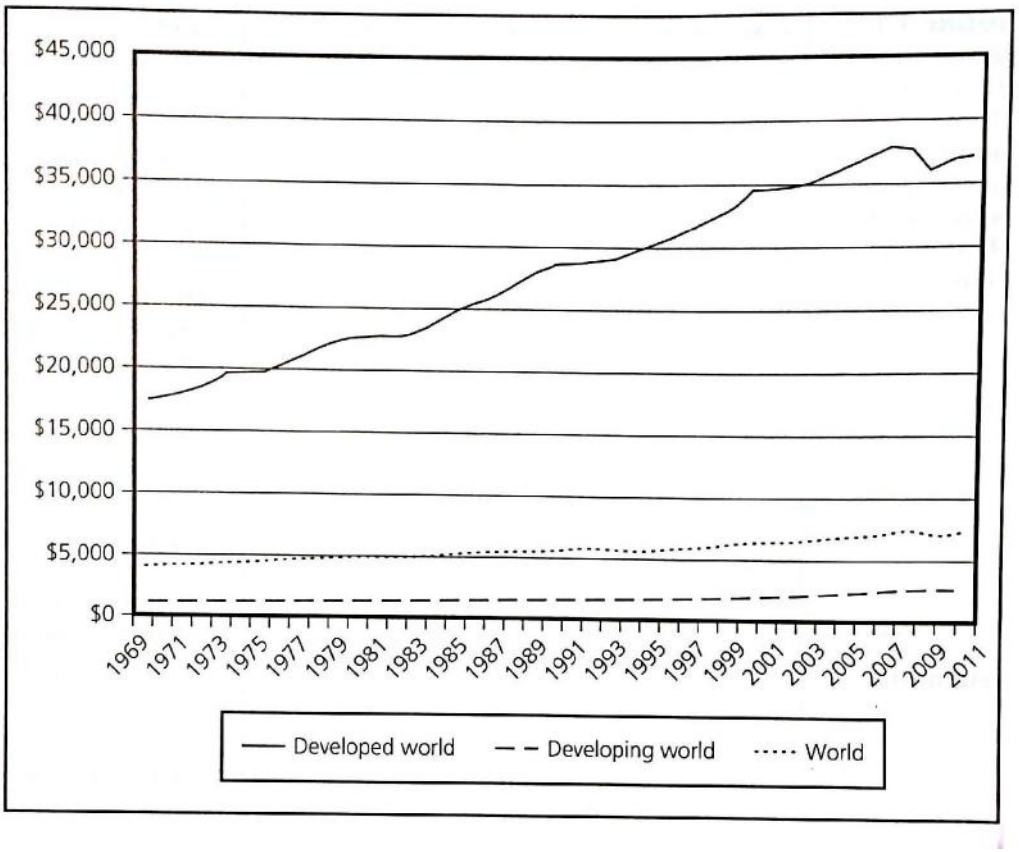

Figure 1.2

Even if innovation can improve the living standards sometimes, especially in the 20th century, these new products or services can create negative externalities; examples can be represented by the pollution generated by firms to develop new outcomes, or by the agricultural and fishing technologies which can provoke the demise of animal species, cause erosion and so on.

Despite the problems that can arise, the aim of innovation is to produce new knowledge, and then solutions, to solve some problems; the issue is that sometimes the innovator loses the purpose of his idea, without considering all the effects and consequences that particular innovation can cause.

Knowledge is the basis of all innovation and being of interest from a variety of different academic disciplines, its implementation and generation do not always follow a linear

path. The knowledge shaping the new outcomes flows rather in different directions with the result of ideas realised with both the information acquired from the customers – *market-pull strategy* – and the guidelines from the R&D departments – *market-push strategy*.

Innovation and the innovation process have been studied a lot, finding several beginnings, definitions and applications. One of the earliest scholars to deal with innovation was Schumpeter, who theorized the process leading to innovation; his theory is based on three different stages: invention, innovation and diffusion which are grounded in the linear model or market-push strategy. His contribution highlights that the more R&D investments, the more innovations will occur; this can be easily verified because if there is a consistent amount of knowledge it will be more likely that new ideas will be generated.

This theory was subject to some critiques: the main objection was that it ignored prices and other changes in economic conditions that affect the profitability of innovations. The solution proposed considers the needs highlighted by the market and consumers in order to mark the path for new inventions. The main reason is linked with the opportunities generated by changes in market demands, which influence the firm investments in order to satisfy consumer needs.

The studies on innovation theory continued to evolve and in the last century three more approaches have been added in order to understand better the change in the innovation technological phenomenon: *induced innovation, evolutionary approaches and path-dependent models*.

"The first approach emphasises the importance of changes in relative prices in driving the direction of technical change" [3]. Instead the other two are related with the importance of past decisions in the choices of today, which could represent constraints for the current strategy. There are two more concepts influencing the innovation process, *bounded rationality* and *uncertainty*: the first one refers to the inability of the decision-maker to gather and process information in a perfect way, where "perfect way" means maximising the profits. Instead the second is related to the characteristics

[3] P. Greenacre, R. Gross, J. Speirs, *Innovation Theory: A review of the literature*, London, Imperial College Centre for Energy Policy and Technology (ICEPT), 2012, p. 6.

of the world where we live. Even if it is possible to imagine the future with forecasts and probable measures so as to prevent possible situations and making the right choice, total certainty is something impossible to reach. This degree of uncertainty has a double face: it could reveal opportunities hidden at the beginning of the process but at the same time it could provoke fear in the decision-maker due to the ineptitude of facing problem-finding solutions. [4]

[4] *Ivi*, pp. 5 – 8.

1.3 The literature.

1.3.1 The inertia: technological and cultural factors.

"Technological progress depends for its success on a conducive social environment". [5] With this assumption Mokyr affirms that the social sphere, in general people, can influence the likelihood of whether an innovation will succeed or not. This fact represents a very crucial point an innovator has to take into account when he decides to implement a new project, because, even if it has been thought out properly, solving several issues, if society is not ready or not convinced, then the new idea will not succeed.

This reluctance is seen as a source of resistance and most times takes the form of non-market processes such as technicians and/or intellectuals opposing the new technology because of the presence of vested interest.

The main point regarding social influence on the innovation process is that historians, and scholars in general, have not spent lot of attention studying and analysing the reasons why some technologies succeed and others do not, and moreover why some societies are technologically successful while others are not. In order to understand technological changes, it is fundamental to analyse the forces shaping the societies and the interaction between political and technological worlds.

In doing this, Adam Smith helps us with his insight, saying that "economy is a self-organizing system" because it respects the main distinctive lines of this kind of system: it is a self-replicating way of organizing information and it changes based on various rules.

Regarding the economy, its most interesting characteristic is the resistance to change, which even if it could seem in contrast with the sentences written above relating to people's influence towards innovation, it is fundamental for the survival of the system since it allows its regular operation and the prevention of chaotic involution.

This topic is strongly related with the Darwinian evolution theory, which is seen like the natural innovation process, because of their common basis, creativity:

[5] J. Mokyr, Technological Inertia in Economic History, *The Journal of Economic History*, 52, 2 (1992), p. 325.

paraphrasing the words of Mokyr: "creativity is evolution". [6]

However, as said before resistance to change could become obvious as a problem. This is important in order to limit the most extreme effects of creativity; this is represented even in the natural selection, only the most powerful will survive and will overcome any resistance. Even if it is functional, resistance to change is not an optimal rule: many times, a positive mutation, in the natural evolution, or a positive innovation does not succeed because of this reluctance towards this newness.

The cultural evolution helps in understanding the reason why resistance provokes some damage. The first reason is related to the adoption of new ideas which will be obstructed by a high level of resistance. At the same time, there is a second and more important reason, which is not only related to the acceptance or not of the innovation, rather with the appearance of ideas. In this way, there is a creativity death, which is even worse than the resistance towards the acceptance of new ideas considering its connection with free thought.

Technological systems work in the same way, and in doing this, stability rather than chaos is needed. To develop technology some norms are required, the functioning rules, which allow knowledge transmission and the conformation to standards: the match of these two parameters helps the system to overcome the forces of inertia which normally slow down the innovation process.

Even in the technological world there are some conditions supporting the development process and, as said by Rosenberg and Birdzell [7], there are two kinds of environment: the free market economies and the centrally planned ones.

The first refers to an environment that is more likely to produce progress thanks to openness towards creativity and freedom of thought, which facilitates the knocking down of resistance to change. The latter instead is more linked to rules and bureaucratic thinking, therefore the tendency to conservatism is at the core of this system. The centralized economies are supported by the belief that routines and standards allow long run existence. Somehow this is correct considering that our societies are based on rules; at the same time, it is important to keep in mind that the

[6] *Ivi*, p. 326.
[7] *Ivi*, p. 327.

process of innovation is something free, at least at the beginning where new ideas have to develop, and standards could represent a resistance in the creativity process.

Mokyr highlights the importance of a hybrid system that allows new proposals and ideas to stand out but at the same time places obstacles in the way, in order to create a kind of Darwinian selection where only the best ideas survive. This is even connected with a cost thinking because if every new idea was implemented, there would be an incredible waste of money and resources.

The problem relating to this natural selection is the presence of uncertainty in the new projects: in fact, even overcoming the natural resistance, and therefore succeeding in the Darwinian selection, there is no certainty about the success of the new innovation in the economy. There could be several reasons why the project could not be accepted, such as lobbying to protect the interest of some groups, the inappropriate environment or timing for the product establishment or the event of some unpredictable circumstances, like economic shocks, which could modify the former situation and consequently the factors for the establishment of the new technology.

Furthermore, it is important to bear in mind the labour factor which is one of the most influencing and resisting elements in the technological field. An example can be found in the Industrial Revolution where machines replaced a great deal of work which had been done by hand, plus artisans and domestic workers, causing a high level of unemployment.

However, the advent of new technologies does not always mean a decrease in employment; it is demonstrated by economists and historians that an innovation creates as many jobs as it destroys. The issue regards the worker adjustment from one job to another which is not immediate because of the need to train people and even to create the structures necessary for the new process. Moreover, the adjustment could even include the relocation of the industry.

In all these cases, there could be temporary unemployment, with a bad effect in the short-term in order to achieve long-term benefits.

In order to prevent and to safeguard the workers during the industrial revolution period there was the birth of the labor unions, “organizations intended to represent

the collective interests of workers in negotiations with employers over wages, hours and working conditions" [8]. Even if their aim was and still is the protection of the workplaces, they soon became the opponent to this technological change and consequently a resistance player.

Yet labour claims for better wages and conditions can also be an important factor in pushing the entrepreneur to seek higher productivity through the process of innovation.

Taking into account these theories and among all these factors, historians created a list including the elements determining the likelihood of success for innovation: [9]

- The first regards the strength and will of the owner to defend the skill or equipment which represent the standard for the market, which, with the introduction of the new innovation, would be shelved. The more specific and important the skill/equipment for the owner, the greater the commitment to become an obstacle to the new invention.

- Second regards the way, and moreover the degree, to which benefits and losses are distributed among people, in particular amongst the winners and losers. Depending on the distribution of the consequences of innovation, the winners and/or losers will organize themselves into groups so as to favour or to throw up obstacles to the new entrant. These group activities could reach the aim of their inception or not due to the presence of a free rider problem or the dispersion of the people involved. Labour unions often support these activities in order to overcome the business power and the problem due to the heterogeneity of the group.

- Thirdly, the role of authority in the political economy: if the persons who administrate have some interests in the innovation, the orientation is likely to be unconservative. On the other hand, if the power is held by people with stakes

[8] Investopedia, Terms, http://www.investopedia.com/terms/l/labor-union.asp, date of referral 30 August 2016.
[9] Mokyr, *Technological Inertia in Economic History*, cit., pp. 330 – 336.

in the actual standards, the attitude will be conservative, representing resistance against the new technology.

- Finally, even the intellectuals play an important role in determining the path in the field of innovation. The difference between this and the other cases is that there are not any economic interests in maintaining the status quo, rather they choose a side caring for social and moral values. Reading the writings of these socially active intellectuals, it is possible to identify several schools of thought: one concerns the aversion towards risk, another regards the creation of negative externalities with all the economic and welfare implications.

  Even philosophy is involved: technology, and moreover innovation, is often associated with challenge for the supremacy between humans and nature, which in the last centuries has seen the first take advantage at the expense of the last. This preeminence has been possible thanks to the technological discoveries which allow humans to change the status quo manipulating, in a sense, nature. It is even for this reason that intellectuals are often against innovation: the manipulation is seen as something sinful and wrong; humans, according to the philosophers, should be the custodians of nature, not the masters.

  In addition, it is important to remember the political dimension, which highlights how technological change is often linked with social divide, foreign domination, wars and sometimes a reallocation of power, which can be seen as a threat by the person/group who holds the power.

1.3.2 The political dimension: a normative approach.

Government in this field plays a crucial role ensuring the condition for, first of all, the development of innovation, but also to reduce as much as possible the countervailing distortions, ensuring the social benefit. [10] In order to do this, it is fundamental to understand the linkages between the process of innovation and public administration.

"Innovation has long been recognized for providing benefits to society far beyond those that accrue to any particular participant in the private sector, and for being an important contributor to economic growth." [11] For this reason, the role of the government is very important because in the absence of its intervention, the private party is normally brought to take into account only their own interests, leading to a market failure, that is when society's benefits and costs are not appropriately balanced.

However, market failure is very common because of the inability to capture fully all of the profits that arise from the creation of knowledge,[12] which is the most expensive part of the innovation process. Especially nowadays, where technology increases very fast, the cost of inadequate investments is incredibly high and discourages companies from investing in knowledge which is not essential for their business.

It is in this situation that the role of the government becomes fundamental: from one side, it has the responsibility to create and to maintain an environment appropriate for the development of private sector research. On the other hand, it has to find the best way to overcome the natural inclination of private parties to consider only their own benefits and choose in which innovative activities their resources would be best employed.

In order to achieve this goal, governments began, in the 20th century, to institutionalize inventive activities so that they could have control of the knowledge and moreover the certainty to create innovation without causing damage to society, or at least attempting to avoid it. Of course, this policy brought several responsibilities and costs due to the fact that the governments had the charge of the knowledge production needed by both

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[10] D. P. Leyden, A.N. Link, *Government's Role in Innovation*, Berlin, Springer Science & Business Media, 1992, p. 2.
[11] *Ivi*, p. 1.
[12] *Ivi*, p. 2.

the private and the public sectors.

A model of technological development.

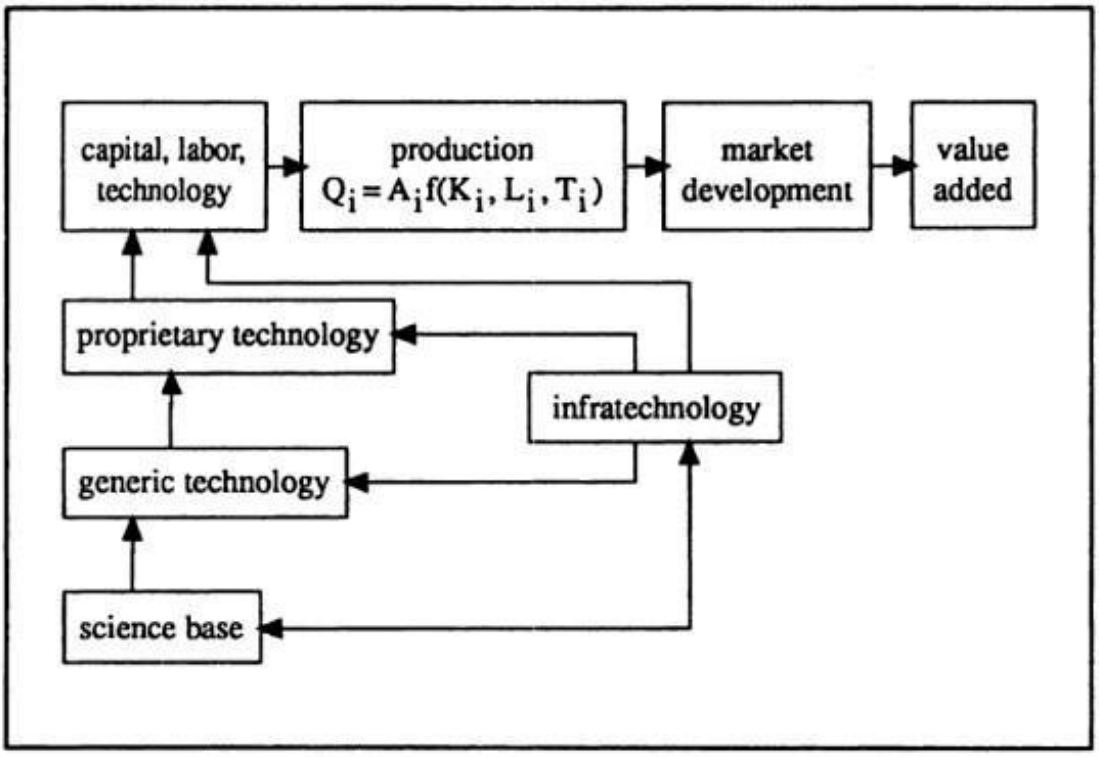

Figure 1.3

During this period, several public research laboratories started up, both governmental and academic. They were established with the aim of creating the *"science base",* the set of essential knowledge needed for the development of future innovation carried on by both private and public participants.

This new modus operandi led the US government in 1989 to finance roughly 60 percent of the total amount spent on research by the universities. The discoveries achieved by the laboratories did not necessarily lead to new product or process application, and for this reason the fund derived from the private sector was limited. However, the innovation process was prompted by private enterprises implementing this new knowledge in their products.

Effect of governmental R&D.

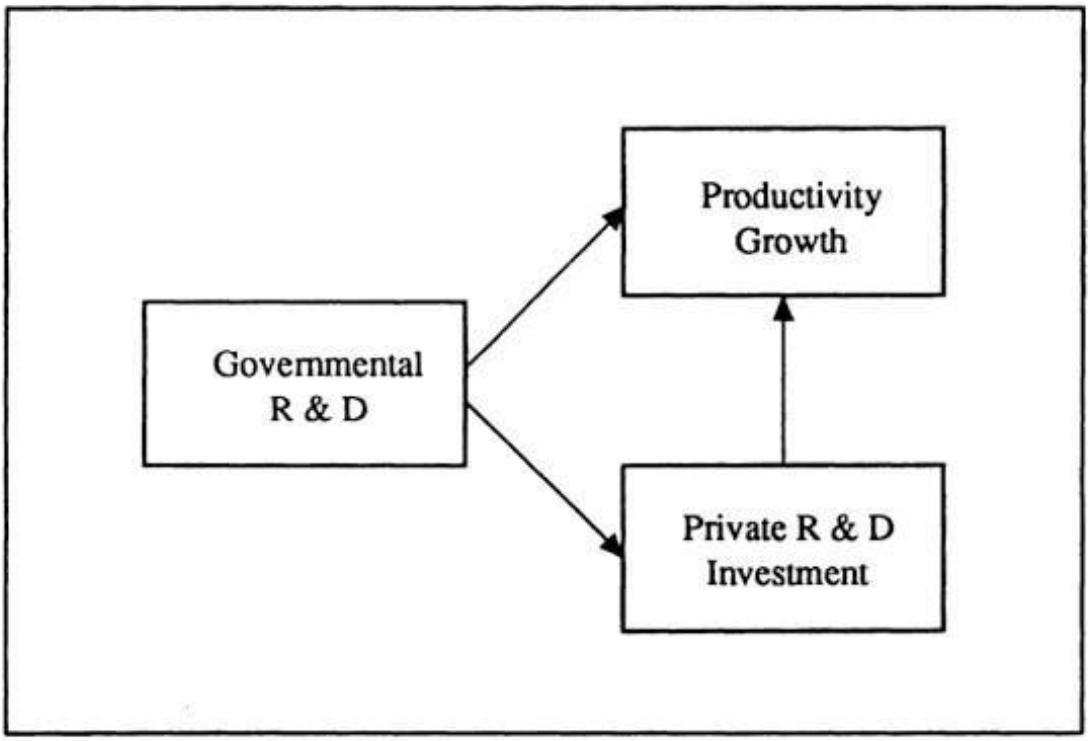

Figure 1.4

This image summarizes the effect of governmental research and development, which can be defined as the real promoter in the innovation process.

Nowadays the view has changed somewhat and the government is not seen as the "knowledge creator" but as an innovation stimulator, with the duty of creating an environment that facilitates the private sector prosperity.

The UK Department for Business, Innovation and Skills together with HM Treasury said in relation to a growth review that the government's role is to "provide the conditions for private sector growth and investment" [13], limiting excessive regulation and rigidity of formal rules (*red tape idiom*), bureaucracy allowing the private parties to invest, innovate and employ.

However, at the beginning of the 20th century the role of government was extremely

[13] M. Mazzucato, *The Entrepreneurial State*, London, Demos, 2011, p. 29.

restricted. The decision made to opt for nationalization of development was not very successful because the difficulty of creating their own growth was recognised. This growth can only happen when business leaders, entrepreneurs, individual workers and governments work together, as all these parties constitute the whole economy.

What the government can really do is "provide the conditions for success to promote a new economic dynamism — harnessing our economic strengths, removing the barriers which prevent markets from supporting enterprise, and putting the private sector first when making decisions on tax, regulation and spending". [14]

Some "progressive academics" argued about the State role, which is limited to the "creation of the conditions for innovation... accepting that the state will have a vital role in ensuring that market conditions reach the 'just right' balance which will spur innovation and that adequate investment is available for innovators". [15]

This statement is in contrast with the Adam Smith notion about *"Invisible Hand"* which asserted the presence of a self-regulatory property in the market, where "the state's role being limited to that of creating basic infrastructure (schools, hospitals, motorways) and making sure that private property, and other institutions such as 'trust', were nurtured and protected" [16].

Two centuries later, Karl Polanyi showed the essence of the myth of Smith's assumption, highlighting the central role of the State in order to maintain the equilibrium and order of the market, ensuring growth and preventing financial fluctuations. "The road to the free market was opened and kept open by an enormous increase in continuous, centrally organized and controlled interventionism". [17]

Even John Maynard Keynes supported the Polanyi theory, declaring that "markets need constant regulation because of the inherent instability of capitalism where private business investment (one of the four categories of spending in GDP) is extremely

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[14] BIS and HM Treasury, *The Path to Strong, Sustainable and Balanced Growth*, London, Department for Business, Innovation and Skills and HM Treasury, 2010, p. 3.
[15] A. Lent, M. Lockwood, Creative destruction: placing innovation at the heart of progressive economics, London, *IPPR discussion paper*, 2010, p. 7.
[16] Mazzucato, *The Entrepreneurial State*, cit., p. 30.
[17] K. Polanyi, *The Great Transformation: the political and economic origins of our time*, Boston, Beacon Press Boston, 2001, p. 146.

volatile". [18]

These studies focused on the role of the State as a promoter and moderator in order to create a collaboration between private and public organizations, so as to interact and to spread knowledge in the whole economy in a way that assists growth and innovation to be possible.

In order to do it, economists realized that conventional measures of capital and labour inputs were not enough to increase growth, and that, moreover, innovation could play a crucial role in economic growth. This new theory – *new growth theory* – led investments in the research and development sector and in the human capital formation.

Governments began to take care of this new factor – innovation – through significant investments in R&D and human capital formation and more rigid policies, focusing on *innovation-led growth*, in order to protect the knowledge. This modus operandi which began in the 80s up to today, as represented by the European Union's Lisbon Agenda, which set a target for the R&D investment equal to 3 percent of the EU's GDP, along with policies that try to encourage the flow of knowledge between universities and business. [19]

However, R&D alone is not enough and for this reason the national system of innovation has been implemented, "the network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies" [20] or "the elements and relationships which interact in the production, diffusion and use of new, and economically useful, knowledge... and are either located within or rooted inside the borders of a nation State". [21]

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[18] Mazzucato, *The Entrepreneurial State*, cit., p. 30.
[19] *Ivi*, p. 35.
European Commission, *Europe 2020: A strategy for smart, sustainable and inclusive growth*, 2010, http://ec.europa.eu/europe2020/index_en.htm, date of referral 19 September 2016.
DIUS, Innovation Nation, *From Funding Gaps to in Markets: UK government support for early-stage venture capital*, London, Nesta, 2009, http://www.nesta.org.uk/sites/default/files/from_funding_gaps_to_thin_markets.pdf, date of referral 19 September 2016.
[20] *Ivi*, p. 65.
C. Freeman, The "national system of innovation" in historical perspective, *Cambridge Journal of Economics*, 19, 1 (1995), pp. 5 – 24.
[21] *Ibidem.*

The aim of the programme was not related to the amount of knowledge created but with the distribution of it, and so the circulation, through the economy. In this model, an R&D system is not at the core of the knowledge creation process because other elements such as education, training, design and quality control come into play.

