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The European research agenda: the role of social sciences and humanities disciplines for innovation

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INTRODUCTION

The economic crisis has revealed the weaknesses of our political, economic, and social systems. Our points of strength (especially at the economic level) have become our most critical points. The high unemployment rate, along with the increase in the poverty rate, is on the list of burdens with which we have to cope. The former represents the basis of the growth of the latter. Therefore, this critical situation has pointed out the crucial role played by the European Union and the Member States in planning future development strategies to enable our societies to enter a new era of prosperity.

This social context has paved the way for the relevance of innovation, tools, and structures able to generate development. This thesis focuses on these aspects, analyzing first the concept of innovation along with its various facets (e.g. technological, social, and organizational) and definitions.

The objective is to clarify the borders of such a concept and to understand whether there is a possibility to provide a common and acceptable definition of innovation separately from those in specific scientific fields. Many authors' different definitions of innovation will be compared to obtain an overview of the state of the art. Then the role of the European policies linked to innovation will be highlighted, focusing on the principal tools able to exert a strong impact on the spreading of innovation in Europe: the European Framework Programme.

The latter will be examined, in the second chapter, in relation to their structures, priorities, and historical context. The aim is to offer a clear picture of the steps taken by the European Union in the realization and promotion of the research framework programs from 1984 (FP1) to the current Horizon 2020. Moreover, throughout the investigation of the European Framework Programmes, the emerging role that the social dimension has acquired over the decades in the priorities of the FPs will be taken into account. Thus, the research will consider its gradual inclusion from the slight provision in FP4 to the huge dimension provided in Horizon 2020 (third pillar – societal challenges).

As the last part of the thesis the role of the social science and humanities – SSH – in Horizon 2020 will be introduced as one of the mainstream themes in the European political debate. In particular, an examination of the concept of SSH embedding will be provided as well as a list of funded projects that can be taken as examples of the implementation of the social sciences and humanities.

The reason for this specific focus on the SSH as the final objective of my industrial Ph.D. course was to intercept financial opportunities at the European level (mainly looking at the framework programs) through the realization of specific activities related to social sciences and humanities

themes. The project has been carried out with a large enterprise situated in the Marche Region. The key factor that puts the SSH and their role in Horizon 2020 at the center of my research can be found in the nature of subjects promoted within my home university.

In fact, the University of Macerata is composed just of humanistic faculties (law, economics, psychology, history, social science, and philosophy), and in such a context the social sciences and humanities have gained great relevance, in particular since their promotion in FP7 and Horizon 2020.

This context gave my Ph.D. a multidisciplinary approach, as I was involved daily in different activities linked to the European funding programs, at both the university and the company, which were not attributable to any specific scientific field but transversal to many.

This thesis tries to summarize all these different aspects and experiences gathered along my industrial Ph.D. path and put them together in the unified context of the European funding programmes, which were my main field of research and work.

CHAPTER I

The role of innovation in European Union policies

The chapter aims to provide a perspective on the European policies related to the development of innovation and their implementation so far. A brief analysis of the main issues as well as of the remedial policies adopted is provided.

From a scientific point of view, the first chapter introduces the concept of innovation in all its different facets, giving prominence to the social innovation concept and how it has gained relevance over the decades. A literature review is provided to identify the most comprehensive definition of innovation (a cross-sectorial definition).

The main objective of the last part of the chapter is to explain which players have a relevant role in fostering and spreading innovation throughout Europe and which conditions can encourage or discourage innovation. In this respect, among the several actors of society who play a relevant role in fostering innovation, the focus is placed on the new role of universities and how they have adapted themselves to the emerging social needs.

At the end of the chapter, the partnership between universities and companies as an example of an engine towards the promotion and propagation of innovation (not only technological) in Europe is described and a brief overview of the triple-helix model is presented.

1.1. Policies for growth: the European political and economic background

The European Union has been facing one of the worst economic crises to have overturned the paradigms of our societies and given us a wake-up call concerning the need for a change in mindset. The negative impact on Member States' economies and lifestyles was strong and forced national governments to rethink their policies for growth (Glassner & Galgóczi, 2009).