The new model can be better illustrated comparing the Japanese case with the Russian one, where in the first there was a more horizontal structure among all the parties involved in the innovation process – government, university and business – allowing the knowledge circulation to flow, while in the latter were present several separations among involved parties and sectors.

"In the 1970s Japan was spending 2.5 per cent of its GDP on R&D while the Soviet Union was spending more than 4 per cent. Yet Japan eventually grew much faster than the Soviet Union because the R&D was spread across a wider variety of sectors, not just military and space as in the Soviet Union. In Japan, there was a strong integration of R&D, production and import of technology at the enterprise level, whereas in the Soviet Union there was separation. Crucially, the Soviet Union did not have, or permit, business enterprises that could commercialize the knowledge developed by the state". [22]

It is fair to say that even the US spent and currently spends huge amounts of money in the military and space sector. The difference with the Soviet Union, and why it was not able to grow as quickly as Japan, is in regard to the internal organization of the knowledge. In the Soviet Union knowledge and resources were used principally for the two sectors named above and there was a lack of integration between different fields. What made the fortunes of Japan and the US was the creation of connections between technology and its commercial applications which allowed knowledge to spread among different individuals and organizations, reducing costs and time.

B. Å. Lundvall, *National innovation systems: towards a theory of innovation and interactive learning*, London, Pinter Publishers, 1992.
[22] *Ivi*, p. 67.

Contrasting national systems of innovation: Japan and the URSS in the 1970s.

Japan	USSR
High gross domestic expenditure on R&D (GERD)/GNP ratio (2.5%)	Very high GERD/GNP ratio (c 4%)
Very low proportion of military or space R&D (<2% of R&D)	Extremely high proportion of military or space R&D (>70% of R&D)
High proportion of total R&D at enterprise level and company-financed (approx 67%)	Low proportion of total R&D at enterprise level and company-financed (<10%)
Strong integration of R&D, production and import of technology ex enterprise level	Separation of R&D, production and import of technology and weak institutional linkages
Strong user–producer and subcontractor network linkages	Weak or non-existent linkages between marketing, production and procurement
Strong incentives to innovate at enterprise level involving management and workforce	Some incentives to innovate made increasingly strong in 1960s and 1970s but offset by other negative disincentives affecting management and workforce
Intensive experience of competition in international markets	Relatively weak exposure to international competition except in arms race

Figure 1.5

This result can be achieved only with a substantial presence of the State, which has the duty to act as the major player inside the system of innovation, behaving as the catalyst for development and change, and even having the nous to channel the network towards purposes useful for both State and society. An example can be represented by the military sector which, at least in the developed countries, has an important role in the economic growth and development.

One of the countries most exploiting the engagement of its military sector towards innovation is the USA, which applied the past decade's experiences to solutions in wider industrial policy. In this context, the role of the government changed completely, no longer funding basic science, becoming a player with responsibilities "about targeting resourcing in specific areas and directions, opening new windows of opportunities, brokering the interactions between public and private agents involved

in technological development, and facilitating commercialization". [23]

There are different theories regarding the most significant period for innovation development: some argue that it has been the Roosevelt's New Deal, while others claim it was during the period after the Second World War. Certainly, both periods took on great importance for the advancement in the field of innovation and it is quite complicated to assign the primacy even because, in my opinion, the first has been the precursor of the second, and maybe this would not have been possible without the former, neither the New Deal nor past war policies would have produced innovation without the other.

What is certain is that those years were a success. An example of this new government modus operandi can be illustrated by the commitment undertaken by the US Pentagon with other national security agencies, like National Aeronautics and Space Agency (NASA), which led to the development of several technologies and products then used for civil issues. The effort generated by public and private collaboration led to the development of computers, jet planes, nuclear energy, lasers and biotechnology which represented the reason why the military sector could be the driver for the development of civil innovation.

Even if the US represents the most advanced country and is a major example in terms of development, it has not been the only country changing the way of creating innovation. In fact, in that period, almost all of the most developed countries began a new development path which led to an increase in their knowledge and capabilities with great consequences in the military sector and, successively, public well-being.

Other countries like Japan and United Kingdom faced the same transformation as the US, even if in different ways. What is the common factor?

There is one factor that allowed this huge development, R&D, not from the knowledge creation point of view but from the knowledge circulation, which is considered the real

[23] *Ivi*, p. 76.
F. Block, Swimming against the current: the rise of a hidden developmental State in the US, *Politics and Society*, 36, 2 (2008), p. 8.
E. R. H. Fuchs, Rethinking the role of the state in technology development: DARPA and the case for embedded network governance, *Research Policy*, 39, 2010, p. 8.

value added for the development and progress of a country.

It is not an easy task; some countries have a propensity for it while others less and history shows it, Germany earlier and the US later are the two main examples. It is not a linear process and moreover it cannot be forecasted according to Freeman. [24]

There is a great amount of fortuity in the steps between basic science, R&D, first application and the spread of innovation; moreover, the innovation network is characterized by heterogeneity and 'multiple equilibria' which cannot be controlled with the elements of neoclassical economics.

In this context, there is not a predominant factor, as it normally happens in the linear system. Several causes are equally important for the achievement of success.

Furthermore, this approach becomes useful for the understanding of the ascent and fall of several World Powers throughout history: Germany during the 19th century, US in the 20th century and Japan in the seventies reflect this criterion. All these countries, although they became economic powers for different reasons, pledged strong attention to the development of innovation system through the creation of sophisticated education system, especially of the technical one. The State instead of focusing on the increment of the R&D expenditure, and therefore on the R&D creation, decided to establish a network with the aim of spreading knowledge in order to prompt innovation and develop new technologies.

It is fair to say that even the historical period helped the propagation of this new approach: the Arms Race and the Space Race were the main thrusters for the development of technological innovation with the aim of overcoming the other countries in order to be the first.

Even if the aim was not always for the greater good, or at least public, this way of doing sparked a countless number of technologies from which people took many advantages.

[24] M. Mazzucato, *Lo stato innovatore*, Bari, Gius. Laterza & Figli Spa, 2014, p. 55.

1.4 Innovation policy.

"One of the core messages of this pamphlet is that the history of technological change suggests that the key role of government is not about fixing market failures, but rather about actively creating the market for the new technologies by envisioning the opportunity space and allowing the right network of private and public actors to meet in order for radical innovation to occur. The role of government has, in this sense, been more about fixing "network failures" than about "market failure". It has also been about preventing "opportunity failures" – government's willingness to think big and take risks has created new opportunities and markets, whereas the private sector has shied away because of the long-time horizons and the high failure rates." [25]

Based on this model, the US principally set up its economic policy assuming the *"entrepreneurial risk"* in order to encourage the development and moreover the innovation. It has not been an easy process, especially because of the original juxtaposition between two different schools of political thought: from one side the interventionist policy fostered by Alexander Hamilton and in the other side Thomas Jefferson with the maxim "that government is best which governs least".

As time went by, the first one took over the second with regard to the economic policy, allowing the creation of the system used nowadays which led to the development of innovation inside the country. Some examples are the DARPA programme, the SBIR (Small Business Innovation Research) program, the orphan drugs law and the NNI (Nanotechnology Initiative) program.

The common denominator in all these cases is the proactive approach used by the State, which resulted in fundamental market creation and the encouragement of innovation. [26]

The main indication given from this approach is that the US, in addition to being an entrepreneurial society with the aptitude to establish and enlarge a business, is a country where the State plays an entrepreneurial role, taking on the burdens in order to realize new innovation investments moreover in new areas. The US provides initial financing when venture capitals are not ready to do it due to the risk, supporting

[25] Mazzucato, *The Entrepreneurial State*, cit., p. 91.
[26] Mazzucato, *Lo stato innovatore*, cit., p. 103.

innovation activities that would not otherwise have been realized.

What seems clear is that the main condition for the realization and the spread of innovation is the presence of a strongly intertwined economy in order to allow knowledge-share and expansion. The State assumes the role of catalyst for change, the spark which lights the fire.

Around the growth driven by innovation several myths are born, founded on wrong prerequisites regarding the key factors of innovation. I am going to enumerate them in order to clarify their context. [27]

- *Innovation depends on R&D:* economic studies give lot of attention to R&D, taking for granted the existence of a bond between innovation and R&D, and between innovation and economic growth. Several studies demonstrate that R&D, without all the complementary resources needed for the growth, can even have a negative effect on growth. It becomes fundamental to identify which are the specific conditions needed, so that the expenses in R&D produce positive growth effects.

- *Small is beautiful:* the SMEs are not necessarily the right model in order to guarantee growth and innovation, because the impact of the last on growth is different for different types of firms. SMEs have the chance to create several jobs but at the same time this kind of firm is the most exposed to the risk of failure, destroying a great number of jobs. Based on the result of the studies conducted on the relations between size and growth, it has been discovered that it is high growth rather than size that matters, and that government has to work in order to provide the conditions needed for the growth of innovation.

- *Venture capital loves risk:* this is a kind of private equity focused on early stage, high potential growth companies. Its role is to fill a void of funding for new companies that often have problems in raising credit from traditional financial institutions, but which aspire to enter in a new or already existing market.

[27] *Ivi*, chapter 2.

Risk of loss for different stages at which investments are made (%).

Point at which investment made	Risk of loss
Seed stage	66.2%
Start-up stage	53.0%
Second stage	33.7%
Third stage	20.1%
Bridge or pre-public stage	20.9%

Figure 1.6

Stages of venture capital investment.

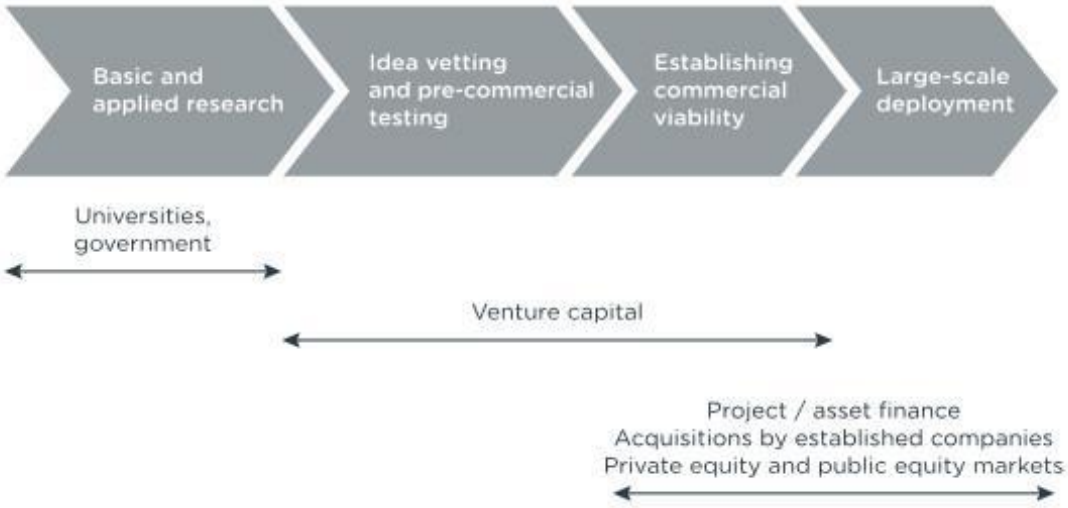


Figure 1.7

What can be seen from the picture is the moment in which venture capital should come onto the scene, which is the most problematic due to the risk in the translation of the invention from the idea to the reality. Even if there is the belief that venture capital is willing to bear the risk, it is demonstrated – even in the figure – that it is normally the State that bears that risk.

- *We are living in a knowledge economy:* quite often the role of patents is subject to misunderstanding; in fact, the number of patents is considered to be strongly related to the growth of innovation. This is not true because the increase in the number of patents is mainly due to the legislative changes or to strategic reasons tied to aims of commercialization. An example could be the IT and telecommunication sector where the companies moved from a patent use related to the development and protection of their own technologies, to the share of licenses with the aim of including technologies produced by others. This evolution led to a decrease in R&D expenditures, and consequently a decrease in owned knowledge and an increase in patent production.

- *Europe problem:* the commercialization. In the court of public opinion, the main disadvantage of Europe versus the US lies in the limited capabilities to commercialize innovation due to the difficulties in the transfer of knowledge. Actually, this is not the real problem, which is rather the reduced knowledge stock compared to the American one. The reason is attributable to the great differences between State and the private sector in the R&D expenditures. The solution could be to prompt research within a greater number of institutions in order to create the interconnected network fundamental to the increase of innovation and growth.

- *Private investments are inversely proportional to the degree of bureaucracy and taxes:* it is taken for granted that a reduction in taxes and bureaucracy can stimulate private expenditure in R&D. Certainly, tax relief can help in the creation of knowledge and so innovation but there is a bug in the system: the beneficiary companies have not demonstrated whether or not the benefits from reduced taxation have generated knowledge that would not have been possible

without it. An example could be illustrated by the tax reduction introduced in the 80s which did not produce any increase in innovation investment. It is fair to say that the reduction in taxes and bureaucracy can encourage the investments but the State does not have to focus its attention only on this matter, rather on the creation of public institutions for the generation of innovation and knowledge in order to create the interconnected network for the propagation of the information.

All these myths, together with the widespread idea that the State has a restricted role in the generation of entrepreneurship, innovation and growth, are the main problems that governments have to face constantly. Wiping out this concept represents the real obstacle for the governments in order to achieve that interconnected network within the State, indispensable for achievement in the innovation field.

In this context, the case of Marconi with his radio development fits in perfectly, representing the perfect case history for this new approach.

In fact, after the first experiments conducted in his homemade laboratory, he almost immediately received the support of the British government in the person of William Henry Preece, the General Post Office chief engineer, who saw the potential of that system, providing all the necessary support.

Even the Italian government was a great help to Marconi, as it allowed him to carry out other tests in order to further develop his system, ensuring its worldwide viability.

Without any public financing, the innovation of the radio could not have seen daylight and would have represented a great loss for humanity.

This case is very useful because it highlights the limits of the previous theories underlining the benefits of this new approach used by governments and including in its history several myths described above. Obviously, the approach is not the best one, however it was the best in those geographical and historical conditions, allowing and supporting the growth and the birth of innovation like the radio system.

1.5 Examples.

In order to mainly clarify the role that the State exerted in promoting innovation, I am going to illustrate some well-known examples where the role of the government has been fundamental to their success.

1.5.1 Apple case. [28]

Born in 1976 in Cupertino, California, this company now is one of the most successful and popular brands in the world. The ability of its founder – Steve Jobs – to maintain the mentality of a start-up and to seize and integrate the already developed (by others) technologies, allowed the company to gain lot of success, becoming a symbol for customers and a reference point for competitors. [29]

Apple has succeeded in revolutionizing the world of electronics, producing more and more sophisticated and easy-to-handle products, exploring new frontiers until then uncharted. iPod, iPhone and iPad are the examples.

Even if Apple appears to be the company which brought to light new technologies, this is not completely true, in fact the majority of them were already invented and used by the State and the Army. The main abilities of Apple have been principally three: [30]

- The identification of emerging technologies with huge potential;
- The integration of these technologies using advanced engineering competences;
- The vision, giving priority to the development of products in order to maximize user satisfaction.

[28] On this, see: O. W. Linzmayer, *Apple Confidential 2.0: The Definitive History of the World's Most Colorful Company*, San Francisco, No Starch Press, 2004.
[29] Macworld, History of Apple, 1976-2016, http://www.macworld.co.uk/feature/apple/history-of-apple-steve-jobs-what-happened-mac-computer-3606104/, date of referral 3 September 2016.
[30] Mazzucato, *Lo stato innovatore*, cit., p. 131.

The Apple products origin.

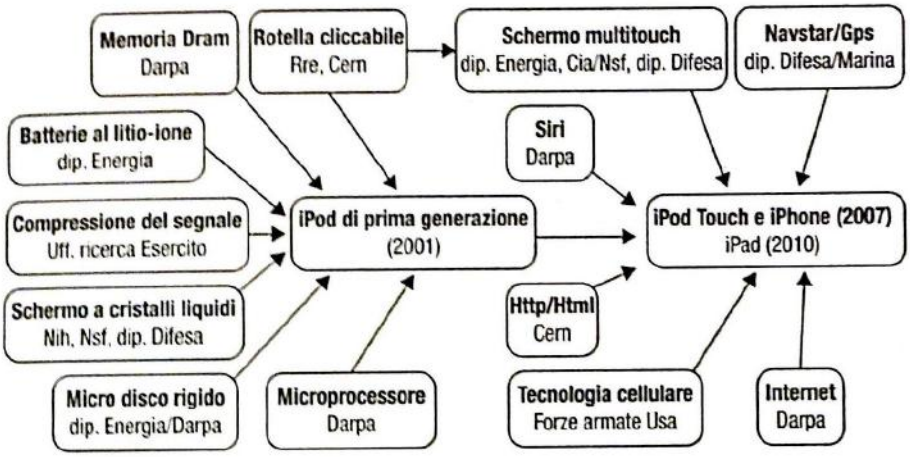


Figure 1.8

This figure shows the origin of the technologies which are the basis for all the Apple products. It is very interesting to highlight that none of them comes from the company's R&D department and justifies the discrepancy in the research investments with other companies.

R&D/turnover.

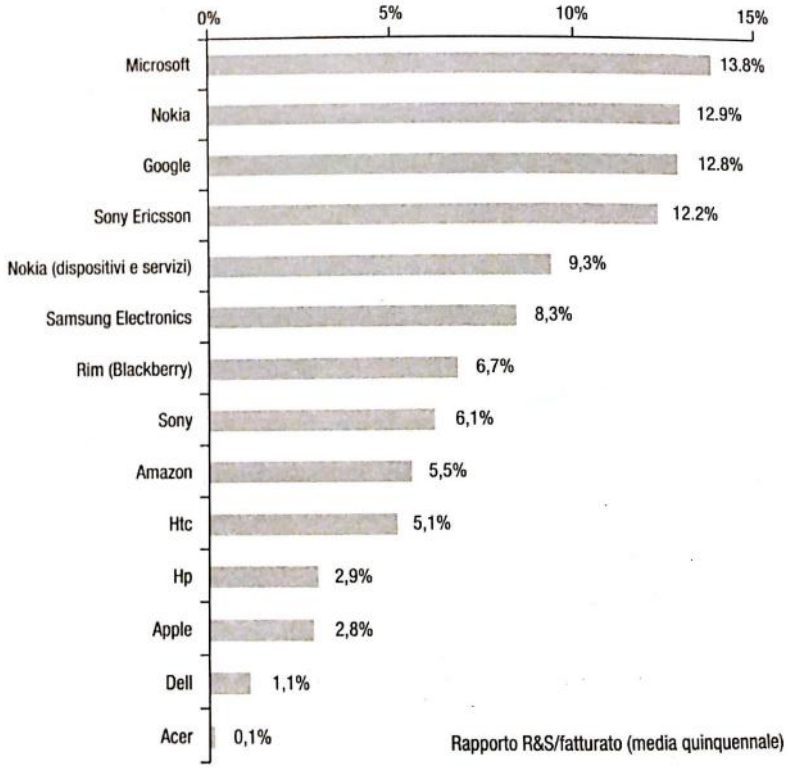


Figure 1.9

This has been possible thanks to the organizational structure sought by Steve Jobs, which is the same used in the start-up: the engineering ability within the company is not focused on the development of new technologies, but rather on the ability to integrate technologies and components in a new innovative architecture.

The State, furthermore, played an incredible role in the Apple establishment not only related to technology development – entirely borne by the government – but even with investments during the first stages of the company creation – acting as a venture capitalist – and with fiscal, commercial and technological policies in support of American companies in order to enable them to develop and to back the efforts needed for the fulfilment of their initial goals.

Apple represents a perfect example in which the State made the difference, taking the risk and helping to drive the company towards new boundaries in order to increase the public welfare.

1.5.2 The green economy. [31]

The green economy is defined as an economy whose aim is the sustainable development in order to avoid, or at least to reduce, environmental risks. To make this happen is a fundamental role of States which are the first promoters in this change which requires action across all sectors; economic, technological and environmental.

The green economy can be seen as the situation where "environmental, economic and social policies and innovations enable society to use resources efficiently – enhancing human well-being in an inclusive manner, while maintaining the natural systems that sustain us". [32]

The green economy.

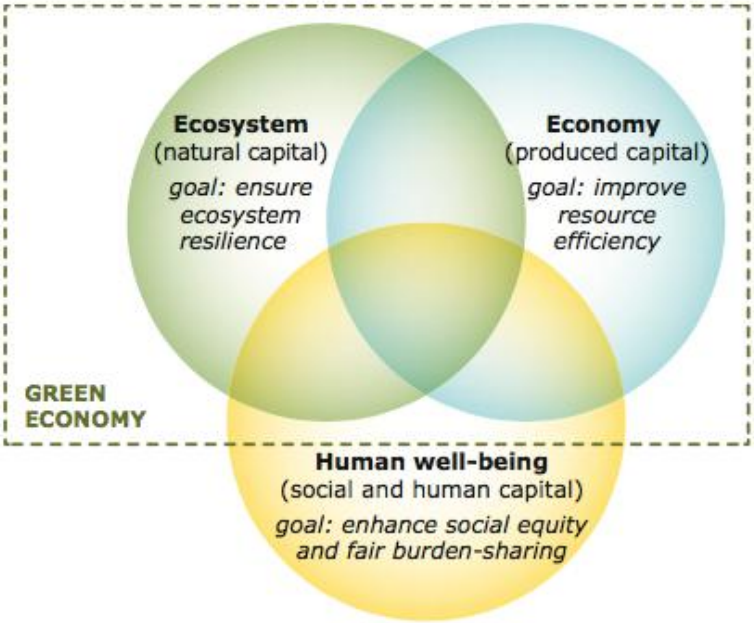


Figure 1.10

This new economy plan seems to be an ambitious one because, despite the Apple case

[31] On this, see: European Environment Agency, Towards a green economy in Europe, EU environmental policy targets and objectives 2010-2050, Copenhagen, *EEA Report*, 8 (2013).
[32] European Environment Agency, Towards a green economy in Europe, EU environmental policy targets and objectives 2010-2050, Copenhagen, *EEA Report*, 8 (2013), p. 5.

where the State fostered a new global infrastructure, the main government task is to transform an already existing architecture – the energy one – on which our society is based. In order to do this, and so encouraging the emergence of green technologies and businesses, the government has to deliver policies oriented for both supply and demand because of their strong influence on the functioning of the market and of private investments.

These policies become fundamental in jumpstarting the green economy because from one side they can stimulate the path of technological development needed for the support of the solution like renewable energy, zero-emissions, etc. and on the other hand they can support and promote the new economy through grants, subsidies, loans and other monetary benefits in favour of specific energetic technologies, privileged energetic charging systems, research contracts, and so on.

The integration of these policies allows the market to have the chance to create solutions to safeguard the environment, so that the way is changed in which society provides resources in order to maintain the natural system that sustains us.

The main question related to this state support regards the duration of these measures. Unfortunately, there is not a correct answer because the situations, the market, the technologies and the players involved differ every time. The answer given by the scholars regards the comparative advantages. Therefore, the government's endeavour has to last until the advantage of actual technologies, in terms of monetary cost, will not be lost. [33]

[33] Mazzucato, *Lo stato innovatore*, cit., pp. 159 – 162.

The two cases described above, even if the results of the State's approach are the same, differ in two characteristics:

- In the first one, there was the creation of a new market architecture and so the need to find the right trade-off between demand and supply, while in the second one the market already existed and the aim was its transformation in order to achieve a better standard of living which included all the sectors together;
- In the first one the State was the main developer of new technologies while in the second one its role was more marginal, although fundamental, because it assumed the role of the promoter and provided incentive for the others.

These two cases allow us to better comprehend the ways in which the State can, and has to, operate; to help me to understand the difficulties and the risks of an effort like this and to appreciate that most the work of our States is not always acknowledged.

1.6 The contribution of Marconi case.

In the next chapters I will propose a deeper analysis of the radio case, highlighting the relationships with the public sectors in a historical way, clarifying the reason why this innovation history represents the perfect case to fill the gap between theory and what happened in reality.