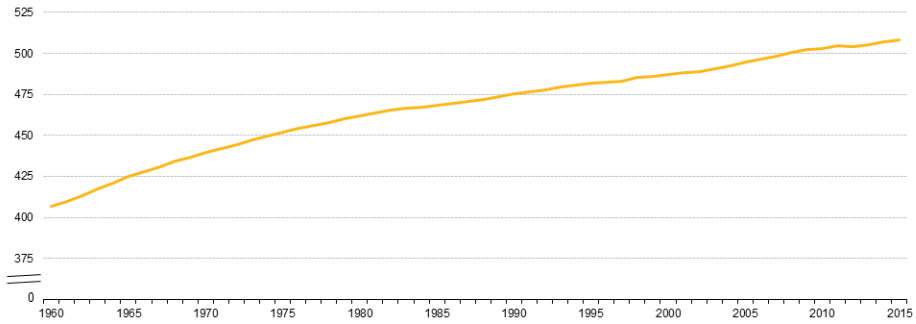
The world is moving fast, and Europe will face a set of currently unfolding trends, such as the demographic and social dimension (Hambleton, Savitch, & Stewart, 2003), with an imbalance in population growth that will lead to a worldwide population of around nine billion people, which obviously means a more crowded world and greater competition for resources (European Commission, 2012-a).

At the same time, the energy and environment dimension will point out more constraints on key resources as well as those in the economic and technologic fields, in which an accelerating shift of the world's center of gravity will slide eastwards. The territorial and mobility dimension and the

research, education, and innovation dimension will display both the challenges of sustainable transport and the need to fill the innovation gap.[1]

Graphs 1 and 2 were elaborated by Eurostat and show both the increasing European population in the 28 Member States of the European Union between 1960 and 2015 and the gross inland energy consumption in the EU28.

Graph 1 – The European population growth between 1960 and 2015 (million persons)

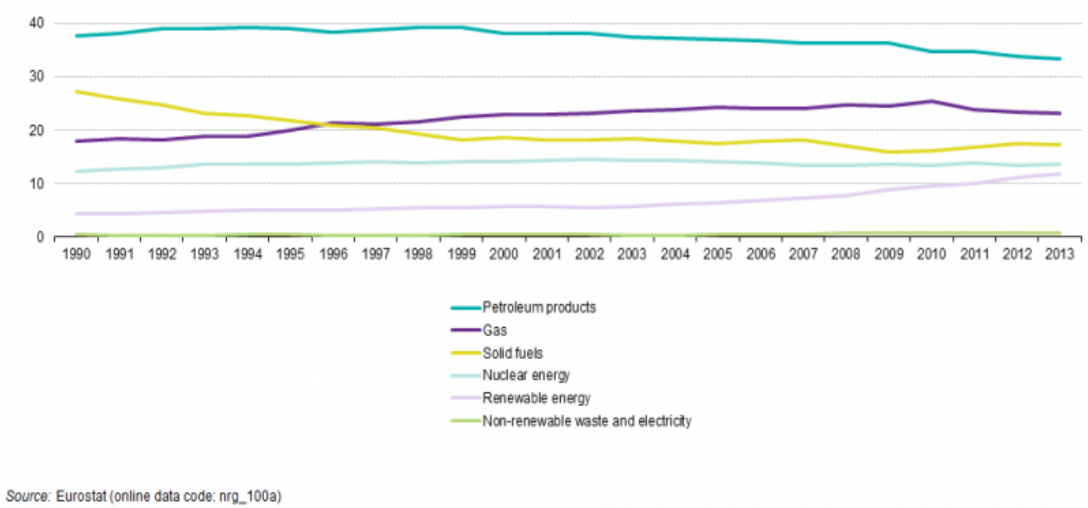


(*) Excluding French overseas departments up to and including 1997. Breaks in series: 2001 and 2010–12, 2014 and 2015.
Source: Eurostat (online data code: demo_gind)

Source: Eurostat

[1] The European Union still lags behind South Korea, the United States, and Japan in the global innovation performance, but the European Commission's Innovation Scoreboard shows that the EU and its 28 Member States have become more innovative in recent years. As a result, the EU has closed half of the innovation gap with the US. In addition, the biggest innovation increase is taking place in some of the EU's Member States that joined in 2004 and thereafter, making them the EU's biggest innovation potential. "There is great untapped potential for innovation in the Central and Eastern European Member States! We should use it to further enhance Europe's competitiveness and our position in the global innovation performance," stated Martin Kern, the EIT Interim Director.