I hope this dissertation can help one to interpret the theory in a more efficient way, keeping in mind what theory says and comparing it to history. The main difference with other studies conducted in this case, and therefore what makes this dissertation worthwhile, regards the presence of original sources which helped me to reconstruct the history of the radio development in its complexity.

LIST OF FIGURES

- **Figure 1.7**

Stages of venture capital investment.

M. Mazzucato, The Entrepreneurial State, London, Demos, 2011, p. 40.

S. Ghosh, R. Nanda, Venture capital investment in the cleantech sector, Cambridge (MA), *Harvard Business School Working Paper*, 11-020, 2010, p. 6, http://www.hbs.edu/faculty/Publication%20Files/11-020.pdf, date of referral 23 August 2016.

- **Figure 1.8**

The Apple products origin.

M. Mazzucato, Lo stato innovatore, Bari, Gius. Laterza & Figli Spa, 2014, p. 155.

- **Figure 1.9**

R&D/turnover.

M. Mazzucato, Lo stato innovatore, Bari, Gius. Laterza & Figli Spa, 2014, p. 130.

- **Figure 1.10**

The green economy.

European Environment Agency, Towards a green economy in Europe, EU environmental policy targets and objectives 2010-2050, Copenhagen, *EEA Report*, 8 (2013), p. 5.

CHAPTER 2

MARCONI: INNOVATOR, PATRIOT AND FASCIST

"In the public mind, Mr. Marconi and wireless telegraphy are pretty nearly one; he is all of it. And for this there is some reason. Marconi was the first in the field, the first to send a wireless message several miles, the first to reach a hundred miles, and the first to cross the sea. He has had the lead, and he has it now. And this, in the face of a perfect host of competitors, is a big achievement for a young man still under thirty. He deserves all the fame he has won." [34]

As declared in Harper's Weekly, "the oldest general-interest monthly in America, whose aim was exploring the issues that drive the American national conversation, through long-form narrative journalism and essays" [35], Guglielmo Marconi is widely considered the father, and moreover the inventor, of the radio, the most important innovation of the early 20th century which allowed us to connect to the world as it had never been done before. Furthermore, this new technology would be the base for the majority of the following innovation thanks to the discovery of the radio waves.

Some characteristics of the inventor created lot of curiosity: Marconi was not like the other researchers and, for this reason, many colleagues tried to discredit his invention.

[34] United States Early Radio History, http://earlyradiohistory.us/1903wir.htm, date of referral 10 July 2016.
[35] Harper's Magazine, History, http://harpers.org/history/, date of referral 24 July 2016.

2.1 Myth origin.

Guglielmo Marconi was born on April 25, 1874 in Bologna. His father, Giuseppe, a wealthy landowner, married an Irish singer Annie Jameson, who came to Bologna in order to study singing.

Marconi, with an independent soul, persistency and obstinate will, inherited several characteristics from his parents, who educated their young son in a dynamic and open way, aspects of which will later characterise his relationships and life [36].

A young Guglielmo Marconi.

Figure 2.1

[36] B. Valotti, G. Dalle Donne, *Marconi, Il ragazzo del wireless*, Milano, Ulrico Hoepli Editore Spa, 2015, p. 7.

His childhood is typified by continuously moving between Italy and England, where Marconi had many relatives who would be highly important initially for the development of his discoveries and latterly for the formation of his company.

Let's take a step back in order to better understand the path which led him to invent the radio. One intriguing aspect about Marconi is his education because he did not follow a "normal" path and moreover he never got a diploma. In fact, from his earliest years, his mother took care of his education. Marconi started to attend the National Institute in Livorno where he discovered his passion for the sea and for electricity; passions for which he began his own path of education through private lectures. His first teacher was Giotto Bizzarrini who, at the request of Giuseppe Marconi, instructed Guglielmo on scientific subjects. In the same period Marconi, thanks to his mother's connection, knew Vincenzo Rosa, professor of physics at the Livorno high school, with whom he began to examine the subject in depth. More than lessons, their lectures were conversations which covered scientific topics about which Marconi had an interest.

Bizzarrini, in a letter to Umberto di Marco said: "Guglielmo dimostrava una passione istintiva per lo studio delle applicazioni elettriche e una mentalità eccezionalmente portata alla specializzazione scientifica" [37]. It was 1892 and Marconi was laying the groundwork of his knowledge for the innovation of the radio.

[37] *Ivi*, p. 9.

Marconi's notes.

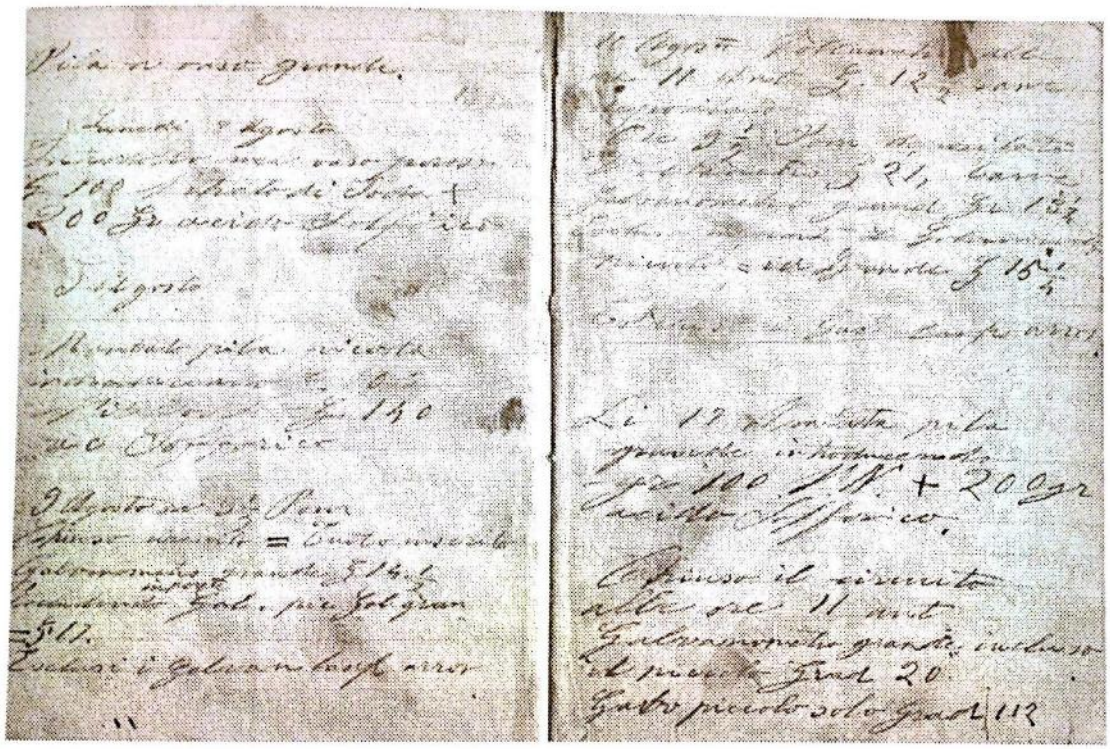


Figure 2.2

Another important figure in his education was Augusto Righi, one of the most influential professors in the field of electromagnetic waves and an academic at the university of Bologna, who gave some suggestions about Marconi's studies and experiments. He was wrongly considered his master but, as confirmed by himself and Marconi, their relationship was merely educational. Marconi learnt a lot about Righi's experiments which would be fundamental for his future invention.

This reconstruction was possible thanks to the latest Marconi letter referring to and explaining his relationship with professor Righi. This letter, together with all the other artifacts, allows us to understand more fully how the idea for the radio innovation came up: interests, different lectures, social context and a series of right contacts with important personae, helped the emergence of the idea for the radio in his mind.
With these discoveries, it is possible to describe the character of the real Marconi, far away from the myth that he was self-educated and whose genius would be arrived at as if by a miracle.

This interpretation has been even confirmed by Marconi himself during his speech on the occasion of the Nobel Prize conference in 1909: "Nel tracciare brevemente la storia del mio contributo alla realizzazione della radiotelegrafia, debbo dire che non ho mai studiato in modo regolare la Fisica e l'Elettronica, per quanto fin da ragazzo abbia nutrito il più vivo interesse per questi argomenti. Ho tuttavia seguito un corso di conferenze sulla Fisica tenuto dal compianto prof. Rosa a Livorno e posso asserire di essermi tenuto diligentemente al corrente di tutte le pubblicazioni di quel tempo relative ad argomenti scientifici comprendenti lavori di Hertz, Branly e Righi". [38]

[38] *Ivi*, p. 15.

2.2 The first experiment.

"What kind of boy were you?" I asked. "Interested in science?"

"Oh, tremendously! I commenced experimenting when I was seven. I made my first wireless experiment when I was nineteen."

New York Tribune interview.

PART II. EIGHT PAGES.

New-York Tribune.

MISCELLANY AND ART.

NEW-YORK, SUNDAY, APRIL 14, 1912.

Kate Carew, Attuned to Wireless Waves, Gets Marconi's Message

Inventor Says Power Will Some Day Be Transmitted by Wireless, and Telephone Wires Will Be Abolished; He Talks, Too, About His New Inventions, Including a Remarkable Compass.

THE INVENTOR GAVE ME A WIRELESS SIGNAL TO CONTINUE.

SOME OF THE FIRST THINGS A SCIENTIFIC MAN HAS TO HAVE IS PATIENCE.

"YOU WILL SEND OUT A WAVE OR TWO AND SOON THE SOMEBODY WILL APPEAR."

Figure 2.3

"Did you dream of the wireless from the beginning?"
"No; I don't think I did. I had in mind always the idea of bringing countries closer in touch with each other, uniting remote spots and centres of life, but it was all so vague. As nearly as I can put that far-off ambition into words, it seemed to be that I wanted to engage in some form of scientific work that would keep me travelling". [39]

In this interview granted to Kate Carew for the New York Tribune in the 1912, his philosophy regarding his invention of the wireless is summed up and moreover about the life of Marconi himself.

In 1894, while vacationing in the Biella hills and stimulated by Oliver Joseph Lodge reading about Hertz' experiments, Marconi came up with the idea for the wireless: "Nell'estate del 1894, dall'alta montagna di Oropa, contemplando il Biellese pensai che l'uomo potesse trovare nello spazio nuove energie, nuove risorse, nuovi mezzi di comunicazione". [40]

Coming back to his house in Pontecchio, he began to experiment with the transmission of signals based on electromagnetic waves; initially the signals were sent and received in-house but soon the testing increased considerably, so much so that he was able to transmit outside, reaching the garden.
It is important to mention the role of his parents, who supported Marconi both morally and economically, in particular his father Giuseppe, who would be his lifelong landmark.

If 1894 could be seen as the moment in which the idea for the wireless was born, 1895 represents the year of the birth of the radio. Indeed, during that summer Marconi discovered the relationship between air and ground, precisely connecting one of the oscillator spheres to the ground and pointing the other towards the sky: raising the second sphere, the signal could be received far away. This discovery was fundamental for the birth of the radio because it demonstrated the accuracy of his studies.

[39] K. Carew, *Attuned to Wireless Waves, Gets Marconi's Message*, New York Tribune, 14 April 1912, p. 17.
[40] Radio Marconi, Marconi, http://www.radiomarconi.com/marconi/gm_docum.html, date of referral 3 July 2016.

Furthermore, this relationship has proven to be essential, even for other applications we are using nowadays such as television.

The first Marconi wireless system.

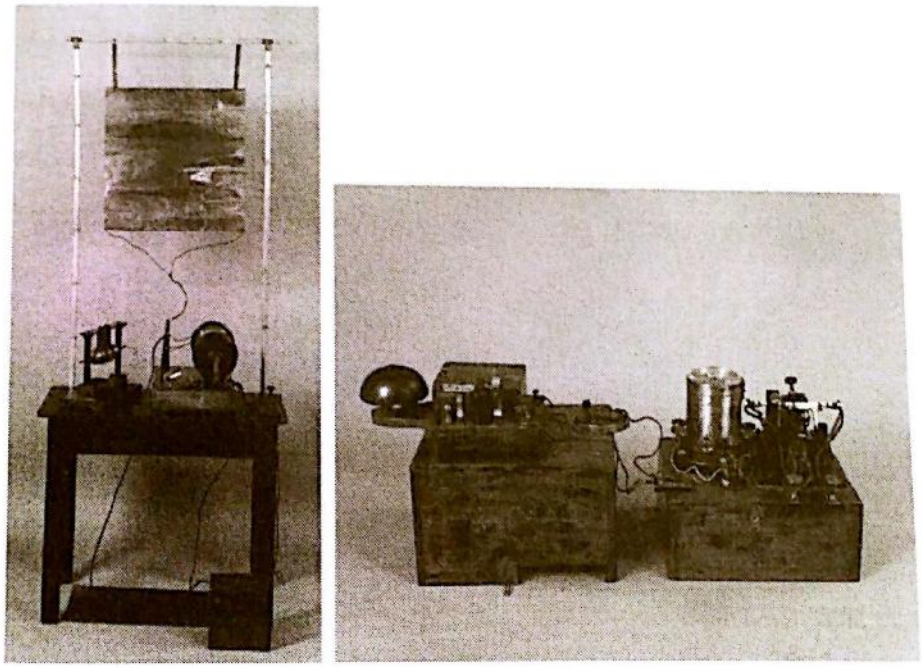


Figure 2.4

2.3 England.

Marconi's dual nationality always played an important role in his life, for both Marconi 'inventor' and Marconi 'entrepreneur'. It allowed him to meet countless numbers of people who helped in some way to create his empire and to catch several opportunities in terms of development and exportation of his invention all around the world.

Moreover, England during that period was the best place in Europe for the development of a new communication technology due to the presence of the extended Empire and cradle of the Second Industrial Revolution.

Therefore, in 1896 Marconi moved to London where he was hosted by his cousin Henry Jameson Davis, an engineer, who would play an important role for the radio and Marconi's future acclamation.
From the beginning Marconi noticed several differences compared with Italy, understanding the huge possibility for the exploitation of his wireless system in a commercial way. The main differences regarded English society, more cosmopolitan than provincial, with an entrepreneurial spirit, higher level relationships, information and concepts.
Guglielmo Marconi was the right man in the right place at the right time.

Whether London and his cousin Henry could represent a credible source for the establishment of new and influential relationships, the first meeting obtained in the British capital was possible thanks to his father's connection, who was organising a parallel network in Italy in order to enlarge the possibility of success for his son.
The meeting was organised with the General of the Italian Army, Annibale Ferrero – who had been appointed Italian Ambassador in London the year before – after an exchange of letters between him and the US consul Carlo Giardini, a good Marconi family friend. In this letter Giardini explained the discovery accomplished by Marconi with his willingness to donate the wireless system to the Italian government.
The answer, unforeseen given the role covered by Ferrero, was a suggestion to protect his invention with a patent efficient all around the world, to set aside the transfer agreement towards the Italian government and to freely move where he could be

offered more possibilities for the commercialization of his wireless technology.
This stance was confirmed the 29th February, 1896, during a meeting in Marconi's London home. Ferrero showed interest in the innovation, recognising its usefulness for the Italian government but at the same time confided to Marconi that he should not place his confidence in the national administration which had not helped in the development process. He concluded by warning Marconi about the possibility of fraud encompassing lack of recognition by the government.

General Annibale Ferrero was an important figure in Marconi's life, especially at the beginning of his British experience, enough to influence and to address the choices for the development and, moreover, the safeguarding of the wireless technology: Ferrero was pushing Marconi to prepare the documents for the copyright on his invention and he succeeded.

There was no time to waste. Cousin Henry with his network revealed himself to be useful in so much as he organised a meeting with his legal counsel Mr. William Carpmael, a law firm owner who specialized in patents for the application of industrial electrics. On 5th March the patent demand was delivered and, 40 days after his arrival in London, Marconi reached his aim: the protection of his invention through patent, which had been rejected in Italy by Pietro Lacava, an official of the Poste e Telegrafi Ministry, who did not seize the opportunity to revolutionize the communication world, not taking Marconi's invention seriously. [41]

Meanwhile the network of connections was enlarging and with it even the number of possibilities for the development of the wireless system. One of the first persons who showed interest in the project was Frank Wynne, an electrical engineer involved in the advancement of the electric railways who, understanding the potential of the wireless, proposed to establish a company funding the experiments for its development.

The network was continuing to grow and on the 31st March, 1896, Guglielmo Marconi met William Henry Preece, General Post Office chief engineer, thanks to his cousin's

[41] P. Beltrami, *Guglielmo Marconi. L'anima della comunicazione*, Bologna, Area 51 srl, (Accessed via Google Books http://bit.ly/2elnZts), 2016.

relationship. There were two reasons pushing Marconi to meet Preece: the first was related to the role and the power of the General Post Office; the second regarded the experimental activities conducted by the Office as consistent with the path undertaken by Marconi. In fact, Preece was a supporter of physical reasoning which put him in juxtaposition with the theorists like Lodge, a rival of Marconi.
Preece was very enthusiastic about wireless technology and offered Marconi the possibility of using the laboratories owned by the General Post Office of Great Britain in order to find some employees able to help him with his experiments, to do some sea experiments and the chance to show the technology to the Royal Society of Sciences.

Marconi accepted the proposal with pleasure, so much so that the first offer made by Wynne took second place. During this period, he improved his system and prepared the experiments requested by Preece; it was an incredible success. "The first signals came in from a distance of a hundred yards, the next covered a mile and a quarter, then six and finally nine miles. 'La calma della mia vita ebbe allora fine' Marconi told a friend – the calm of my life ended then" [42] his daughter Degna would write in her book "My father Marconi".
The General Post Office, ready to give maximum support to the development needed by Marconi and Preece, described the results achieved during the British Association conference in September - and in December at the Toynbee Hall of London with a greater audience - who praised him.

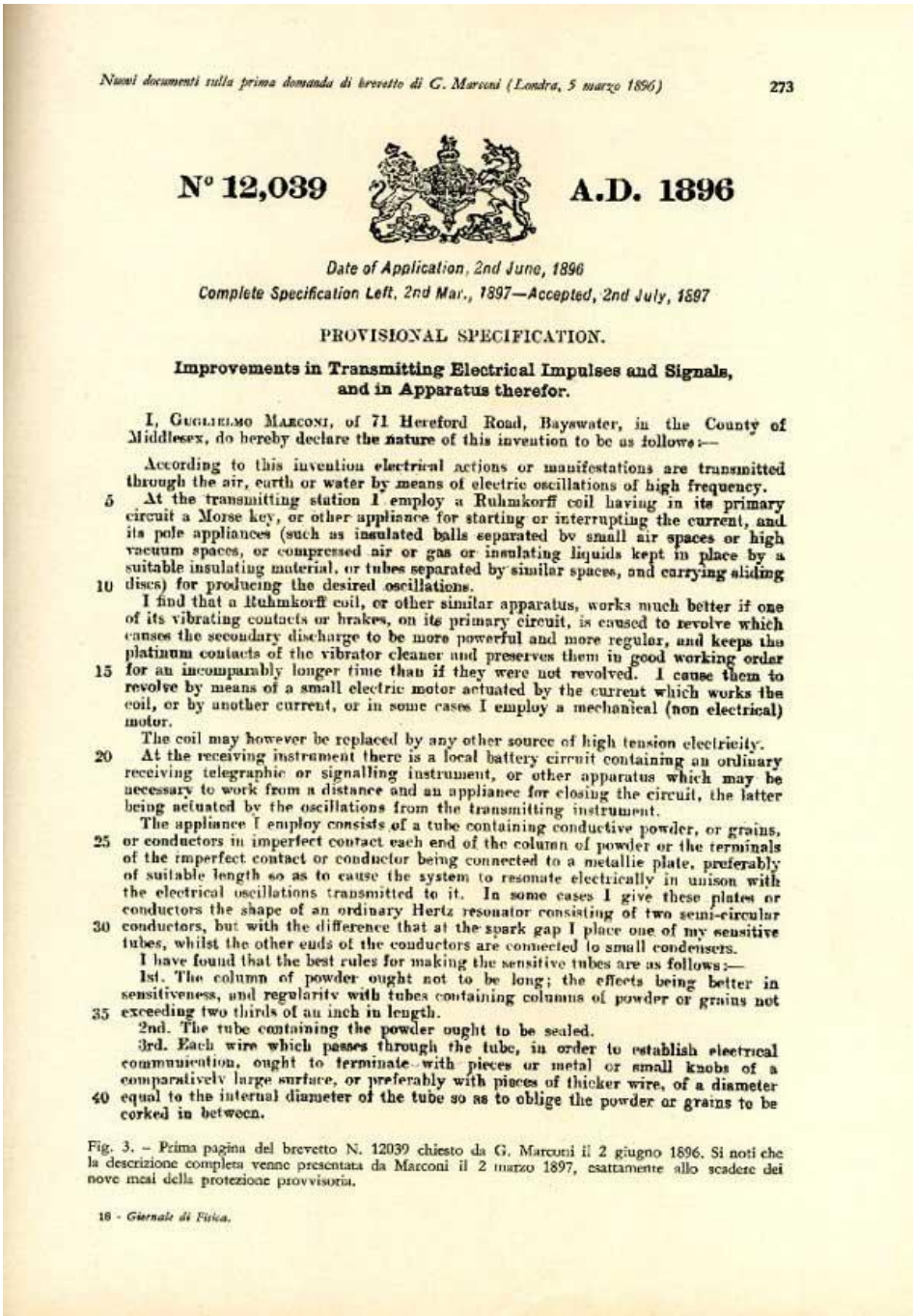
The newspapers wrote a lot about this new 'magic' technology and the news spread throughout the world. Marconi was becoming even more famous than before.

This whole notoriety, although appreciated, attracted general attention to a technology that was not globally protected by copyright. For this reason, Marconi asked Preece for assistance. Preece suggested the intervention of two lawyers, John Cameron Graham and John Fletcher. They, together with Mr. Carpmael, established an incredible team that specialised in several different fields. The 2nd July, 1897 the patent was approved and in this way the wireless technology could be considered protected by third parties.

[42] D. Marconi, *My Father, Marconi*, New York, McGraw Hill, 1962, p. 46.

Some months later, 'The Electrician' – the most influential British electricity magazine – defined "the patent 12039 extraordinary and faultless". [43]

Patent n° 12039.



Nuovi documenti sulla prima domanda di brevetto di G. Marconi (Londra, 5 marzo 1896) 273

N° 12,039 **A.D. 1896**

Date of Application, 2nd June, 1896
Complete Specification Left, 2nd Mar., 1897—Accepted, 2nd July, 1897

PROVISIONAL SPECIFICATION.

Improvements in Transmitting Electrical Impulses and Signals, and in Apparatus therefor.

I, GUGLIELMO MARCONI, of 71 Hereford Road, Bayswater, in the County of Middlesex, do hereby declare the nature of this invention to be as follows:—

According to this invention electrical actions or manifestations are transmitted through the air, earth or water by means of electric oscillations of high frequency.

At the transmitting station I employ a Ruhmkorff coil having in its primary circuit a Morse key, or other appliance for starting or interrupting the current, and its pole appliances (such as insulated balls separated by small air spaces or high vacuum spaces, or compressed air or gas or insulating liquids kept in place by a suitable insulating material, or tubes separated by similar spaces, and carrying sliding discs) for producing the desired oscillations.

I find that a Ruhmkorff coil, or other similar apparatus, works much better if one of its vibrating contacts or brakes, on its primary circuit, is caused to revolve which causes the secondary discharge to be more powerful and more regular, and keeps the platinum contacts of the vibrator cleaner and preserves them in good working order for an incomparably longer time than if they were not revolved. I cause them to revolve by means of a small electric motor actuated by the current which works the coil, or by another current, or in some cases I employ a mechanical (non electrical) motor.

The coil may however be replaced by any other source of high tension electricity.

At the receiving instrument there is a local battery circuit containing an ordinary receiving telegraphic or signalling instrument, or other apparatus which may be necessary to work from a distance and an appliance for closing the circuit, the latter being actuated by the oscillations from the transmitting instrument.

The appliance I employ consists of a tube containing conductive powder, or grains, or conductors in imperfect contact each end of the column of powder or the terminals of the imperfect contact or conductor being connected to a metallic plate, preferably of suitable length so as to cause the system to resonate electrically in unison with the electrical oscillations transmitted to it. In some cases I give these plates or conductors the shape of an ordinary Hertz resonator consisting of two semi-circular conductors, but with the difference that at the spark gap I place one of my sensitive tubes, whilst the other ends of the conductors are connected to small condensers.

I have found that the best rules for making the sensitive tubes are as follows:—

1st. The column of powder ought not to be long; the effects being better in sensitiveness, and regularity with tubes containing columns of powder or grains not exceeding two thirds of an inch in length.

2nd. The tube containing the powder ought to be sealed.

3rd. Each wire which passes through the tube, in order to establish electrical communication, ought to terminate with pieces or metal or small knobs of a comparatively large surface, or preferably with pieces of thicker wire, of a diameter equal to the internal diameter of the tube so as to oblige the powder or grains to be corked in between.

Fig. 3. – Prima pagina del brevetto N. 12039 chiesto da G. Marconi il 2 giugno 1896. Si noti che la descrizione completa venne presentata da Marconi il 2 marzo 1897, esattamente allo scadere dei nove mesi della protezione provvisoria.

18 - *Giornale di Fisica.*

Figure 2.5

[43] Valotti, Dalle Donne, *Marconi, Il ragazzo del wireless*, cit., p. 43.

2.4 The Company.

"Do the right thing" has always been the way of thinking adopted by Guglielmo Marconi, even if the choice was not advantageous for him. This could have been the case regarding the birth of the company for the development and commercialization of the wireless system. I wrote 'could have been' because in this instance he decided to take another choice but let's take a step back.

As early as March 1896, Mr. Wynne together with his partner Urquhart made a proposal to Marconi in order to found a society in a position to fund the research for the development of the wireless system and consequently the commercialization of the same in their core sector, the electric railway.
During that period Marconi needed resources for the further improvement of his system and Wynne's proposal represented an interesting solution. The doubts regarded the impossibility of governing the company due to the insufficient stock property included in the offer: 40%.

Marconi did not have to think too much about this offer because at the end of the same month he met William Henry Preece who immediately showed greater interest in his work as much as to support him through the structures of the General Post Office. This collaboration led Marconi to become an important figure in the British scientific environment and moreover allowed him to make the wireless invention popular.
The interest exhibited by Preece pushed Marconi to refuse Wynne's offer, giving priority to the General Post Office proposal with whom he was carrying out some experiments. Preece's offer regarded the patent transfer to the British government to the tune of £10000; which, if Marconi had accepted, would have been an incredible result for England.

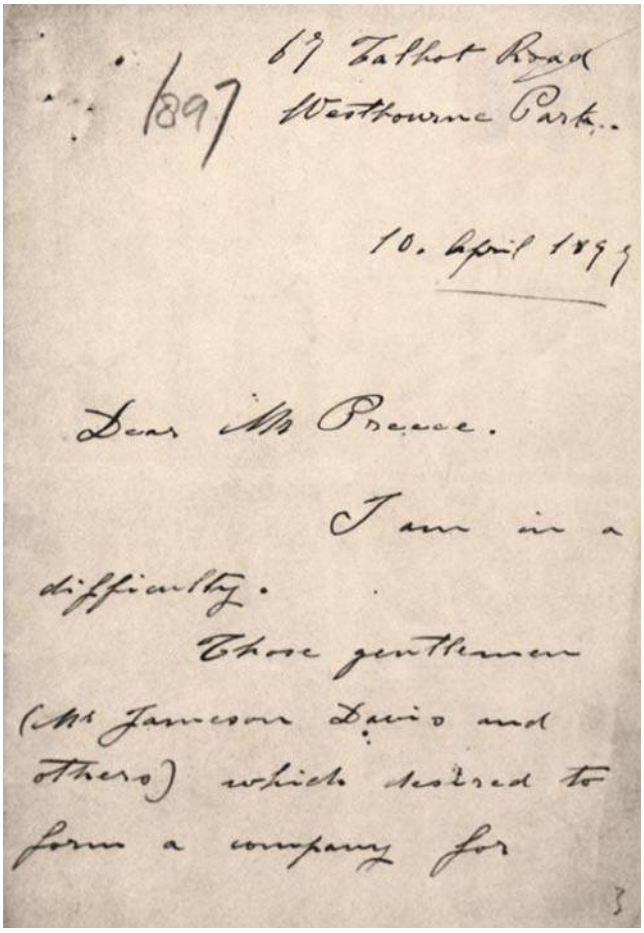
Luckily another character made a proposal: it was his cousin Henry. The month of March represented an important period for the birth of the company, a period in which Marconi had to make an important choice. In 1896 Mr. Wynne's proposal and the interest showed by the General Post Office in the figure of Mr. Preece, and the following year, in 1897, his cousin's offer.

Marconi was between two fires: from one side Preece, the man who believed in him from the beginning, providing resources and personnel for the development of the wireless system. On the other side was his cousin Henry, the one who had made him welcome since his first day in England. Henry had introduced him into the right circles, protecting him from hidden dangers and supporting him during the whole British experimental period, who thought through the process of when the right moment would be to launch this new technology around the world and to capitalise on all the efforts made during these years.
Furthermore, his cousin's proposal was much more convenient for Marconi due to the fact that it would allow him to carry on the developmental experiments with a substantial budget and moreover the amount for the patent acquisition would be higher than the Preece one. In the proposal there would even be the bestowal of half of the stocks, which would guarantee a continuous income.

These doubts were remarkable and can be proven by a letter sent by his lawyer, Mr. Graham, to Preece where his worries of appearing ungrateful are highlighted in relation to all the support offered by the chief engineer of the General Post Office. Preece, for his part, seemed sure about Marconi's choice and this certainty was reinforced by another letter, the one written by Marconi himself to the chief engineer the 10 April 1897. [44]

[44] *Ivi*, pp. 59 – 64.

Marconi letter to William Preece on April 10, 1897.



[1897] 67 Talbot Road
Westbourne Park.

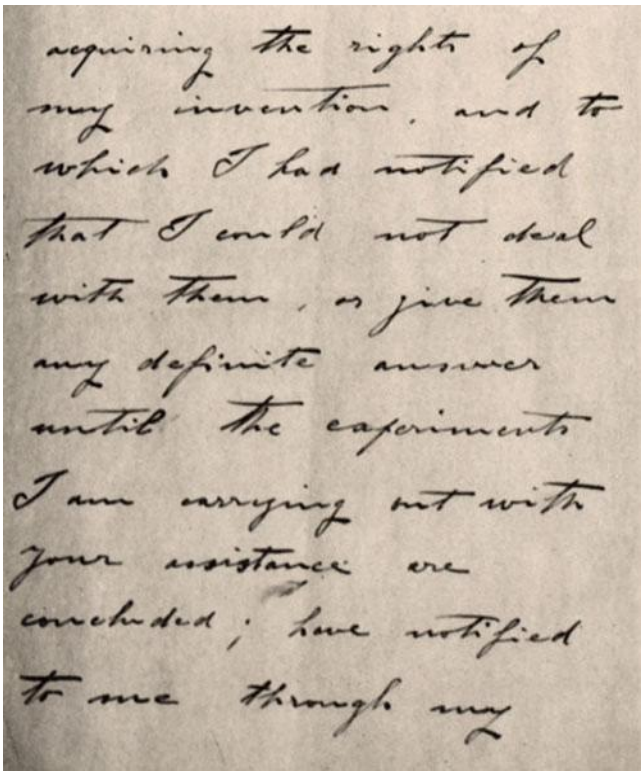
10. April 1897

Dear Mr Preece.

I am in a difficulty.

Those gentlemen (Mr Jameson Davis and others) which desired to form a company for

3



acquiring the rights of my invention, and to which I had notified that I could not deal with them, or give them any definite answer until the experiments I am carrying out with your assistance are concluded; have notified to me through my

solicitors that they want to know without much delay whether I intend to accept their offer or not.

I referred their proposal to Mr J. C. Graham for advice. Mr Graham seems favourable for the company, as my solicitors assure me that it is a genuine offer and that Mr Jameson and his friends have got the money.

The terms offered to me are the following. viz

For me to receive £15.000 in cash and half the shares of the company. The company would also have a working capital of £25000 which would be used in experimenting and in developing the system.

What makes me consider the offer

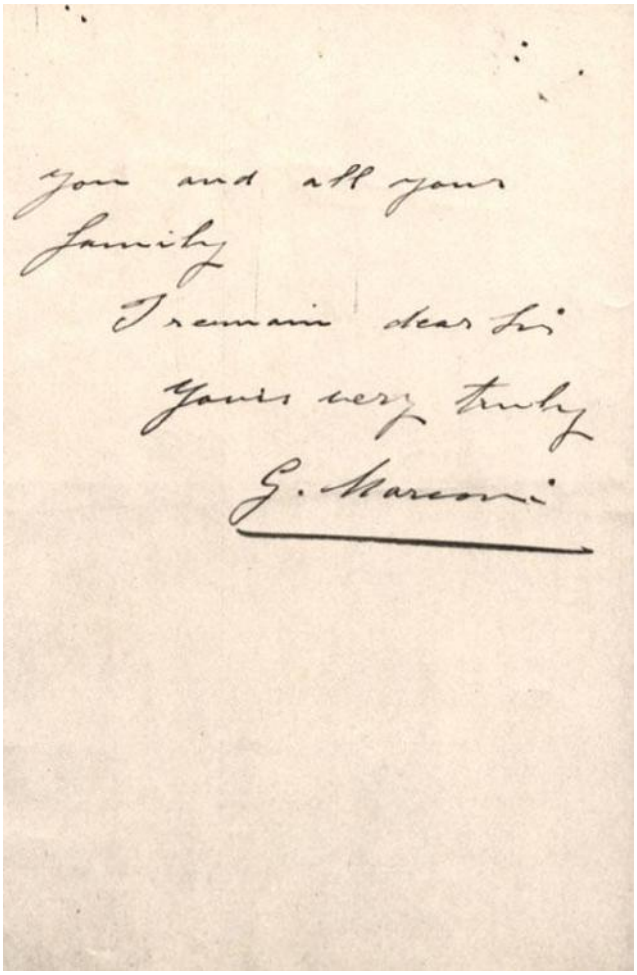
is not so much the £15.000 which I would receive, (which I would accept more as a garantee than anything else) but the £25.000 working capital which would enable me to largely experiment and well protect the patents specially in foreign countries.

Mr Jameson and his friends think that the company would make

4

money through constructing apparatus for use on board ships, for the purpose of enabling the ships to be warned in fogs, when in the proximity of rocks or dangerous shallows, or for preventing collisions.

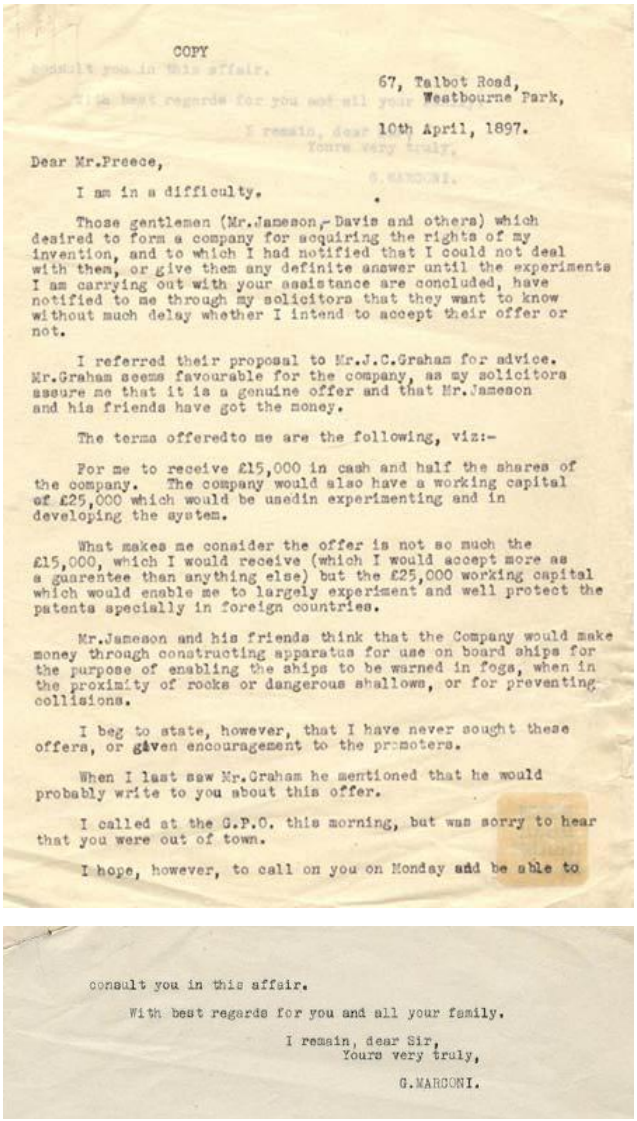
I beg to state however that I have never sought these offers, or given encouragement to the promoters.



you and all your
family
I remain dear Sir
Yours very truly
G. Marconi

Figure 2.6

Typed copy of the previous letter (Figure 2.6).



COPY

67, Talbot Road,
Westbourne Park,

10th April, 1897.

Dear Mr.Preece,

I am in a difficulty.

Those gentlemen (Mr.Jameson,- Davis and others) which desired to form a company for acquiring the rights of my invention, and to which I had notified that I could not deal with them, or give them any definite answer until the experiments I am carrying out with your assistance are concluded, have notified to me through my solicitors that they want to know without much delay whether I intend to accept their offer or not.

I referred their proposal to Mr.J.C.Graham for advice. Mr.Graham seems favourable for the company, as my solicitors assure me that it is a genuine offer and that Mr.Jameson and his friends have got the money.

The terms offeredto me are the following, viz:-

For me to receive £15,000 in cash and half the shares of the company. The company would also have a working capital of £25,000 which would be usedin experimenting and in developing the system.

What makes me consider the offer is not so much the £15,000, which I would receive (which I would accept more as a guarentee than anything else) but the £25,000 working capital which would enable me to largely experiment and well protect the patents specially in foreign countries.

Mr.Jameson and his friends think that the Company would make money through constructing apparatus for use on board ships for the purpose of enabling the ships to be warned in fogs, when in the proximity of rocks or dangerous shallows, or for preventing collisions.

I beg to state, however, that I have never sought these offers, or given encouragement to the promoters.

When I last saw Mr.Graham he mentioned that he would probably write to you about this offer.

I called at the G.P.O. this morning, but was sorry to hear that you were out of town.

I hope, however, to call on you on Monday and be able to consult you in this affair.

With best regards for you and all your family.

I remain, dear Sir,
Yours very truly,

G.MARCONI.

Figure 2.7

The decision was made in July when, after giving it a lot of thought, Marconi decided to accept the offer made by his cousin Henry. The possibility of being able to continue the experiments and to better safeguard the patents, especially abroad, was a decisive factor.

On July 20, 1897, the Wireless Telegraph and Signal Company was born which changed its name in 1900, thereby becoming Marconi's Wireless Telegraph Company. Marconi, at 23 years old, inventor of one of the most important innovations of the 20th Century and a major partner in a company that would become a world leader, had become a

star. This was demonstrated by the media attention around his person and by his triumphant return to Italy, greeted by several generals, ministers, members of Parliament and even by the Royal Family.

His comeback was promoted by the Minister of the Navy in order to celebrate this Italian inventor and, moreover, to possibly attend to the experiment in collaboration with the Italian Navy.
From the 10th to the 16th of July, Marconi visited La Spezia where a number of experiments took place on board the battleship "San Martino" which had been equipped with receiving devices linked with the San Bartolomeo military laboratory. The signals were received 16 kilometres away, beyond the hills of Palmaria Island. At the end of this experimental period Marconi decided to donate the equipment used during the week to the Navy in order to enable them to continuing experimenting. This turned out to be very useful to them. [45]

This collaboration marks the beginning of the partnership between Marconi and Italian Navy, which would last for many years, adding significant development to wireless technology, such as the realisation of the "Big Thing" [46], which will be debated in the following chapter.

[45] G. Nanni, G. Morolli, B. Valotti, *Guglielmo Marconi, lo scienziato che ha inventato la radio*, http://www.radiomarconi.com/marconi/documenti/cronologia_marconi.pdf, pag. 9, date of referral 4 July 2016.
[46] The attempt to send radio signals across the Atlantic.

2.5 Successes and detractors.

Since the beginning of his experimental life, Marconi had to face the opposition of scientists of electricity and theorists eager to discredit his work due to the conflict of 'practice vs. theory'. The leaders of these opposers were two well-known scientists, Augusto Righi and Oliver Lodge.
Augusto Righi was a famous professor at the University of Bologna with whom Marconi had some dialogue about the experiments he was carrying out during that period. Labelled several times as "the Marconi master", Righi gave lie to this belief explaining how their relationship was merely that, from time to time, Marconi obtained information about his work and provided explanations about the basics behind it.
Lodge, on the other hand, was a British physicist involved in the development of the identification of electromagnetic radiation, who succeeded in creating a detector called a 'coherer'. This was used by Marconi in his wireless system and was the main reason for his opposition towards the Italian inventor.

The cornerstone of their charge regarded the devices used by Marconi for the creation of his wireless system. They asserted that the new technology was based on the oscillator invented by Righi, used as transmitter, and on the Lodge coherer as receiver and moreover that the only merit that could be credited to him was to have had the idea to apply these two apparatuses to the wireless telegraphy.

Their idea could be summed up in a letter written by Lodge for The Times: "It is well known to physicists, and perhaps the public may be willing to share the information, that I myself showed what was essentially the same plan of signalling in 1894. My apparatus acted vigorously across the college quadrangle, a distance of 60 yards, and I estimated that there would be a response up to a limit of half a mile". [47]

Some months later, in September, 'The Electrician' periodical summarized the Righi-Lodge thought in an ironic way writing: "Quanto pubblicato tre anni fa da Lodge basta

[47] G. Weightman, *Signor Marconi's Magic Box: The Most Remarkable Invention of The 19th Century & The Amateur Inventor Whose Genius Sparked A Revolution*, Cambridge (MA), Capo Press, (Accessed via Google Books http://bit.ly/2eMeTVo), 2009.

per permettere al meno preparato dei 'praticoni' di assemblare un Sistema funzionante per la telegrafia senza discostarsi di un solo passo dai metodi di Lodge". [48]

This conflict continued during the following years as illustrated in the case of the Matteucci Medal, an Italian award for physicists, when Righi, being one out three members of the commission, attempted to impede Marconi in his goal of attaining this honour. Meanwhile Lodge, after a patent negotiation with Marconi, which was concluded in positive way for both of them, decided to withdraw from the conflict against the Italian inventor and when Righi asked for a suggestion about the Medal assignment he answered saying that Marconi had the qualification to receive it. [49]

Among these disputes, Marconi collected several appreciations and successes. As early as 1901 there was the Nobel Prize candidacy recommended by Pietro Blaserna, a member of the commission for the Matteucci Medal, who pushed for him to receive this award.

The consecration took place as a result of the experiment relating to the "Big Thing" when the American Institute of Electrical Engineers organised a dinner in his honour in front of a prestigious guest. Mr. Martin, the 'Electrical World' magazine director and fan of the inventor Tesla, was the promoter of the event recognising Marconi's ability to make wireless technology possible. When he took the floor after a brief introductory speech and proceeded to read some messages, the most remarkable was that written by Thomas Edison which said: "I am sorry that I am prevented from attending your annual dinner to-night, especially as I should like to pay my respects to Marconi, the young man who had the monumental audacity to attempt and succeed in jumping an electrical wave clear across the Atlantic Ocean." [50]

From this moment, the story of Marconi's wireless would be scattered worldwide by several successes starting with the running commentary on sports such as the Kingstown regatta and the America's Cup. This was followed by the narrative by

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[48] Valotti, Dalle Donne, *Marconi, Il ragazzo del wireless*, cit., p. 45.
[49] *Ivi*, p. 80.
[50] United States Early Radio History, http://www.earlyradiohistory.us/1902wt.htm, date of referral 10 July 2016.

Rudyard Kipling who decided to write a novel about the invention of the wireless. After the 'Big Thing' triumph, Marconi's wireless telegraphy had attained even literary consecration.

The success did not end here and the wireless system began to be implemented in more and more boats with incredible results. In fact, thanks to Marconi's invention it could be possible to prevent accidents and to save an incredible number of lives otherwise lost at sea due to collisions. An example can be shown by how the collision between the two ships Republic and Florida - a famous event in which Marconi's invention helped in a decisive way - was responsible for saving hundreds of lives. The newspapers celebrated the fact with titles like "The marvels of wireless telegraphy" or "A wireless victory". [51]
It was a great success for both the inventor and the entrepreneur, an achievement representing the origin of another one, the Nobel Prize.

Yet another story ensured that wireless telegraphy become a legend: the Titanic.
"When tomorrow night, some 700 or 800 persons land in New York – Frank Sprague told Marconi – they can look to you as their saviour" [52]. Wireless technology allowed distress calls to be transmitted, which led to the rescue of one third of the passengers. The US press praised him to such an extent, it was as though it considered Marconi the only one responsible for the rescue of more than 700 passengers.
April 17, 1912 during a press conference organized by the New York Electrical Society, Thomas Edison sent a telegram welcoming for the astonishing invention and the amazing work carried out by the system for the rescue of the life.

[51] Valotti, Dalle Donne, *Marconi, Il ragazzo del wireless*, cit., p. 96.
[52] NCB News, http://www.nbcnews.com/id/47046053/ns/technology_and_science-innovation/t/how-marconis-wireless-tech-helped-save-titanic-passengers/#.V7W82pOLQ_U, date of referral 19 July 2016.

The Titanic catastrophe.

Il naufragio del "Titanic,,
nel racconto lei superstiti

L'inchiesta senatoriale

PARIGI 19, ore 21.15 — Telegrafano da New York:

Bruce Ismay, direttore della «White Star Line» è comparso nel pomeriggio di oggi dinanzi alla commissione senatoriale incaricata di fare una inchiesta sopra la catastrofe del *Titanic*. I membri della commissione gli rivolsero parecchie domande. Egli rispose in modo evasivo. Egli dichiara di non aver visto che vi fossero donne ancora a bordo che attendessero la loro volta per montare nei canotti di salvataggio, quando egli stesso vi si imbarcò.

«Quando fui nel canotto di salvataggio non ho guardato dietro di me, disse l'Ismay. Non ho visto il capitano lasciò al suo posto, come non ho visto le donne costrette a remare per fare avanzare i canotti di salvataggio, come è stato rivelato».

Il senatore Smith gli domandò allora brutalmente:

— Tutte le donne e tutti i fanciulli erano in salvo quando vi imbarcaste?

— Temo di no, rispose l'Ismay, con tono addolorato.

Poi il presidente della «White Star Line» dichiarò che il *Titanic* non procedeva a tutta velocità quando entrò in collisione con l'«iceberg».

Secondo alcune voci lo stato della signora Astor sarebbe abbastanza grave perchè avrebbe dato alla luce un bimbo, durante la catastrofe. Ma sembra che queste voci siano molto esagerate. Il medico della famiglia Astor andò a prendere la signora a bordo e la condusse al suo palazzo, ove ella è curata da suo padre e sua madre. Il suo stato non sembra molto grave.

Interrogato sopra il naufragio del *Titanic* il presidente Taft ha fatto la seguente dichiarazione:

Quando seppi che la catastrofe aveva cagionato 1500 morti avrei potuto annunziare che il mio aiutante di campo Archibaldo Butt aveva cessato di vivere. Era un soldato ed è rimasto al suo posto sul ponte del *Titanic*. E' morto da valoroso, ne ho la certezza assoluta».

Alcuni fra i giornali pubblicano un breve racconto relativo alla morte di Sir William Stead che taluni fra i superstiti credono aver visto sopra un «radeau» con il colonnello Astor dopo che il *Titanic* fu affondato.

Altri testimoni dicono che videro il colonnello Astor con lo Stead sul ponte, al momento in cui la nave affondava. Le due versioni sono egualmente vere è probabile che tanto lo Stead quanto il colonnello Astor, quando si trovarono in mare, nuotarono verso un «radeau» tentando di salvarsi.

Ad ogni modo i due uomini che si credettero fossero lo Stead e il colonnello Astor soccombettero poi per il freddo.

La commissione senatoriale ha aperto la sua inchiesta sopra il tacito stesso della compagnia «Cunard». Il senatore Smith ha avuto durante la notte una conversazione con Bruce Ismay e Franklin direttore e vice direttore della «White-Star Line». Essi hanno dichiarato che l'inchiesta del Senato desiderano sia completa quanto possibile.

Il racconto del telegrafista

L'intervista col telegrafista superstite del *Titanic* occupa dei diritti di autore comprende tre colonne dell'*Evening News* di Londra che ne ha concesso la riproduzione al *New York Times*. Eccone i punti principali:

Il telegrafista Arold Bride dice che egli si era recato a sostituire il suo capo Philippa al posto radiotelegrafico, quando il capitano Smith, entrando nella sua cabina, disse a Philippa: Abbiamo urtato contro un «iceberg». Tenetevi pronto a lanciare un appello di soccorso, ma non fatelo che quando vi lo avrò detto. Passarono dieci minuti. Il capitano ritornò e disse: Inviate l'appello. Quale appello? — chiese Philippa. — «Inviate quello che si trova nei regolamenti internazionali per un caso di infortunio. Niente altro che questo, niente altro». E Philippa cominciò a trasmettere i segnali, scherzando, perchè, soggiunse Bride, noi non credevamo affatto ad un disastro. Ci volle molto tempo ancora prima che ci rendessimo conto del fatto che la situazione era grave. Non dimenticherò mai nella vita il modo col quale il mio capo lavorò durante una quindicina di minuti. Io mi poni sotto le ascelle la cintura di salvataggio senza che egli cessasse di lavorare. Continuava ad inviare per l'aria le lettere S. O. S. segnalando l'infortunio.

Una era stata lasciata la penultima scialuppa: penetrai nella mia cameretta per prendere il denaro di Philippa allo scopo di consegnarglielo. Ritornando nella cabina, vidi un fanciullo e un altro uomo dell'equipaggio, che si prendeva al di sopra del mio capo mappe all'apparecchio e che tentava di levargli la cintura di salvataggio.

Allora ho fatto il mio dovere: spero bene di avere freddato quella canaglia e l'ho lasciata giacente sul bastimento. Dalla cabina il telegrafista Philippa cuoce alla parte posteriore della nave e non lo rividi più. La musica di bordo suonava un'aria popolare.

Io, dice Bride, vidi sul ponte un battello portatile che parecchi uomini cercavano di aprire. Andai ad aiutarli quando fui portato via da un'ondata che mi trasportò col battello. Quando si era rivolto ci era rimasto sotto di esso ma riuscii però a liberarmi. Intorno a me erano rimasti di uomini nuotavano aggrappati alla cintura di salvataggio. Io nuotavo con tutta la mia forza per allontanarmi dal Titanic e che affondava ad una cinquantina di metri. Allorchè il «Titanic» scomparve riuscii ad aggrapparmi al battello portatile.

La scena intorno a me era terribile. Alcuni uomini nuotavano altri venivano inghiottiti. Con parecchi uomini che con me erano riuscii a pendere posto nel battello portatile recitammo preghiere. Infine fummo raccolti a bordo di una scialuppa di salvataggio quantunque fossi già ferito. Ci portarono infine a bordo del «Carpathia» e di là all'infermeria. Io vi ero già da alcune ore quando qualcuno venne a dirmi che il telegrafista del «Carpathia» ostenuato dal lavoro stava male. Mi si chiese se potevo aiutarlo ma non potevo camminare. Mi sembrava il avere i piedi rotti. Mi recai al posto telegrafico con l'aiuto delle stampelle, presi la chiave del telegrafo e poi non uscii più neanche nemmeno per un minuto dalla cabina dell'apparecchio.

Il telegrafista del «Titanic» è un giovane di 22 anni.

L'ultimo grido umano

La signora Gordon arriva da New York un dispaccio nel quale fa una descrizione della collisione del *Titanic* con l'iceberg e della partenza del battello di salvataggio.

Ultimo, essa dice, parecchi colpi di pistola. Alte grida furono sentite dai passeggeri sul ponte posteriore. Il vapore si alzò in aria. Vi fu una esplosione e il *Titanic* rimase. Le grida aumentarono quando dopo una tregua e forte esplosione la prua affondò. La parte posteriore salì a un centinaio di piedi in aria e poi scomparve lentamente come se una grande mano l'avesse spinta dolcemente sotto le onde. Guardammo la nave ad una distanza di 200 metri. Per un momento regnò il silenzio ma subito dopo dalla boscaglia ove aveva galleggiato il *Titanic* si levarono grida ed urla che continuarono almeno per un'ora. Le ultime grida furono da una voce di uomo che diceva: Mio Dio! Mio Dio!

Scene orribili nella tragica notte

Il primo ufficiale del «Titanic» Marthark, si trovava nella passerella della nave al momento della collisione. Se qualcuno si uccise — ciò che non è dimostrato — è probabilmente Marthark e non il capitano Smith il cui eroismo e la cui abnegazione furono ammirevoli e non si smentirono affatto, neppure nel momento in cui la passerella era scomparsa sotto i flutti. Prima di essere strappato dal posto dove lo trattenea il sentimento del dovere il disgraziato continuava ancora a gridare nel megafono: «Comportatevi come uomini, cioè come inglesi». Più tardi fu visto fra coloro che si dibattevano nell'acqua e rifiutò di salvare se stesso. Gli altri ufficiali di bordo imitarono il suo esempio.

Ma di fronte a tanto eroismo un doloroso riscontro si verificò: All'ultimo momento avvennero scene di violenza: si spararono colpi di arma da fuoco e ciò risulta da tutti i resoconti. Così per esempio Luigi Signell e Baldon dicono che uomini brunirono le cervella ai nuotanti che gridavano e cercavano di giungere alle scialuppe e che i passeggeri furono fatti segno di colpi di arma da fuoco nei battelli. Fu una notte orribile.

Il colonnello Gracie dice che la posizione della sua cattera era tale che allorchè qualcuno segnalò che un vapore si avvicinava nessuno osò voltarsi a vederlo temendo di fare capovolgere la barca troppo carica.

Un testimonio oculare riferisce che tutte le donne raccolte dal «Carpathia» sembravano in stato di demenza.

Sette bambini orfani

Mandano anche da New York un particolare commovente: Sette bambini di età inferiore ai sette anni sono stati sbarcati dal «Carpathia». Nessuno sa dove siano i loro genitori. Essi sono stati gettati nei battelli di salvataggio dai loro parenti che rimasero a bordo e che senza dubbio perirono. Nessuno sa chi siano poichè i loro vestiti non portano alcuna indicazione.

L'"Iceberg,, fotografato

Un telegramma da Cherbourg dice che il piroscafo *Amerika* della Compagnia Anchorge Americana è arrivato ieri sera in quel porto, proveniente da New York.

La nave ha potuto fotografare, sito ore prima che avvenisse la catastrofe del *Titanic*, l'iceberg, che fu scontrato dal transatlantico. Fra i passeggeri dell'*Amerika* si notavano i coniugi Straus i di cui genitori si trovavano a bordo del *Titanic*. Seppero qui in modo definitivo che i loro disgraziati genitori erano periti.

La sottoscrizione a Londra

Telegrafano poi da Londra che una povera donna madre di sei figli, che aveva ricevuto un soccorso abbastanza considerevole, avendo creduto che suo marito fosse morto durante la catastrofe del *Titanic*, passando dinanzi all'edificio della «White Star Line» ebbe la gioia di vedere il nome di suo marito fra i superstiti. Essa si affrettò a riportare al municipio la somma che aveva ricevuto.

Sei orfani della medesima famiglia hanno avuto il dolore di perdere la loro madre nella notte stessa in cui il loro padre affondava con il *Titanic*.

Si hanno esempi di miseria lamentevole e la sottoscrizione aperta da Sir Lord Mayor sarà la benvenuta.

I fondi di soccorso aperti da Lord Mayor giungono alla somma di un milione e 500 mila franchi.

Si serie e dolore

La città di Southampton è particolarmente immersa nel lutto e non è più possibile sperare per le povere donne che attendono la lista completa dei superstiti.

Stamane si era riunita una folla dinanzi agli uffici della *White Star Line*, ove sono poche sono arrivate.

Una donna gettò un grido di gioia scorgendo il nome del marito sulla lista, e svenne dal dolore leggendo poi dopo il nome: ritrovato morto.

Il sindaco di Southampton ha più di seicento famiglie da soccorrere e in ogni famiglia vi sono almeno tre figli.

Quasi tutte le cameriere erano di Belfast: una sola è stata salvata. Fra i superstiti vi è un uomo che aveva a bordo del *Titanic* un cameriere che era marinaio, l'altro fuochista. La compagnia non sa quale dei due sia stato salvato, e due disgraziate donne si domandano non sapendo quale dei due è ancora vivo.

Figure 2.8

2.6 Italian relationship: Patriot and Fascist.

Marconi's life has been characterized by the duality between Italy, his homeland, and England, where he achieved success, establishing his Company. Despite the distance, the bond with his country remained unchanged, as shown by several episodes where Marconi favoured it rather than England. An example can be illustrated by the first wireless system, initially proposed to the Italian Poste e Telegrafi Ministry which rejected the fund request.

This behaviour could be justified by the patriotism which has always characterized the life of the Bolognese inventor: it was in Italy that he took the first steps in the development of the wireless, and it was in Italy that he received the first signal during his famous hill experiment.

This bond with his homeland led in the 1897 to donate to the Italian government the devices used during the experiments conducted in collaboration with the Navy in La Spezia in order to continue the development for military aims.

It is reasonable to assume that his relationship with the Italian government was a marginal component in his work, which had at this point assumed an international dimension. Initially it is correct, since this collaboration was interrupted after his first experiments and the development was carried on by the Navy technicians in order to extend the application to the ships and stations along the coast. However, the scarcity of their results, combined with the important success achieved by Americans and British, pushed the Italian government into reconnecting with Marconi. This choice was prompted by the invention of a new device, the magnetic detector, and so in 1902 Luigi Solari was sent to acquire the newest wireless devices and to begin a new collaboration. In the meantime, King Vittorio Emanuele III decided to make the Carlo Alberto ship available to Marconi in order to make it possible for him to accomplish new tests over long distances. This openness represented an interesting occasion for the inventor considering the scarce resources of his company available for this development: Marconi's Wireless in that period was facing the creation of the international commercial structure therefore the stockholders were unable to

economically bear the burden of large-scale experiments.

In 1902 there were two different experimental tasks where Marconi had the chance to further develop the new device. In this context Marconi met the Navy Admiral Carlo Mirabello who would become a fundamental figure in the development process of the wireless system.

It is right to say that the Italian government's offer represented a fair compromise for both.
On one side, the Italian Navy was obtaining knowledge and technology in the form of free concessions and, at the same time, receiving imagination and reputation. On the other side, Italy represented a stepping stone for Marconi's entrepreneurial strategy for expansion in those years, both for the resources made available and for the opportunity to acquire new markets, in order to establish an international wireless network and to develop the system.

However, the relationship between Marconi and Italy was not only related to the invention of the wireless. In fact, since 1915 this relationship became more intense and the scientist became part of Italian public life.

As soon as Italy entered World War I, Marconi, who was in US for a patent trial, put himself at the disposal of the Italian government offering his knowledge, experience and devices in order to assist the Army against the enemy. In a letter addressed to General Vittorio Zupelli, Minister of War, he wrote:
"Eccellenza e caro signor Generale. Come ebbi il piacere di dirle a voce, quando or sono pochi giorni Ella mi ricevette sì cordialmente al Ministero, vengo ora a confermarle per iscritto l'offerta che faccio la Governo del mio servizio di persona e d'opera per il tempo della Guerra. Mediante la conoscenza più esatta che mi sono potuto fare della situazione, ed animato dal solo sentimento del dovere, sentimento comune ad ogni degno cittadino e suddito del Re, le esprimo che sono convinto di potere esplicare la mia modesta opera utilizzando gli studi e l'esperienza special che credo di possedere, nel modo più utile ed efficace, se mi sarà concesso l'onore di far parte della forza armata del paese indossando la divisa militare. È noto a me, come lo sarà pure all'E.V., che la

competenza e lo zelo degli ufficiali e soldati addetti alla radiotelegrafia sia del tutto all'altezza dell'importanza di questo nuovo mezzo di comunicazione ora applicato all'arte della Guerra, e credo pure che almeno per ora non vi sarebbe alcun urgente bisogno della mia cooperazione diretta; ma in una Guerra come l'attuale e colle grandi incognite dell'avvenire credo che si presenteranno circostanze nelle quali il mio consiglio, la mia cooperazione e la mia opera personale anche presso le linee di combattimento potrebbero essere di qualche vantaggio al paese. Per questo motive mi offro ora all'E.V. chiedendole di volermi arruolare preferibilmente nell'arma del genio militare possibilmente con un grado di ufficiale. Le sarà noto Eccellenza che ho sempre nutrito profondi sentimenti di riconoscenza verso il R. Governo per l'appoggio morale e materiale che questo mi ha sempre esteso, ma posso assicurare l'E.V. che di nulla potrei mai essere più grato o più fiero che di poter aver l'onore di far parte del nostro glorioso esercito durante il periodo storico che ora attraversiamo, che son certo è e sarà un periodo di pericolo, di Gloria e di vittoria per la nostra amata Patria, per il nostro Re". [53]

He was nominated 'Genio Lieutenant' on the 19 June 1915 and Captain a month later, with the task of controlling the entire Front wireless system of the Italian Army.
Marconi's biographers agree upon about the influence exercised by Francesco Saverio Nitti, Minister from 1911 in Giolitti's government and Prime Minister in 1919, who played an important role in his commitment to the Italian government.

Nitti wrote: "Guglielmo Marconi aveva per me una grandissima affezione e grande stima. Eravamo stati in America insieme e da allora dovunque io andavo voleva seguirmi. Si confidava a me nelle cose più gravi e mi interrogava e veniva a me per consiglio nelle sue maggiori decisioni." [54] Furthermore, he described Marconi as "abilissimo nei suo affari personali. Inettissimo per gli affari dello Stato, data la mancanza di ogni preparazione economica e politica e incapacissimo di ogni concezione politica". [55] From his writings, we can discern his opinion about Marconi, a figure very skilled in his personal affairs but unsuitable for a political position. Despite

[53] Valotti, Dalle Donne, *Marconi, Il ragazzo del wireless*, Milano, cit., p. 116.
[54] *Ivi*, p. 117.
[55] *Ibidem*.

these judgements, Nitti benefited from Marconi's work in several diplomatic missions and moreover in the constitution of the Banca Italiana di Sconto in order to hinder the dominance of German banking.

Thanks to his work - and consequently to the prestige generated for the Country - Marconi was elected Senator the December 30, 1914 upon a proposal by Senator Colombo, the founder of the Edison Company. In his proposal speech, he illustrated Marconi's deeds with reference to his dedication to giving prestige, honour and advantage to his homeland, Italy.
After the nomination, Marconi worked to ensure that Italy was always playing a fundamental role in international politics, defining a sincere cooperation with its allies. Italy was a great country, he felt, and it should be treated as such. [56]

[56] *Ivi*, p. 120.

Article from "Il Resto del Carlino".

La discussione al Senato sulle dichiarazioni del Governo

Guglielmo Marconi invoca un più equo trattamento degli interessi economici italiani da parte dell'Inghilterra

Il discorso di Guglielmo Marconi

Il senatore Mazzetti per la difesa dei monopoli tabacchi

Il sen. Palle

Guglielmo Marconi parla sull'autarchia economica dell'Italia

Laseduta

Le crisi che dei sen. Barzellotti

Oratori favorevoli al Governo

I. sen. Mazzetti

Note alla seduta

Figure 2.9

This moment could represent the dividing line between the scientist and the committed politician, involved in the development of Italian foreign affairs. In those years, foreign public opinion, principally in England, was not favourable towards the

behaviour of the Italian military. Therefore, it was complicated to obtain all the economic measures possible in its favour.
Marconi's prestige helped Italy to increase its international credibility, as demonstrated in 1917 during the American diplomatic mission where the scientist, at this point politician, was sent to represent his country.
Whether the mission was a success or not, it succeeded in gaining a loan of 700 million dollars. This was an authentic triumph for Marconi; everywhere he went the crowd cheered him.

Nitti said: "Per gli americani l'Italia moderna è rappresentata da alcuni uomini: Garibaldi, Verdi, e ora Mr. Marconi. La folla durante il nostro soggiorno non si occupava che di lui, non vedeva che lui, tutti gli altri erano indifferenti". [57]

Nitti himself, furthermore, proposed Marconi to become Italian high commissioner for the US, becoming an organisational, political and diplomatic figure. The Council of Ministers formalised the proposal to which Marconi replied outlining quite fixed and rigid conditions which the Italian government did not accept.

We can understand his displeasure in a letter sent to his friend Nitti on September 18, 1917: "…sono informato che a New York si continua a parlare molto degli scandali riguardo alle accuse reciproche che si fanno i membri delle nostre commissioni permanenti, e che l'ambasciatore non ha ancora condotto a termine la famosa richiesta. È triste perché ci va di mezzo il nostro prestigio nazionale ed il buon nome dell'Italia." [58]

Despite this disappointment, his political commitment proceeded and he went over to England for another diplomatic mission in order to obtain a loan; unfortunately, this time he did not succeed.

"Frustration was Father's sole reward when he was forced onto the political stage. After the loan fiasco, Nitti drafted him to go to the Versailles Peace Conference. This

[57] *Ivi*, p. 123.
[58] *Ivi*, p. 124.

was the greatest heartbreak of all." [59]

This mission represented the worst disappointment for Marconi who thought he should retire from public life but Nitti, once again, was able to convince him to agree to join a delegation on the occasion of the Paris Peace Conference. Even on this occasion Marconi endured profound failure, not succeeding in enforcing the Treaty of London which legitimised considerable territories.

As the biographers agree, Mr. Nitti was an influential figure for Marconi who was convinced one more time to serve his country. It was 1920 and in that period Gabriele D'Annunzio, a friend of Marconi, was occupying the city of Fiume annexed to Yugoslavia after the Paris Peace Conference. Nitti, using leverage on Marconi's patriotism, asked him to convince the poet to leave the city. Marconi accepted the task, refusing to give any specific commitments.
In a radio message Marconi clarified his position, not in line with that of Mr. Nitti, giving his support to D'Annunzio. This event indicated the break in the relationship with Nitti, his political mentor until that moment.

The radio message: "Navigando nelle acque del Quarnaro il mio pensiero commosso si rivolge a te eroe del pensiero e dell'azione, strenuo propugnatore del diritto da italiani affermato di unirsi alla Patria, tenace difensore della religione di Dante e del voto di Mazzini, di Cavour e di Garibaldi. Confidiamo per l'attuazione della eterna idea italiana in un prossimo avvenire di giustizia, di verità, di pace". [60]

In the post-war period, the connection between Marconi and the Italian government began to decline due to the non-fulfilment of the agreement stipulated in 1916 which renewed the Marconi patent-free concession in exchange for supplying a monopoly of the devices and of the percentage on wireless traffic. Moreover, in 1921 the prohibition of private concession for radio-communication station ceased, and with it there was the arrival of foreign companies for the control of Italian communication.

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[59] Marconi, *My Father, Marconi*, cit., p. 229.
[60] Valotti, Dalle Donne, *Marconi, Il ragazzo del wireless*, cit., p. 128.

Marconi, even after the measures taken for the bankruptcy of Banca Italiana di Sconto, of which he was president, and threatened to leave the country with all his activities.

In Italy, meanwhile, there was a new party that was gaining in credibility: the National Fascist Party rooted in Italian nationalism and the desire to restore and expand Italian territories.
Marconi, as indeed many Italians of his time, was a fervent nationalist and thanks to this ideology there followed an inevitable embracing of Fascism. On June 15, 1923, some months after the march on Rome, Marconi enrolled in the party following pressing invitations made by his friend, ardent Fascist supporter, Filippo Campiero.

The reasons for his joining were represented by both the ideological party programme, nationalism, national order, discipline, and fair collaboration between capital and labour, and the connection with Campiero and moreover with D'Annunzio. Luigi Solari, a collaborator, reported a dialogue with Marconi where the motivations for his involvement in Fascism are illustrated: "Ho deciso, dopo matura riflessione, di iscrivermi al partito fascista per convinzione, non per convenienza. Le ripeto: per convinzione; poiché chi è stato all'estero, come sono stato io, e ha sofferto per la poca considerazione che gli stranieri avevano in passato per il nostro paese dominato dal disordine e dall'indisciplina, si sente ora orgogliosa nel constatare il nuovo aspetto assunto dall'Italia sotto il governo Mussolini […]. La mia adesione al fascismo è perciò sincera e con questa mia adesione ritengo di potere servire ancora utilmente il nostro paese". [61]

Thanks to his standing, ideology and connections, Marconi, since the early years of Fascism was appointed to important positions: in 1927 he was nominated president of CNR (Consiglio Nazionale delle Ricerche), the Italian coordination organism for research, and some years later, in 1930, president of the Reale Accademia d'Italia, whose purpose was "to promote and coordinate Italian intellectual activity in the sciences, the humanities, and the arts, to preserve the integrity of the national spirit, according to the genius and tradition of the race, and encourage their diffusion

[61] *Ivi*, p. 144.

abroad".[62]

Being president of the Accademia d'Italia, he became involved by right in the Grand Council of Fascism where he got involved in matters of foreign affairs referring precisely to the injustice borne by Italy due to the Paris Peace Conference. Moreover, in the 1930s Marconi changed even his political view, Anglophile until then, as a result of the measures adopted by the League of Nations that led him to withdraw his English business in its entirety. Guglielmo Marconi was completely Italian. [63]

As written above, ideology, nationalism and Italian prestige were the main ideals leading Marconi to join Fascism. After several disappointments borne by his homeland, he finally realised where his loyalties lay, as this episode pushed many intellectuals of that period to undertake the path of Fascism.

In an interview granted to the Fascist journal "Il Popolo d'Italia" on the anniversary of the invention of the wireless and on the occasion of the "Beam system" [64], Marconi asserted: "Sistema a fascio. Io non uso oggi questa parola perché sono fascista e perché il fascismo per le fortune dell'Italia è trionfante. Io rivendico a me stesso l'onore di essere stato in radiotelegrafia il primo fascista, il primo a riconoscere l'utilità di riunire in fascio i raggi elettrici, come Mussolini ha riconosciuto per primo nel campo politico la necessità di riunire in fascio le energie sane del paese per la maggiore grandezza dell'Italia". [65]
It is evident that the unwavering conviction expressed by the scientist to the new party which restored Italy's name, giving back international prestige, was a fundamental element for intellectuals.

[62] P. V. Cannistraro, *Historical Dictionary of Fascist Italy*, London, Greenwood Press, 1982, p. 474.
[63] R. Chiaberge, *Wireless. Scienza, amori e avventure di Guglielmo Marconi*, Milano, Garzanti Libri, 2013, p. 264.
[64] Plan to link the British Empire by a network of wireless communication stations.
[65] Valotti, Dalle Donne, *Marconi, Il ragazzo del wireless*, Milano, cit., p. 134.

LIST OF FIGURES

- **Figure 2.6**

Marconi letter to William Preece on April 10, 1897.

History of telecommunications, Guglielmo Marconi, http://www.alternativaverde.it/sttlcing/documenti/Marconi/1897/marc10041897.htm, date of referral 13 July 2016.

- **Figure 2.7**

Typed copy of the previous letter (Figure 2.6).

History of telecommunications, Guglielmo Marconi, http://www.alternativaverde.it/sttlcing/documenti/Marconi/1897/marc10041897.htm, date of referral 13 July 2016.

- **Figure 2.8**

The Titanic catastrophe.

G. Falciasecca, B. Valotti, *Guglielmo Marconi. Tra storia e cronaca*, Bologna, Pendragon, 2006, (Accessed via Google Play), p. 105.

- **Figure 2.9**

Article from "Il Resto del Carlino".

B. Valotti, G. Dalle Donne, *Marconi, Il ragazzo del wireless*, Milano, Ulrico Hoepli Editore Spa, 2015, p. 120.

CHAPTER 3

GUGLIELMO MARCONI AND THE RADIO DEVELOPMENT

"Nell'estate del 1895, dall'alta montagna
di Oropa, contemplando il nostro Biellese,
pensai che l'uomo potesse trovare nello
spazio nuove energie, nuove risorse
e nuovi mezzi di comunicazione.

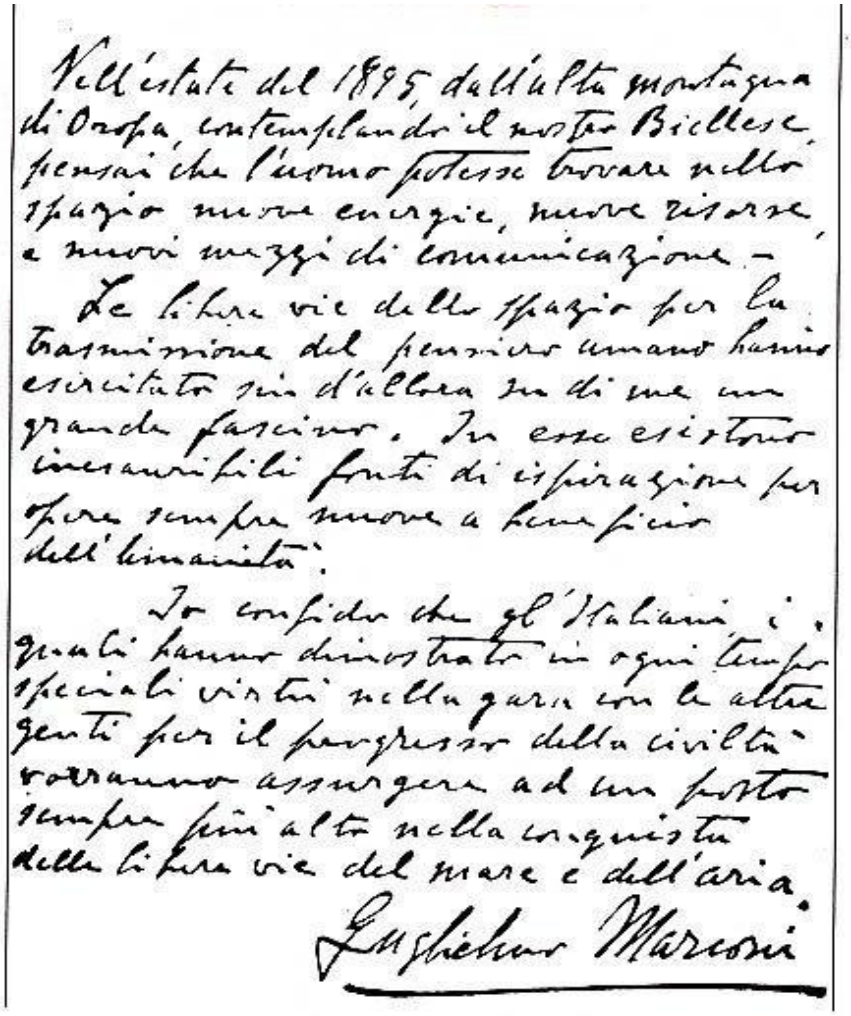
Le libere vie dello spazio per la
trasmissione del pensiero umano hanno
esercitato sin d'allora su di me un
grande fascino. In esse esistono
inesauribili fonti di ispirazione per
opere sempre nuove a beneficio
dell'umanità.

Io confido che gli Italiani,
i quali hanno dimostrato in ogni tempo
speciali virtù nella gara con le altre
genti per il progresso della civiltà
vorranno assurgere ad un posto
sempre più alto nella conquista
delle libere vie del mare e dell'aria."

Guglielmo Marconi [66]

[66] Radio Marconi, Marconi, http://www.radiomarconi.com/marconi/gm_docum.html, date of referral 17 December 2016.

Autograph letter.



Nell'estate del 1895, dall'alta montagna di Oropa, contemplando il nostro Biellese, pensai che l'uomo potesse trovare nello spazio nuove energie, nuove risorse, e nuovi mezzi di comunicazione.

Le libere vie dello spazio per la trasmissione del pensiero umano hanno esercitato sin d'allora su di me una grande fascino. In esse esistono inesauribili fonti di ispirazione per opere sempre nuove a beneficio dell'umanità.

Io confido che gl'Italiani, i quali hanno dimostrato in ogni tempo speciali virtù nella gara con le altre genti per il progresso della civiltà vorranno assurgere ad un posto sempre più alto nella conquista delle libere vie del mare e dell'aria.

Guglielmo Marconi

Figure 3.1

3.1 Introducing the case.

Guglielmo Marconi is a character that continues to pique the curiosity of many researchers because, thanks to being in the right place at the right moment, he was able to develop an incredible innovation and to cooperate with different countries – Italy and England in particular – in order to spread his wireless system and consequently becoming the 'lord of the radio', enlarging his empire.

Marconi brings together the interest of scientists and historians for the way in which he carried out both his political and his scientific life simultaneously. He was able to hold dialogue with different - and even conflicting - governments in order to improve his new-born innovation and to be the first to conquer those markets.
In doing this, he had to answer to some requests made by the different governments for the fulfilment of their aims. We can describe the situation as a cooperation with interests where each participant is willing to comply with the others in favour of a bigger gain.

Even if this situation could sound individualist, it is not the case: in fact, all the parties worked together, even though with differing viewpoints, in order to further develop the wireless system. There was a fair exchange: between the governments with their essential power and resources for the development of Marconi's innovation, and Marconi with a new technology to spread and to commercialize.

The governments could represent the demand, while Marconi the supply.
The role assumed by the governments in the case of wireless development was of vital importance because it allowed Marconi to further develop his system so that it could be used in order to connect people all around the world.

Analysing the case and therefore studying the literature behind the innovation and development process, I discovered that a lot of papers have been written, several theories have been proposed and many cases have been analysed to confirm these theories. However, there is a gap in this literature, as far as the historical reconstruction of cases of innovation is concerned, and engaged to test and further

develop these theories, exploring their limited scope.

The majority of the literature on innovation consists in several scientific papers written by scholars who studied in depth how the world should work in order to improve it, writing many theories and laws on its functioning and the ways to reach this improvement.
Historically, such theories have been applied but have not always represented the right way for a substantial improvement. Sometimes, in order to reach this aim, it was necessary to merge different theories.

In doing this, historians should help us to analyse these events in order to understand what really happened. Unfortunately, the researchers often focus on events in support of the theories that they are trying to shore up. What is missing is the link with history in order to contextualize past experiences, to understand why some models worked in that context and not in others and to realize that in the future different models could work than worked in the past.

The role of governments, especially, in the innovation process is widely covered, mainly from a theoretical point of view, without many links with real cases and therefore with few opportunities to understand why or why not it worked.

I am pretty convinced that the case regarding the development of the Marconi wireless system could help to better understand some theoretical models concerning the innovation development and moreover it could reduce the gap between theory and historical cases.

3.2 The radio.

3.2.1 The experimentation. [67]

The radio is considered to be one of the greatest innovations in history because it revolutionized the system of communication, allowed people situated on different parts of the globe to connect with one another without any cable. whatsoever. It also inspired its successors to carry on with Marconi's studies leading to the development of modern communication methods.

The history of the radio can be traced back roughly from 1893, the year in which Marconi started his first experiments. However, there were two particular episodes that significantly marked the development of the radio: the "Hill Experiment" and the "Big Thing".
The Hill Experiment was a fundamental one in order to verify if his studies and instruments were actually serviceable or not and was the first step taken by Marconi. The experiment consisted of making an electric bell ring without any cable or other connecting material used for the activation of it. The great obstacle was represented by the Celestini Hill which was placed in the middle between the bell and the transmitter controlled by Marconi.

Around this experiment a myth, a legend, has been created, because it was the first time a human could rise above the optical view. From that moment Marconi understood that radio waves could be used in order to overcome natural obstacles and therefore to send signals over larger distances, linking all people in this way.

[67] On this, see: V. Cantoni, G. Falciasecca, G. Pelosi, *Storia delle telecomunicazioni*, Volume I, Firenze, Firenze University Press, 2011;
H. G. J. Aitken, *Syntony and Spark: The Origins of Radio*, Princeton, Princeton University Press, 1985.

Celestini Hill.

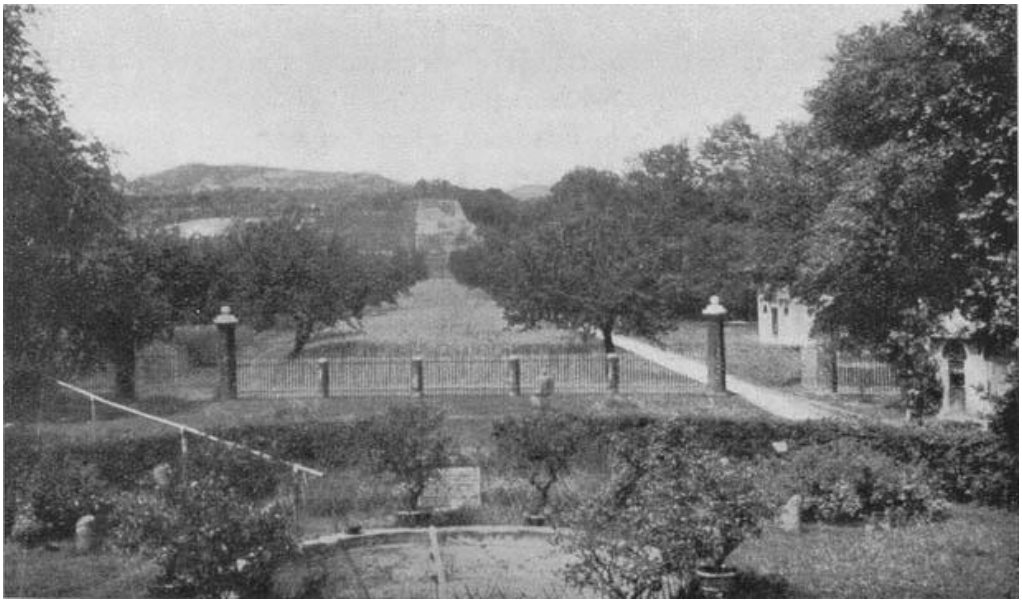


Figure 3.2

Even if this experiment marked a very significant success for the innovation of the radio, it was just a starting point. Since that moment, Marconi continued to experiment with his system in order to improve it. To do this he travelled to other countries such as England where he decided to settle. In this way, he had the opportunity to come into contact with several personalities including politicians and institution members.
These connections allowed him to receive support, both financial and personal, thereby assisting in the development process begun some years previously.

The climax of this process was reached on December 12, 1901 during the famous "Big Thing" [68], when Marconi received a weak signal, three points indicating the letter S in the Morse code, transmitted from the United Kingdom to Canada going through the Atlantic Ocean.

[68] Valotti, Dalle Donne, *Marconi, Il ragazzo del wireless*, cit., p. 73.

Messages received by Marconi wireless telegraphy.

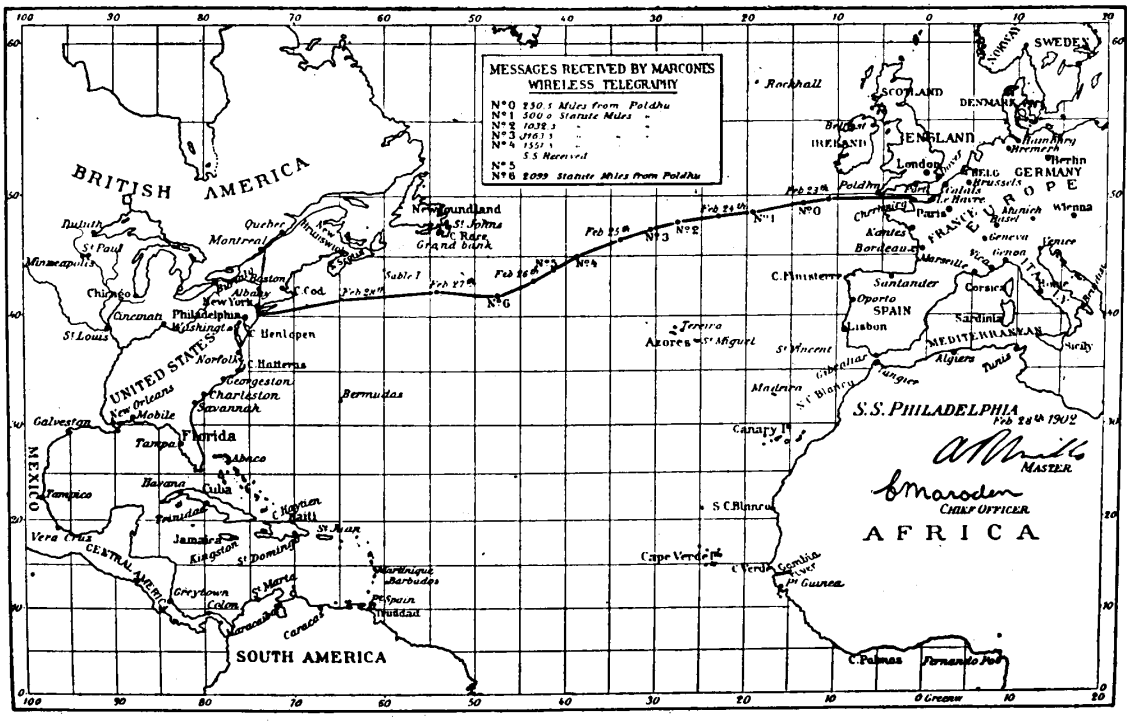


Figure 3.3

This achievement represented an incredible triumph for Marconi because, in addition to delivering a fundamental innovation to humanity, he had been able to overcome his opponents and so became the first innovator: this experiment was a propeller for the commercialization of his system and moreover for the acquisition of new investors useful for the development of the radio.

These obviously are not the only moments which characterized the development of the radio, but I decided to choose them because, reading the bibliography of Marconi, these are the moments in which all the commitment, passion and strategy used by him in order to bring to light his dream, leaving in this way an indelible mark in human history, emerged clearly.

3.2.2 The success & the Nobel prize. [69]

The success he attained with the experiments and the ongoing development of the radio made Marconi one of the most popular men of his time. The public was divided in two different groups: his supporters, grateful to him and to his scientific discoveries, and his opponents, the majority of them members of the scientific community, who greeted Marconi and his fame with astonishment and scepticism. This situation was replicated on the occasion of his Nobel Prize nomination in 1901, when Marconi was proposed by Pietro Blaserna, one of the most famous Italian physicists, a strong supporter of Marconi as evidenced by the award of the Matteucci Medal. [70]

That same year he did not achieve Nobel success but his fame grew so much as to set up several dinners and events in his honour: one of the most important was the one organized by the American Institute of Electrical Engineers, which was his consecration.

From that moment on, a period of hard work, further development and investment began in order to inaugurate commercial service. As early as 1902 Marconi journeyed between America and Europe in order to show his radio equipment, demonstrating the reception of transatlantic signals. [71]

By these demonstrations he derived the funds necessary for the improvements and one year later the he managed to send a complete telegram.

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[69] On this, see: J. M. Williamson, Innovation Policy in Telecommunications: Revisiting the Success of Guglielmo Marconi, *Federal Communications Law Journal*, 57, 345 (2005), pp. 345 – 349.
[70] Valotti, Dalle Donne, *Marconi, Il ragazzo del wireless*, cit., p. 98.
[71] G. Falciasecca, B. Valotti, *Guglielmo Marconi. Tra storia e cronaca*, Bologna, Pendragon, 2006, (Accessed via Google Play), p. 45.

First telegram sent from the America.

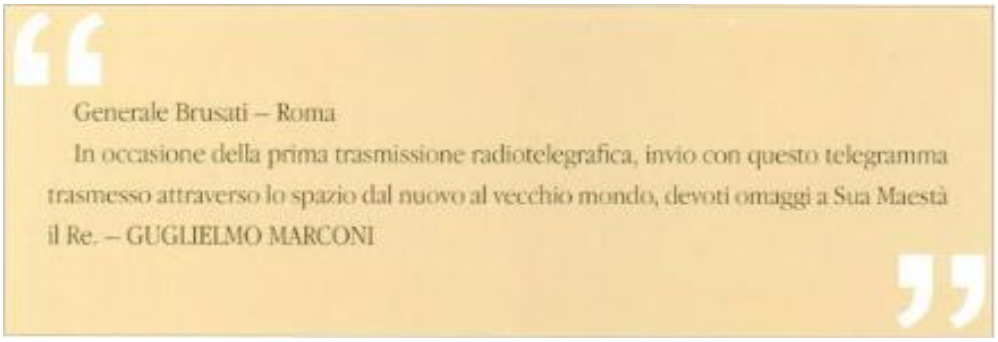
Generale Brusati – Roma
In occasione della prima trasmissione radiotelegrafica, invio con questo telegramma trasmesso attraverso lo spazio dal nuovo al vecchio mondo, devoti omaggi a Sua Maestà il Re. – GUGLIELMO MARCONI

Figure 3.4

The success of his wireless system was such that radios were installed in several ships for military but also civil use. An example can be illustrated by the telegram sent in 1909 on the occasion of the shipwreck of the Republic and the rescue of passengers on board the transatlantic liner.

This episode demonstrated once and for all the usefulness of the Marconi innovation and in the same year he was nominated, winning the Nobel prize in recognition of his contribution in the development of the wireless system.

The commercialization of the radio was moving along fine and great attention was showered on Marconi. The New York Times, on 18 October 1907, went to press in this way:

The New York Times, "First wireless press message across the Atlantic".

"All the News That's Fit to Print."

The New York Times.

THE WEATHER.

NEW YORK, FRIDAY, OCTOBER 19, 1907.—EIGHTEEN PAGES

BANK HERD IS SAFE IN HEINZE CRASH

Clearing House Committee Finds the Mercantile National in Sound Condition.

BATTS BANK CLOSED DOORS

AMERICAN NOTE, FOR BOER ...

ARMY WOMAN'S DAYS ENDED.

CONRIED AND BOYD AT ODDS IN STOCKS

Opera Director's Brother Hopes that the Dealings of the Opera House Equivalent.

PROFIT FIGURES WIDE APART

FIRST WIRELESS PRESS MESSAGE ACROSS THE ATLANTIC

Signalling the Opening of the Marconi Service to the Public, and Conveying a Message of Congratulation from Privy Councillor Baron Avebury, Formerly Sir John Lubbock.

THE WESTERN UNION TELEGRAPH COMPANY.

RECEIVED at 2:25 o'clock by Henry Hoff.

Times, New York.

MARCONI CONGRATULATES THE NEW YORK TIMES

FROM THE PRIME MINISTER OF FRANCE.

WIRELESS JOUR... TWO WORLD...

MISS VANDERBILT MUST TAKE CHANCES

A HIGH OFFICIAL SAYS SO

J. PIERPONT MORGAN'S ...

DEUTSCHLAND STUCK CLOSE TO HER PIER

Capt. Kierhoff Gives Up Attempt to Get Liner Off After Three Hours' Work.

PASSENGERS SENT TO SEA

ROCKEFELLER TOO SAVING.

SAVED BY SENATOR NEWLY.

GEN. SMITH FORCE SLAYER.

MARSH ON THE STAND.

THE ISSUE OF THE NEW YORK TIMES contains AUTHOR'S LIST NUMBER of The New York Times Saturday Review (FIRST SECTION)

Figure 3.5

From this moment forward, the fame and the use of the Marconi wireless system grew greater and greater, becoming the world's major producer and supplier for the radio system.

He was conquering the world.

3.3 The radio development and the government. [72]

The relationship between Marconi and the State has been important and productive since the early days. At least at the beginning, this was possible thanks to his father, Giuseppe, and to his great network. The first call was for the General of the Italian Army, Annibale Ferrero, who was the Italian Ambassador in London and contacted by the US consul Carlo Giardini, a friend of the Marconi.

This one was the first contact Marconi had with a state official, but from this moment forward there would have been plenty more. Actually, the first contact at government level took place two years before, in 1895, directly with a Minister of the Italian government for Mail and Telegraph. The aim of this connection was to find the conspicuous resources relevant for the development of his innovation because Giuseppe Marconi, at that moment the sole financier, was no longer enough.

Unfortunately, the Minister did not get the opportunity and Marconi moved towards another country, England, where he had some relations due to his mother's Irish origin. Here since the beginning he found several interested people who understood the great potential of his innovation.
One of the most important was William Henry Preece, General Post Office chief engineer, who proved to be interested in and helpful to Marconi, making available the laboratories of the Office in order to conduct further experiments.
The partnership continued and Marconi could count on laboratories, equipment and moreover employees of the Office in a manner that could help him.
This represented an important support system for Marconi, who was always looking for new investors in order to continuously develop the radio.

The same Preece gave him the opportunity to make experiments with his innovation also outside the laboratories with some tests in the sea using two steamers, in order to analyze the behavior of the system in a different environment.

[72] On this, see: G. Morolli, G. Nanni, *Guglielmo Marconi, esploratore dell'etere*, Caravaggio (BG), ABE, 2004.

These tests were preparatory for several presentations of the system in front of the members of the Royal Society of Sciences in order to demonstrate its usefulness in the navigation sector for example for collision avoidance in case of fog.
The UK was particularly interested in Marconi and moreover in his innovation so much so as to increase the assistance for the young Italian and to organize, through Preece, other conferences where the improvement of the radio was illustrated and the network and fame of Marconi was increased.

The relationship with the UK was the first time a State entered directly into contact with Marconi, sustaining him and providing all the resources necessary. In this case the commitment of the State was still limited; in fact the role was merely financial without any indication regarding the path to follow in the development process.
This strategy proved to be very useful because there was the opportunity to have priority over others in the application of the radio system and in all its progress. On the other hand, it allowed the innovator some freedom to undertake any development path without any restriction.

Some months after the beginning of this cooperation, following a number of important improvements and the countless possibilities of development in several fields, Preece, on behalf of the British Government, proposed to Marconi an agreement for the transfer of the actual and future patents against the payment of £10000.

Marconi, albeit with some misgivings, turned down the proposal and simultaneously founded the company. However, the contacts with the British government did not stop. In fact, Marconi proceeded with his commercial operations in England in order to impose and to maintain the leadership in this new sector as confirmed by several episodes. These included demonstrations of the ship-to-shore connections, the connection across the English Channel, the tuning and magnetic detector design and the most renowned of all: "The Big Thing". [73]

Both the technical and commercial features of the radio were improving considerably,

[73] Falciasecca, Valotti, *Guglielmo Marconi. Tra storia e cronaca*, cit., p. 98.

and as early as 1902, 16 radio stations on the two Atlantic coasts and 54 passenger vessels equipped with permanent radio equipment, transpired as useful for both commercial and security operations, existed.

The stations were developing very quickly and, just one year later, all the major Navies were equipped with Marconi radio system; the data can be seen in the below box.

The commercialisation of the Marconi system.

IL SERVIZIO MARCONIGRAFICO IN INGHILTERRA

Londra, 5

- Guglielmo Marconi si trova sempre a Poldhu ove lavora con grande lena agli esperimenti di comunicazione colla stazione canadese di Table Head. Le condizioni di salute di Marconi lasciano qualcosa a desiderare e l'illustre inventore avrebbe molto bisogno di riposo. Ora Poldhu riceve benissimo ogni notte migliaia di parole da Table Head, ma per poter radiotelegrafare perfettamente a grande distanza occorreranno ancora circa tre mesi, durante i quali la stazione inglese sarà rinforzata da macchine potenti per trasmettere.

Il giornale il *Times* ha fatto un contratto colla compagnia Marconi per ricevere da Table Head quotidianamente, a una tariffa minima, diverse centinaia di parole le quali vengono spedite al Canada da New-York col telegrafo ordinario.

Circa l'apertura commerciale della stazione di Poldhu pel pubblico nulla è fissato essendo ancora pendente la controversia tra il *Post Office* e Marconi.

Intanto da per tutto aumentano gli impianti di stazioni Marconi. A tutto oggi la marina da guerra inglese ha 26 stazioni. Gli Stati Uniti ne hanno 5, la Germania 2, il Congo 2, le isole Hawai 6, l'Alaska 3, l'Havana e la Floridia una ognuna. Tutte queste sono stazioni di media potenza, quelle ultra potenti sono: una in Inghilterra, una in Canada e una negli Stati Uniti.

Le maggiori compagnie di navigazione sono già provviste di apparecchi Marconi. Ormai 120 piroscafi ne sono muniti. In questi giorni anche la Compagnia di Navigazione Generale Italiana ha fatto una convenzione per provvedere i suoi legni di radiotelegrafo Marconi.

Figure 3.6

Even the Italian government decided to invest in the Marconi system, and in 1902 the contract for the installation of the radio in the Italian Navy vessels began. Actually, the connection between Marconi and his home country had begun a few years before, in 1897, when at the invitation of the General Inspector of the Army Engineers Benedetto Brin Marconi came to La Spezia in order to demonstrate his innovation to the Navy Ministry, doing some experiments between San Bartolomeo and the tugboat n° 8. [74]

Guglielmo Marconi during the experiments in La Spezia.

Figure 3.7

After these experiments, there was a period of stop with the Italian government, which thought to develop the radio system – donated by Marconi in La Spezia – by itself in order to improve its efficiency extending the use to the Italian coastal stations and ships.

[74] V. Cantoni, G. Falciasecca, G. Pelosi, *Storia delle telecomunicazioni*, Volume I, Firenze, Firenze University Press, 2011, p. 142.

The outcomes unfortunately were not very satisfactory and as a result of the improvement made by Marconi and of the American and British success, the Italian Navy decided to acquire the receiving and transmission equipment produced by the Marconi production workshop. This happened in 1902 when Luigi Solari, a young officer, was shuttled to Chelmsford in order to purchase the radio-telegraphy equipment model 1901. [75]

In the same year, the news about the invention of the magnetic detector kicked off a new phase in the relationship with the Italian inventor, and by a decision of the King of Italy, Vittorio Emanuele III, the Italian Navy made available, at the request of Marconi, the Carlo Alberto vessel in order to perform experimental cruises.

It was an important opportunity for Marconi having regard to the financial difficulties of Marconi's Wireless whose resources were deployed in the creation of an international commercial structure.

The Carlo Alberto began its journey on the route Napoli – Poldhu – Kronstadt – Kiel – Ferol – Cadice – Gibilterra – La Spezia where Marconi had the possibility to experience several pieces of equipment in order to improve the scope of transatlantic communication. [76] The success obtained by this first experience persuaded the Navy Minister to continue the collaboration and to perform new experiments in the long-distance communication between the American and British stations.

The offer made by the Italian government was determined by different motivations: surely the brilliant results of the first campaign and the project presented by Marconi relating to the possibility of implanting a power-station in Italy in order to communicate with South America carried great weight. However, the chance to agree upon a convention for the free application of the wireless system for military purpose was the real motivation pushing the Italian government to give this huge financial and logistic support to the Italian innovator. [77]

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[75] *Ivi*, p. 146.
[76] Falciasecca, Valotti, *Guglielmo Marconi. Tra storia e cronaca*, cit., p. 108.
[77] *Ivi*, p. 109.

It represented a win-win situation: on one side the Italian government had the possibility to obtain the most sophisticated technologies without any economic outflow, gaining in both technological and reputational aspects towards the other countries – especially US and UK – which represented the most advanced states in the world. On the other side, Marconi, whose financial difficulties were on their way to impeding a massive commercialization of the wireless system, saw his home country as a stepping stone for the launch of an entrepreneurial strategy in a rapidly growing market.

Italy represented the best place to be for Marconi because of the significant investments done by the government in allowing him to continue with the development of the system and creating, at the same time, a commercial structure for his company with the aim of developing markets and establishing an international wireless network in a privileged position.

In fact, the geographic position of the country ensured that he was at the centre of the world-communication network, assuming the strategic role of communication node for Southern Europe with the possibility to penetrate new markets such as Portugal, Spain, Austria and Hungary and the Balkans.

The first step was the installation of the Coltano station – close to Pisa – considered essential for the communication between Italy and South America where were present many fellow countrymen. [78]

[78] *Ivi*, p. 110.

Opening of the Coltano station.

GUGLIELMO MARCONI
inaugura la stazione telegrafica di Coltano

PISA 20, sera - Ieri la stazione radiotelegrafica di Coltano è stata ufficialmente inaugurata da Guglielmo Marconi assistito dal marchese Solari, mettendola in comunicazione con le stazioni di Cligton (Irlanda) e Glacebay (Canada).

Marconi pochi muniti prima di iniziare la corrispondenza avvertì per telegrafo e per cavo sottomarino le due stazioni, ma queste dopo lunghissima attesa che vivamente aveva impressionato il Marconi hanno risposto sempre per telegrafo e per cavo sottomarino che la prima comunicazione era incomprensibile. Allora Marconi ha chiamato direttamente col mezzo di Coltano le due stazioni le quali hanno direttamente risposto che i segnali erano buoni e leggibili. Così il funzionamento di Coltano è stato ufficialmente inaugurato.

Marconi ha informato i ministri delle Poste e della Marina on. Calissano e Leonardi Cattolica.

Ecco il dispaccio inviato da Marconi all' on. Ministro Calissano:

"Ho l'onore di informare V. E. che la stazione di Coltano corrisponde tanto in trasmissione che in ricezione con le stazioni di Inghilterra e del Canada. Confido che tale notizia riesca gradita a V. E. che specialmente ha dedicato speciali e lusinghiere attenzioni a questo impianto".

L'on. Calissano ha subito risposto con questo telegramma:

"Mi affretto a ringraziarla della comunicazione che con così cortese pensiero ella mi ha fatto col suo telegramma odierno e che a mia volta mi farò un dovere oggi stesso di far nota ai miei colleghi del consiglio dei ministri. La notizia favoritami che la stazione di Coltano è oggi in grado di corrispondere tanto in trasmissione quanto in ricezione con le stazioni dell' Inghilterra e del Canada sarà appresa dai colleghi con grande soddisfazione come lo è per me, e lo sarà per tutto il paese che in questo nuovo impianto potente di comunicazioni radiotelegrafiche transoceaniche constata un nuovo trionfo del genio di V.S. ed un nuovo strumento di civiltà e di difesa a gloria e a fortuna della patria."

Teobaldo Calissano

Il ministro della guerra ha così telegrafato a Marconi:

"Invio i miei più vivi rallegramenti per il compimento della grandiosa stazione radiotelegrafica di Coltano che aggiunge un nuovo titolo di gloria a V.S. e permette all' Italia di mantenersi sempre prima nel nuovo canto aperto alla scienza dalla sua geniale invenzione. Distinti saluti

Leonardi Cattolica"

Figure 3.8

The relationship went on and in 1903, on the occasion of an event in honour of the Italian inventor where he had the opportunity to show off the latest improvements. Then there was the conclusion of an agreement under which the Italian government could freely use the Marconi patents reproducing the relevant equipment by itself, with the only contractual provision being to exclusively accept messages transmitted through Marconi's machines. [79]

The agreement turned out to be especially convenient for the Italian innovator because in this way he made sure the monopoly in the Italian market: even if the installation of fixed stations was taken over by the Italian State, all the ship-owners interested in communicating with Italy would have been forced to use equipment produced by Marconi Company itself.

As a result of this agreement, several new station installations followed. One of the first was the creation of a network in order to link the main Benadir stations among themselves and with the homeland. Another important installation regarded the ceremony for the communication between the Bari station and the Antivari one in Montenegro, which gave an opening to a more incisive Italian presence in the international communication sector. [80]

The close relationship between Marconi and various governments – the Italian and the British one mainly – has highlighted how the connection between private and public sector was useful, taking credit away from many theories which argued the difficulties to carry out an innovation working together.
Moreover, from this case it is possible to understand that the two parties could create an environment apt to push innovation into the market even with different targets but with the same development idea.

Studying this case I see the role of the players at that time, all those who made it possible, through the letters and telegrams exchanged between the two parties.

[79] *Ivi*, p. 113.
[80] *Ivi*, p. 114.

In the next paragraph, I am going to present and to analyse some of them, so as to support the theoretical argument.

3.4 The documents.

The letters I am going to present come from the archives of the Accademia Nazionale dei Lincei in Rome, one of the largest and most important archives, regarding the history of Guglielmo Marconi and his relationship with institution and persons.

These letters lie at the heart of my final dissertation because, in addition to being a genuinely authentic evidence of history and of what happened some years ago when an Italian man took over the communication world, as was once known, they have stimulated an interest in the character of Marconi, getting me curious about the way in which the radio innovation turned out and so deepening one of the most interesting fields: innovation.

From these letters, I was able to rebuild the entire history of radio development, the work of Marconi - trying to match his strategy with the theories written and promulgated in the past by important scholars - and discovering that the reality was not like the one is to be found in books.
I discovered a method in which public and private sector can collaborate in order to create a new value for humanity while preserving their different goals. Furthermore, I found out that the innovation of the radio is not the only new technology created and developed with a partnership between these two players, but that many others have had the same approach such as those presented in the first chapter.

These letters help me to support my thesis and are very precise and accurate in describing the relationship between States and Marconi.

I would like to present them as a stream, in which the constant is the close connection between Marconi and the government in which one supports and relies on the other.

The UK and Italy have always been the two soul countries of Marconi: with these two nations, he had his most important relationships from the beginning of his scientific life. As written above, the UK was the first country where he developed his initial political contact with the General Post Office, which gave him the support for the development of an embryonic innovation.

Then there was Italy, with which he developed a well-advanced system allowing him to export it throughout the whole world.

Marconi always preserved his relationship with these two countries and this is witnessed by an exchange of several letters.

An example can be illustrated by the request made in 1935 by Marconi to the Italian army (figure 3.9), to the Minister of War, asking if he could carry out some new experiments to further develop the devices already bestowed on him. They gladly accepted the request by providing all the necessary support to the Italian innovator.

Letters sent to General Guasco.

2772

Roma, 2 maggio 1935/XIII

Caro Signor Generale

Ella ricorderà il mio desiderio di eseguire certe esperienze speciali con micro-onde, in presenza di S.E. il Capo del Governo e Ministro della Guerra, coi camions militari recentemente equipaggiati di tali apparecchi dalle Officine Marconi di Genova.

A tale scopo gradirei poter fare delle prove preliminari, e Le sarei molto grato se volesse compiacersi mettere a mia disposizione uno di tali camions, lunedì prossimo facendolo trovare, alle 11 del mattino di quel giorno, nel giardino della Reale Accademia d'Italia, ove gli esperimenti potrebbero farsi senza intrusione di curiosi. Beninteso con l'autocarro dovrebbero venire gli operatori dell'apparecchio.

Non occorre aggiunga che sarò ben lieto di vedere anche la S.V., se le Sue occupazioni Le permetteranno di venire all'Accademia in quel giorno, o qualsiasi ufficiale che Ella volesse evèntualmente delegare. Sarebbero presenti i miei due ingegneri assistenti, signori Mathieu ed Isted, che ebbero già l'incarico del montaggio degli apparecchi sopra i camions.

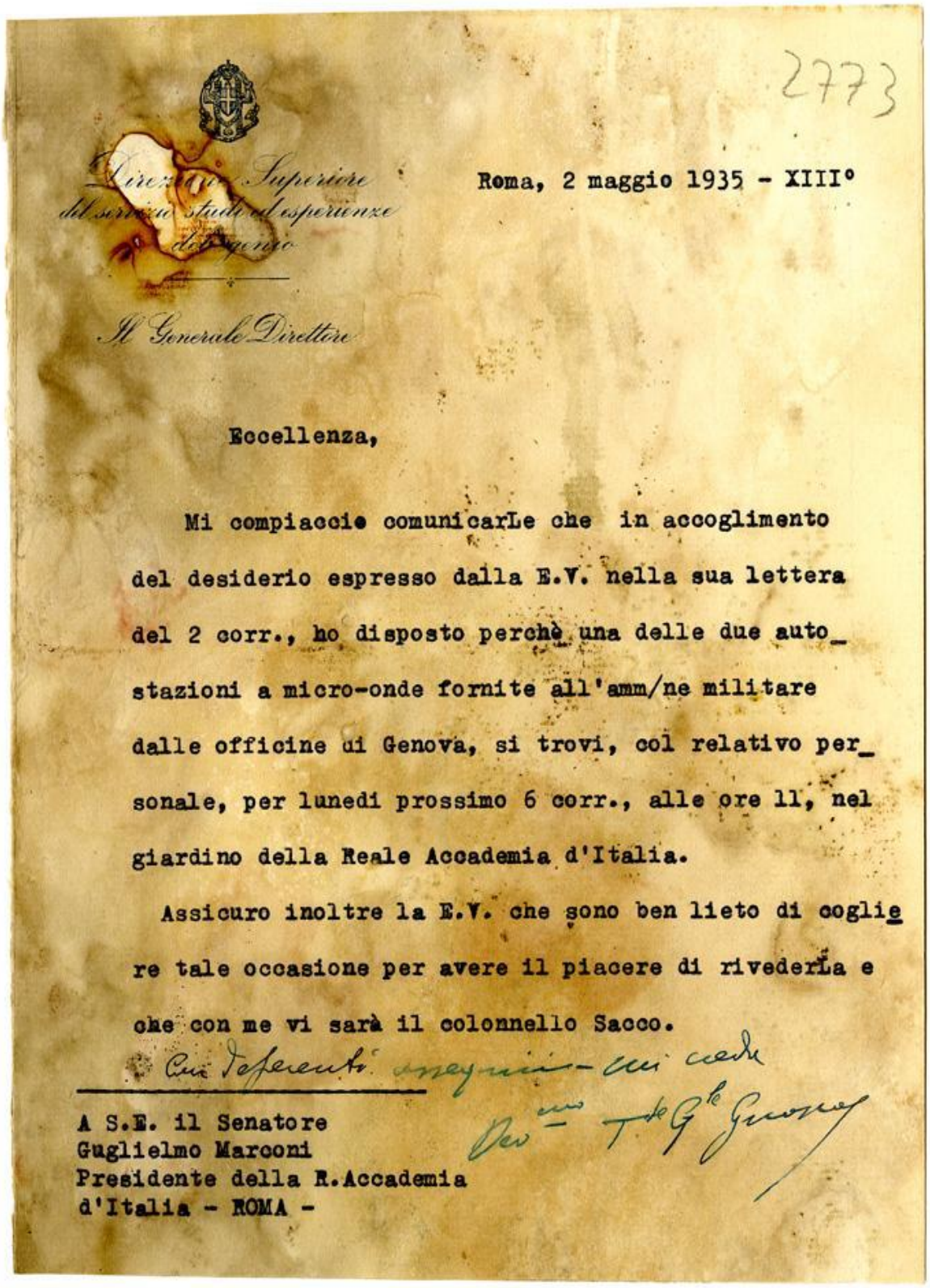
RingraziandoLa anticipatamente, Le porgo, caro Generale, i miei più cordiali saluti.

G M

Al Generale di Divisione Gr. Uff. Angelo GUASCO
Ispettorato Generale del Genio
Ministero della Guerra
ROMA

Figure 3.9

Letter received by General Guasco.



2773

Direzione Superiore del servizio studi ed esperienze del genio

Il Generale Direttore

Roma, 2 maggio 1935 - XIII°

Eccellenza,

Mi compiaccio comunicarLe che in accoglimento del desiderio espresso dalla E.V. nella sua lettera del 2 corr., ho disposto perchè una delle due auto_ stazioni a micro-onde fornite all'amm/ne militare dalle officine di Genova, si trovi, col relativo per_ sonale, per lunedì prossimo 6 corr., alle ore 11, nel giardino della Reale Accademia d'Italia.

Assicuro inoltre la E.V. che sono ben lieto di coglie re tale occasione per avere il piacere di rivederla e che con me vi sarà il colonnello Sacco.

Cui deferenti ossequi - mi creda

Dev.mo T. de G.le Guasco

A S.E. il Senatore
Guglielmo Marconi
Presidente della R.Accademia
d'Italia - ROMA -

Figure 3.10

From this letters (figures 3.9 and 3.10), it is possible to understand the close relationship that bound the two parties; it was a kind of collaboration where the one helped the other who ensured his availability in terms of technological devices and support.

On this matter, the exchange of letters held with General Foschini and General Pariani (from figures 3.11 to 3.15), respectively Sottocapo di Stato Maggiore e Sotto Segretario di Stato, with regards to the anti-aircraft devices is interesting.

Report received by General Foschini. (1/3)

Mod. 8

III 27.36

Ministero della Guerra

COMANDO DEL CORPO DI STATO MAGGIORE

SOTTOCAPO DI S. M. PER LA DIFESA TERRITORIALE

207 R. P.

28-6-37-XV

PROMEMORIA per S.E. MARCONI Gr. Cr. GUGLIELMO
Presidente dell'Accademia d'Italia = Senatore del Regno.

RISERVATO PERSONALE

SUNTO DELLE QUISTIONI PROSPETTATE VERBALMENTE

1°)- Ascoltazione degli aerei a scopo di allarme.

Mentre per le città interne al territorio nazionale è possibile, con l'ordinario servizio di avvistamento, ricevere in tempo le segnalazioni relative ad incursioni aeree, per le città costiere i mezzi di cui oggi si dispone per l'avvistamento rendono assolutamente tardive e perciò inefficaci le segnalazioni.

Occorrerebbe pertanto potere disporre di un apparecchio radio che, captando il rumore prodotto dagli aerei (motore, eliche) ovvero intercettando le irradiazioni dei magneti o con altro geniale sistema, fosse in grado di segnalare l'avvicinarsi di aerei nemici, alla distanza di almeno 50 - 60 chilometri.

La felice soluzione di tale arduo problema avrebbe una importanza decisiva per la difesa contraerea (possibilità di mettere tempestivamente in allarmi tutti i mezzi di difesa) e per la protezione antiaerea (allarme alla popolazione, oscuramento, occupazione dei ricoveri ecc.).

2°)- Costruzione e prove pratiche di trasmettitore e ricevitore di allarmi.

Per richiesta del dipendente Comitato centrale interministeriale di protezione a.a. la Società Marconi ha studiato il modo di trasmettere da una località centrale, sede di comando D.I.C.

./.

A.T. (1) il segnale di allarme a tutti i comuni compresi entro un raggio di circa 200 chilometri, per ottenere simultaneamente in essi l'oscuramento e l'attuazione di tutte le predisposizioni per gli attacchi aerei.

All'uopo, la Società Marconi ha ideato:

- un trasmettitore radiofonico della potenza di 400 Watt antenna, alimentato normalmente dalla rete di distribuzione delle città, ma alimentabile - occorrendo - con un gruppo moto-generatore autonomo (motore elettrico accoppiato a un motore a scoppio), per consentire la continuità di funzionamento nel caso di interruzione della corrente elettrica esterna;

- un ricevitore comune munito di un selettore del segnale di allarme, il cui compito è quello di raccogliere il segnale di allarme lanciato dall'apparecchio trasmittente e segnalarlo automaticamente, al personale di guardia, a mezzo di una suoneria.

Trasmettitore e selettore sono costruiti in modo che il primo, dopo aver dato il segnale di allarme, può passare in radiofonia e trasmettere gli ordini del caso ed il secondo, dopo aver fatto suonare la suoneria, dà la possibilità al personale di ascoltare le comunicazioni predette.

Nel preventivo di spesa la Società Marconi ha considerato il costo dei vari pezzi dell'impianto, escluso però quello delle alberature della stazione trasmittente, dovendo i sostegni dell'aereo essere studiati in relazione alla ubicazione dei trasmettitori ed ai locali disponibili.

Per la ricezione può servire qualsiasi apparato radio-ricevente, applicandovi il selettore dianzi accennato.

I prezzi segnalati sarebbero i seguenti:

./.

---

(1) - Difesa contraerea territoriale.

Report received by General Foschini. (3/3)

a) impianto trasmittente (suscettibile di una eventuale riduzione)..... £. 120.000

b) gruppo elettrogeno (motore Diesel accoppiato ad un alternatore trifase) ..... " 17.200

c) selettore del segnale d'allarme con suoneria, da applicare all'apparecchio ricevente ..... " 5.000

d) gruppetto elettrogeno quale riserva di alimentazione " 5.700

Ad evitare le lungaggini burocratiche inerenti alla richiesta di fondi, loro giustificazione, conseguenti quesiti e difficoltà, si fa appello all'alto patriottismo della Società Marconi perchè voglia a suo carico provvedere alla costruzione di un apparecchio trasmittente e due riceventi per poterli, possibilmente, esperimentare nelle grandi manovre terrestri, marittime e aeree che avranno luogo in Sicilia nella seconda quindicina del prossimo agosto.

3°)- Allarme radiofonico.

Gli attuali apparati radiofonici riceventi non hanno nessun dispositivo per la chiamata, ed obbligano il radiotelefonista a stare sempre in ascolto. Ciò porta alla necessità di aumento di numeroso personale specializzato e ad un logorio del materiale costoso, sottoposto a continua funzione.

Sarebbe perciò di somma utilità potere disporre di un organo di chiamata indipendente dallo stesso apparato e cioè non inserito nel circuito dell'organo radiofonico, in modo che sia l'apparato stesso e sia il radiotelefonista possano essere disimpegnati dall'ascolto continuo.

Roma, 28 Giugno 1937.XV.

IL SOTTOCAPO DI S.M. PER LA DIFESA TERRITORIALE

G. Foschini

Figure 3.11

Letters sent to General Foschini.

II. 2-36

Roma, 1 luglio 1937-XV.

Eccellenza,

La ringrazio per la Sua cortese lettera del 28 giugno u.s. e per l'acchiuso pro-memotia e Le confermo quanto ebbi il piacere di dirLe a voce, che farò cioè del mio meglio per cercare di venire incontro ai desideri da V.E. manifestati.

Voglia gradire, Eccellenza, i sensi della mia più alta considerazione

A S.E. il Generale F. FOSCHINI
Sottocapo di Stato Maggiore
per la Difesa Territoriale
Ministero della Guerra
ROMA

Figure 3.12

Letters received by General Foschini.

III. 27.36

COMANDO DEL CORPO DI STATO MAGGIORE

IL SOTTOCAPO DI S.M. PER LA DIFESA TERREA

Roma, lì 2 Luglio 1937.XV.

3 LUG 1937 Anno XV E.F.

Eccellenza,

La ringrazio molto della Sua gentile lettera.

Ritenendo opportuno che una eminente personalità quale la E.V. sia informata dell'indirizzo originale che si tende a dare in Italia alla difesa contraerea, Le comunico una circolare, di carattere riassuntivo, da me indirizzata or è un mese ai Prefetti del Regno che, nella loro qualità di Presidenti dei Comitati provinciali di protezione antiaerea, dipendono da questo Stato Maggiore.

Vivamente La prego di non disturbarsi a rispondermi. Sarà già molto che V.E. distragga una piccola parte del Suo pensiero sempre per leggere!

Voglia gradire i sensi della mia devozione.

Francesco Foschini

A Sua Eccellenza
MARCONI gr.cr. GUGLIELMO
Presidente dell'Accademia d'Italia
Senatore del Regno

R O M A

Figure 3.13

Letter received by General Pariani.

III. 27.36

Ministero della Guerra

IL SOTTOSEGRETARIO DI STATO

Roma, lì 29 Giugno 1937.XV°

Eccellenza,

S.E. il Gen. Foschini mi ha informato della cordiale accoglienza che V.E. ha voluto fare alle domande formulate dallo Stato Maggiore per la difesa territoriale.

Fiducioso che la E.V. darà geniale soluzione a problemi che hanno tanta importanza per la difesa nazionale, Le esprimo i miei fervidi ringraziamenti e La prego di gradire i miei cordiali saluti.

IL SOTTOSEGRETARIO DI STATO

Pariani

A S.E.
MARCONI Gr. Cr. GUGLIELMO
Presidente dell'Accademia
d'Italia
Senatore del Regno
R O M A

Figure 3.14

Letter sent to General Pariani.

III. 27.30

Roma, 2 Luglio, 1937/XV.

Eccellenza,

Desidero ringraziare vivamente la E.V. per le gentili espressioni rivoltemi con Sua lettera del 29 giugno u.s., relayiva al colloquio da me avuto con S.E. il Generale Foschini, ed assicurarLa che sarà mia premura fare quanto è in me per trovare una soluzione alle domande formulate.

Voglia gradire, Eccellenza, i miei più cordiali saluti.

A Sua Eccellenza il Gen.PARIANI,
Sotto Segretario di Stato
Ministero della Guerra,
Roma.

Figure 3.15

In these exchange of letters (from figure 3.11 to 3.15), it is possible to notice how the opinion of Marconi was considered significant, but not from a military point of view, rather from a technological one. In fact, even if the case is presented and the difficulties detected in the battlefield emerge, the summary of the report is a request to Marconi to develop and to supply some devices in order to improve the quality of the communication so as to enhance the military defence.

Other letters testify the importance for the Italian State of the relationship established with Marconi who, even if he could appear to be "exploited", took advantage of this request for further developments to be used also for commercial purposes.

Another example can be found in the telegram sent by Lieutenant Colonel Guasco (figures 3.16 and 3.16) for the installation of a radio network near Rome and for the extension of a series of new experiments.

Letter received by General Guasco. (1/2)

2711

Roma, 21 ottobre 1935-XIII

Ministero della Guerra
Ispettorato del Genio

Eccellenza,

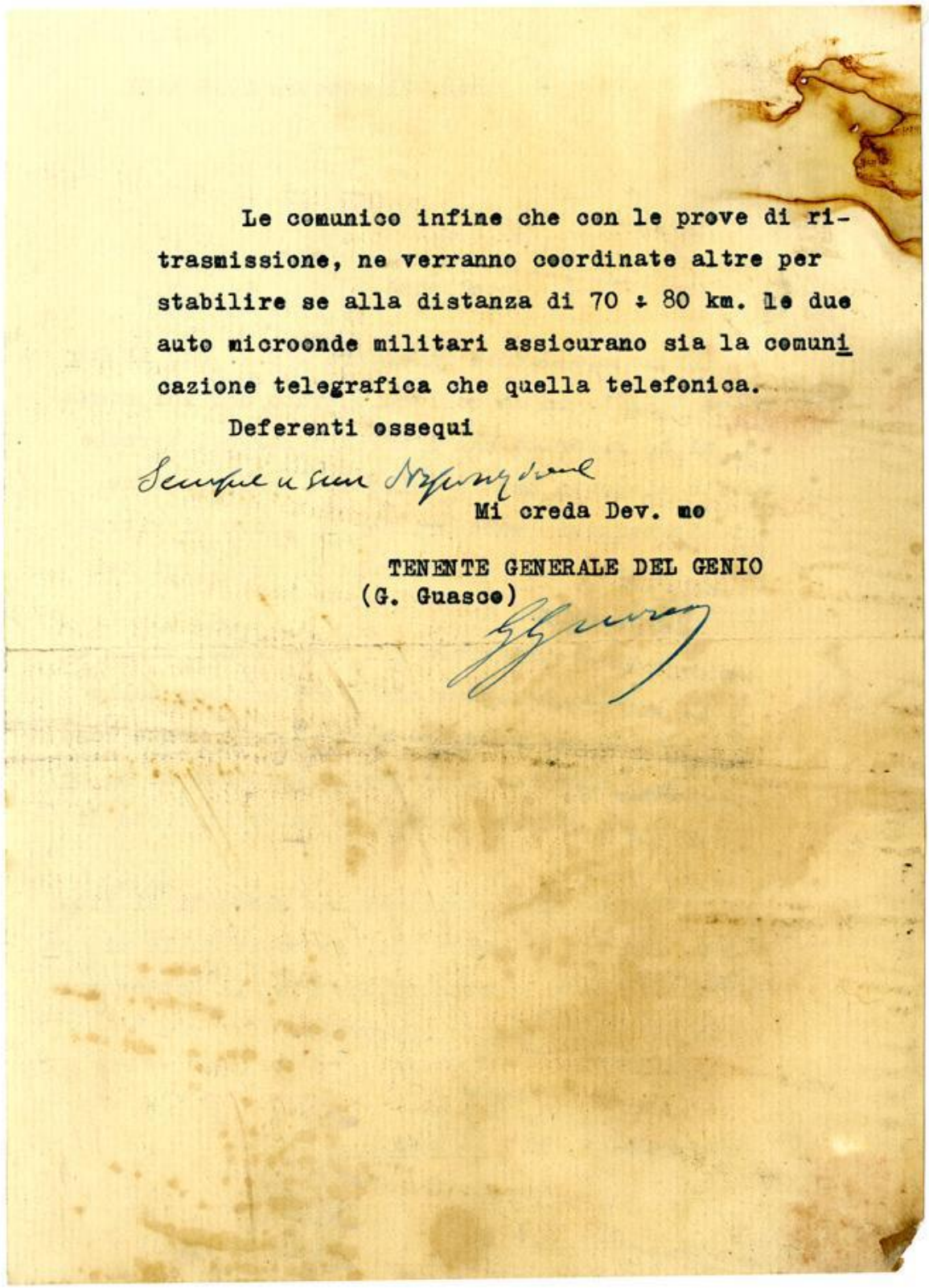
Credo mio dovere informare l'E.V. che il Marchese SOLARI, in un colloquio avuto con lui stamane, mi ha riferito che l'Ufficio Marconi avrebbe subito disposto per la sollecita realizzazione dei dispositivi necessari per le prove di ritrasmissione in senso unilaterale da eseguirsi nei dintorni di Roma.

Per quanto riguarda gli esperimenti di interferenza, e la continuazione o sospensione delle prove di propagazione fra Monte Nero e Monte Rosa (Livorno e Rapallo) il predetto Marchese mi ha comunicato che avrebbe atteso la determinazione di V.E.

Affinchè Ella abbia maggior elementi di giudizio, annetto a questa mia, la copia della mia relazione in data 16 ottobre che S.E. il Sottosegretario ha completamente approvato.

A S.E. il Senatore
Guglielmo MARCONI
Via Condotti, 11 ROMA

Letter received by General Guasco. (2/2)



Le comunico infine che con le prove di ritrasmissione, ne verranno coordinate altre per stabilire se alla distanza di 70 ÷ 80 km. le due auto microonde militari assicurano sia la comunicazione telegrafica che quella telefonica.

Deferenti ossequi

Sempre a sua disposizione

Mi creda Dev. mo

TENENTE GENERALE DEL GENIO
(G. Guasco)

Figure 3.16

Report received by General Guasco. (1/3)

2712

2 copie

RELAZIONE SULLE ESPERIENZE CON LE STAZIONI MARCONI
A MICROONDE

In vista del prossimo ritorno di S.E. Marconi dal Suo viaggio nel Brasile, lo scrivente ritiene utile rendere noto tutto ciò che è stato fatto in merito alle esperienze con microonde dalla data degli accordi intervenuti a S.Margherita fra S.E. Marconi e il sottoscritto ed approvati da S.E. il Sottosegretario.

Le prove sul comportamento delle microonde agli effetti del collegamento radiotelegrafici e radiotelefonico ebbero inizio il 14 settembre u.s. e furono continuate nei giorni 28 settemb. 4,5,12 ottobre utilizzando i due trasmettitori impiantati a Montenero (Livorno) ed a Sestri Levante e i due ricevitori installati a Monterosa (Rapallo) e S.Margherita Ligure. Sono stati ottenuti i seguenti risultati:

1°) Il collegamento radiotelegrafico fra Montenero e Monterosa (distanza 130 Km. in linea d'aria con visuale diretta) è stato sempre effettuato con buona intensità dei segnali, sia durante il giorno, che durante la notte, ad eccezione delle ore comprese all'incirca fra le 12 e le 15 in cui i segnali diventano debolissimi e quasi incomprensibili.

2°) Il collegamento radiotelefonico fra le medesime località suddette è stato sempre incerto per cui non si può fare affidamento su un servizio regolare a tale distanza.

3°) Il collegamento fra Sestri Levante e S.Margherita Ligure (distanza 15 Km. in linea d'aria con visuale diretta) è stato sempre effettuato, sia in telegrafia, sia in telefonia, con

2713

forte intensità di ricezione in modo da assicurare un per_ fetto servizio sulle 24 ore.

4°) Durante le esperienze di cui sopra è stato osservato che il collegamento si effettua nelle migliori condizioni disponendo paralleli fra di loro gli assi dei dipoli del trasmettitore e del ricevitore e che in dette condizioni di parallelismo il massimo assoluto di intensità di rice_ zione si ottiene allorchè i due dipoli sono disposti ver_ ticalmente.

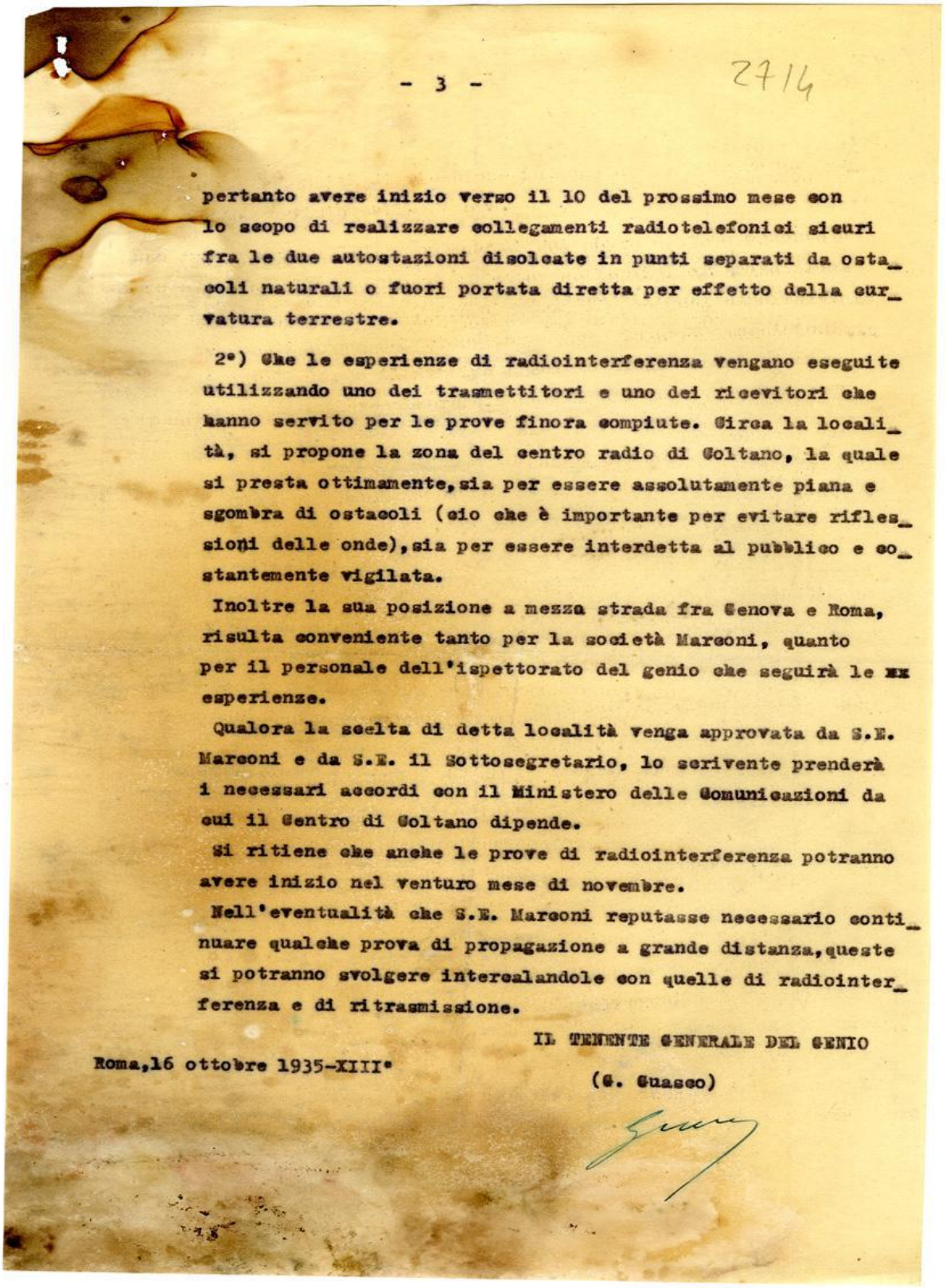
Con gli assi dei dipoli disposti fra di loro a 90°, i segnali si annullano completamento quando le stazioni sono al limite di portata, come si è verificato fra Montenero e Monterosa, mentre si riducono fortemente d'intensità quando le stazioni sono a breve distanza, come si è verifi_ cato fra Sestri Levante e S.Margherita Ligure.

* * *

In merito allo svolgimento ulteriore del programma con_ cordato in data 2 settembre con S.E. Marconi ed approvato da S.E. il Sottosegretario, programma che contemplava, ol_ tre allo studio della propagazione, anche esperienze di ritrasmissione,mediante stazioni ripetitrici,ed esperienze di radiointerferenza (sbarramento a microonde), il sotto_ scritto propone:

1°) Che le prove di ritrasmissione siano eseguite nei dintorni di Roma utilizzando le due autostazioni Marconi acquistate dall'amm/ne militare, disponibili presso la officina mil.R.T., e una stazione ripetitrice che la socie_ tà Marconi potrà (secondo accordi intervenuti fra lo seri_ vente e i tecnici della società stessa) approntare per i primi giorni del venturo novembre. Le esperienze potrebbero

Report received by General Guasco. (3/3)



- 3 -

2714

pertanto avere inizio verso il 10 del prossimo mese con lo scopo di realizzare collegamenti radiotelefonici sicuri fra le due autostazioni disolcate in punti separati da ostacoli naturali o fuori portata diretta per effetto della curvatura terrestre.

2°) Che le esperienze di radiointerferenza vengano eseguite utilizzando uno dei trasmettitori e uno dei ricevitori che hanno servito per le prove finora compiute. Circa la località, si propone la zona del centro radio di Coltano, la quale si presta ottimamente, sia per essere assolutamente piana e sgombra di ostacoli (cio che è importante per evitare riflessioni delle onde), sia per essere interdetta al pubblico e costantemente vigilata.

Inoltre la sua posizione a mezza strada fra Genova e Roma, risulta conveniente tanto per la società Marconi, quanto per il personale dell'ispettorato del genio che seguirà le esperienze.

Qualora la scelta di detta località venga approvata da S.E. Marconi e da S.E. il Sottosegretario, lo scrivente prenderà i necessari accordi con il Ministero delle Comunicazioni da cui il Centro di Coltano dipende.

Si ritiene che anche le prove di radiointerferenza potranno avere inizio nel venturo mese di novembre.

Nell'eventualità che S.E. Marconi reputasse necessario continuare qualche prova di propagazione a grande distanza, queste si potranno svolgere intercalandole con quelle di radiointerferenza e di ritrasmissione.

IL TENENTE GENERALE DEL GENIO

Roma, 16 ottobre 1935-XIII°

(G. Guasco)

Figure 3.17

I found these letters (figures 3.16 and 3.17) very interesting because, in addition to testifying to the close relationship between Marconi and the State concerning the commercial sector and so the spread and the installation of a new radio station, it is possible to notice even the scientific one where Marconi is the one responsible for the research and is updated by the Lieutenant about the progress achieved during the experimental period. [81]

Even with the Ministry of Communication the connection was very close and this can be demonstrated by some letters (an example can be represented by figure 3.18) in which the General Director of Post & Telegraph Admiral Giuseppe Pession sends several graphs regarding the radio connection issues in the last months.

[81] On this, see: G. Marconi, *"Per il Premio Nobel" in Scritti di Guglielmo Marconi*, Roma, Reale Accademia d'Italia, 1941.

Letter received by the Ministry of Communication. (1/3)

Ministero delle Comunicazioni

AMMINISTRAZIONE DELLE POSTE E DEI TELEGRAFI

IL DIRETTORE GENERALE

ROMA 18 MAG. 1934 Anno XII

19 MAG 1934 Anno XII

Eccellenza,

Mi pregio di trasmettere all'E.V. gli allegati grafici che si riferiscono alle emissioni r.t. su varie lunghezze d'onda in questi ultimi mesi.

Più particolarmente sono state prese in considerazione le ricezioni ad onda corta.

Un gruppo di grafici é stato compilato dall'ufficio Radioelettrico della Società Italo Radio, sui collegamenti r.t. con Londra, Berlino, New York e Cairo; l'altro gruppo dà le curve di udibilità dei segnali di Coltano rilevati dai piroscafi delle linee col Nord America l'estremo Oriente ed il Sud Africa.

Con particolare ossequio.

A S.E. IL SENATORE GR.CORD.
MARCH. GUGLIELMO MARCONI
PRESIDENTE R.ACCADEMIA D'ITALIA
E C.N.R.
ROMA

Letter received by the Ministry of Communication. (2/3)

19

Le curve di udibilità di cui ai grafici allegati, sono state rilevate dalle Stazioni R T dei transatlantici Conte Verde, Rex, Giulio Cesare e Duilio rispettivamente adibiti alle linee dell' Estremo Oriente, del Nord America e del Sud Africa. Esse sono espresse in unità di forza di segnali, secondo la scala stabilita dalla Convenzione di Washington, e si riferiscono alle emissioni eseguite sulle tre lunghezze d' onda di 16,90 m, di 23,45 m e di 45,10 m dal trasmettitore I A C , installato presso la Stazione di Coltano Radio dell' Amministrazione delle PP e TT.

Per ogni giornata, i diagrammi sono relativi alla posizione della nave, nonchè alle ore ed alle lunghezze d' onda ricevute.

Letter received by the Ministry of Communication. (3/3)

I T A L O R A D I O

Servizio Tecnico

I grafici allegati rappresentano le velocità medie di ricezione ad automatico, realizzate presso l' Ufficio Radioelettrico della Società Italo Radio in Roma, sui collegamenti radiotelegrafici con New York, Cairo, Londra e Berlino, durante i mesi di febbraio, marzo ed aprile 1934 . Più particolarmente essi prendono in considerazione soltanto le ricezioni ad onda corta : durante gli intervalli che compaiono nei diagrammi, il servizio, pressochè continuativo nelle 24 ore della giornata, venne assicurato con collegamenti ad onde medie e lunghe.

Stabilita come segue l' equivalenza convenzionale delle velocità medie :

1 WPM / ZSO = 2 WPM / ZST = 2 WPM / ZWT ,

sono state riportate nelle ordinate dei diagrammi le parole ricevute al minuto, secondo la scala :

1 mm = 5 WPM / ZSO = 10 WPM / ZST = 10 WPM / ZWT

per i collegamenti New York - Roma e Cairo - Roma , e rispettivamente :

Figure 3.18

Marconi was not only the president of the Reale Accademia d'Italia, with the aim of promoting Italian intellectual activity, he was also an adviser and consultant for the Italian government and this role represented a great opportunity for him in terms of experimentation, funds and opportunities. [82]

The connection established with his homeland surely resulted in a great resource for both participants. While the government had the possibility to develop and improve its technological sector with limited financial outflow, Marconi succeeded in perfecting his innovation and spreading it throughout the entire world with the background support, both economically and politically, of a country: his country.

[82] On this, see: On this, see: D. Marconi, *My Father, Marconi*, New York, McGraw Hill, 1962.

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- **Figure 3.7**

Guglielmo Marconi during the experiments in La Spezia.

V. Cantoni, G. Falciasecca, G. Pelosi, *Storia delle telecomunicazioni*, Volume I, Firenze, Firenze University Press, 2011, p. 142.

- **Figure 3.8**

Opening of the Coltano station.

G. Falciasecca, B. Valotti, *Guglielmo Marconi. Tra storia e cronaca*, Bologna, Pendragon, 2006, (Accessed via Google Play), pp. 110 – 111.

- **Figure 3.9**

Letters sent to General Guasco.

Biblioteca dell'Accademia Nazionale dei Lincei e Corsiniana, *Archivio Guglielmo Marconi*, Busta 17/144 "Ministero Della Guerra, Roma", letter of G. Marconi to A. Guasco of 2 May 1935.

- **Figure 3.10**

Letter received by General Guasco.

Biblioteca dell'Accademia Nazionale dei Lincei e Corsiniana, *Archivio Guglielmo Marconi*, Busta 17/144 "Ministero Della Guerra, Roma", letter of A. Guasco to G. Marconi of 2 May 1935.

- **Figure 3.11**

Report received by General Foschini.

Biblioteca dell'Accademia Nazionale dei Lincei e Corsiniana, *Archivio Guglielmo Marconi*, Busta 33/11 "Ricerche sul radiorilevamento degli aerei", letter of F. Foschini to G. Marconi of 28 June 1937.

- **Figure 3.12**

Letters sent to General Foschini.

Biblioteca dell'Accademia Nazionale dei Lincei e Corsiniana, *Archivio Guglielmo Marconi*, Busta 33/11 "Ricerche sul radiorilevamento degli aerei", letter of G. Marconi to F. Foschini of 1 July 1937.

- **Figure 3.13**

Letters received by General Foschini.

Biblioteca dell'Accademia Nazionale dei Lincei e Corsiniana, *Archivio Guglielmo Marconi*, Busta 33/11 "Ricerche sul radiorilevamento degli aerei", letter of F. Foschini to G. Marconi of 2 July 1937.

- **Figure 3.14**

Letter received by General Pariani.

Biblioteca dell'Accademia Nazionale dei Lincei e Corsiniana, *Archivio Guglielmo Marconi*, Busta 33/11 "Ricerche sul radiorilevamento degli aerei", letter of A. Pariani to G. Marconi of 29 June 1937.

- **Figure 3.15**

Letter sent to General Pariani.

Biblioteca dell'Accademia Nazionale dei Lincei e Corsiniana, *Archivio Guglielmo Marconi*, Busta 33/11 "Ricerche sul radiorilevamento degli aerei", letter of G. Marconi to A. Pariani of 2 July 1937.

- **Figure 3.16**

Letter received by General Guasco.

Biblioteca dell'Accademia Nazionale dei Lincei e Corsiniana, *Archivio Guglielmo Marconi*, Busta 17/144 "Ministero Della Guerra, Roma", letter of A. Guasco to G. Marconi of 21 October 1935.

- **Figure 3.17**

Report received by General Guasco.

Biblioteca dell'Accademia Nazionale dei Lincei e Corsiniana, *Archivio Guglielmo Marconi*, Busta 17/144 "Ministero Della Guerra, Roma", letter of A. Guasco to G. Marconi of 16 October 1935.

- **Figure 3.18**

Letter received by the Ministry of Communication.

Biblioteca dell'Accademia Nazionale dei Lincei e Corsiniana, *Archivio Guglielmo Marconi*, Busta 17/145 "Ministero Delle Comunicazioni, Roma", letter of G. Pession to G. Marconi of 18 May 1934.

CONCLUSION

"Ci sono stati tre grandiosi momenti nella mia vita di inventore.
Il primo, quando i segnali radio da me inviati fecero suonare un campanello dall'altro lato della stanza in cui stavo svolgendo i miei esperimenti;
il secondo, quando i segnali trasmessi dalla mia stazione di Poldhu, in Cornovaglia, furono captati dal ricevitore che ascoltavo a San Giovanni di Terranova, dall'altra parte dell'Oceano Atlantico a una distanza di circa 3.000 km;
il terzo è ora, ogni qualvolta posso serenamente immaginare le possibilità future e sentire che l'attività e gli sforzi di tutta la mia vita hanno fornito basi solide su cui si potrà continuare a costruire."

[Guglielmo Marconi - dicembre 1935] [83]

The aim of this dissertation was to fill the gap between theory and history, demonstrating that not always normative theories are consistent with what happens in the reality because of changes in the context. Applying as universal hypotheses that fit with specific geographic areas and historical periods, is not the right manner to cope with history.

The case of the radio development can be considered a good example in order to help filling this gap because of two reasons: the presence of several studies about its evolution and, moreover, for the large quantity of authentic documents existing in the archives.

The opportunity to consult the letters written and received by Marconi gave me the opportunity to understand the relationships that there were behind the innovation process which led to the birth of the radio system, analysing the sources written by the

[83] Centro Italiano Sperimentazione ed Attività Radiantistiche – Sezione di Genova, Guglielmo Marconi http://www.cisargenova.it/guglielmo-marconi.php, date of referral 24 January 2017.

scholars from another point of view.

The letters have been the heart around which my dissertation has been structured, allowing me to analyse in a different and more contextualised way Marconi's history and relationships.

The case of the radio development, the relationships that Marconi established and the behaviour adopted by the British and Italian government are interpreted in the light of theory, trying to fill the gaps that emerge.

The approach that I decided to use to organise the dissertation could be seen as a flow where first I take into consideration the literature, the theories and different streams that characterised it, and then the case that allows to link the theoretical world with the historical one.

Even in the first chapter, the different streams are discussed chronologically, highlighting that one emerged as the evolution of the previous because of the change in the context.

The following chapters reconstruct the historical case comparing the events with the theoretical literature in order to fill the existing gaps.

All this work would not be possible without the great effort in studying and analysing the resources kept in the archives of the Accademia Nazionale dei Lincei in Rome because they allowed me to read and to go through the already existed books and studies about Marconi radio development without taking anything for granted, but contextualising all the sources and comparing them with what was written in the letters.

Commemorative plaque, Oropa.

Figure 4.1 [84]

[84] Radio Marconi, Marconi, http://www.radiomarconi.com/marconi/gm_docum.html, date of referral 24 January 2017.

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