Graph 2 – The gross inland energy consumption (1999–2013) – percentage of the total consumption



Source: Eurostat

These wide issues did not appear suddenly from the fog, but they are recognized as challenges today. Therefore, the European Union is experiencing a period of transformation and moving ahead with structural reforms (surely built on national efforts but based on European assets) to fight these weaknesses.

Firstly, the Europe 2020 strategy (adopted in 2010) aims to tackle these issues through its well-known priorities and objectives. The three priorities strongly entered the political debate and mindset at both the national and the European level by focusing on smart, sustainable, and inclusive growth. Moreover, the five objectives provided by the Europe 2020 strategy set out the agenda for the future steps:

i) 75% of the population aged 20–64 should be employed;
ii) 3% of the EU's GDP should be invested in R&D;
iii) The "20/20/20" climate/energy targets should be met;
iv) reducing school dropout rates to below 10%, with at least 40% of 30–34-year-olds completing tertiary education;
v) ensuring that 20 million fewer people are at risk of poverty or social exclusion (European Commission, 2012).

The objective of the strategy is to make the Member States aware of the future perspectives shared at the European level and enable them to be forward looking in their national policy trajectories. To

catalyze the progress under each priority and accelerate the improvements, the European Commission has put forward seven flagship initiatives.[2] In terms of encouraging and fostering innovation among the Member States, the Flagship Innovation Union[3] initiative is the most relevant.

The Innovation Union was launched in 2010 to build on Europe's strengths and address its weaknesses with respect to innovation, thereby making Europe more competitive in times of budgetary constraints, demographic change, and increased global competition. It acts notably by covering the role of the public sector in boosting innovation by setting the right framework conditions and acting as an innovator itself.

As an innovative element of the Innovation Union, there is a more strategic and broad approach to innovation that includes actions that aim to tackle both the supply-side and the demand-side elements of the innovation eco-system: the public sector, businesses, academia, and finance (European Commission, 2015, p. 6). Responsibilities and actions are equally assigned among the actors with the ability to shape the framework conditions for innovation, from the European Commission to the Member States and regional governments as well as other relevant stakeholders.

Youth on the Move[4] is another flagship initiative that aims to enhance the performance of education systems and to facilitate the entry into the labor market, setting out a comprehensive package of policy initiatives on education and employment for young people in Europe.

The main objectives are to improve young people's education and employability, to reduce the high level of youth unemployment, and to increase the youth employment rate – in line with the wider EU target of achieving a 75% employment rate for the working-age population (20–64 years) – by making education and training more relevant to young people's needs, by encouraging more of them to take advantage of EU grants, and by persuading EU countries to take measures to simplify the transition from education to work (European Commission, 2010).

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[2] Europe has identified new engines to boost growth and jobs. These areas are addressed by seven flagship initiatives. Within each initiative the EU and national authorities have to coordinate their efforts so that they are mutually reinforcing. Most of these initiatives were presented by the Commission in 2010: the Digital Agenda for Europe, Innovation Union, Youth on the Move, Resource-Efficient Europe, the Industrial Policy for the Globalization Era, An Agenda for New Skills and Jobs, and the European Platform against Poverty.

[3] The Innovation Union is the most important policy package tightly related to innovation. Its progress and evaluation are contained in the European Commission's documents entitled *State of the Innovation Union*. The last 2015 report underlines the main achievements during the five years of application: "The Innovation Union succeeded in building momentum around innovation, mobilising stakeholders and mainstreaming innovation in key European, national and regional policies. Decisive actions have been taken on all commitments, but the response has been uneven throughout the Member States. Moreover, while the last steps towards full implementation are within reach, it is not certain that all legislative actions will be implemented or that they will deliver the intended impact. The commitments that require greater involvement of Member States appear to have progressed to a lesser extent, either because of the long legislative processes (e.g. directives ratification), or because they are less binding in nature."

[4] Youth on the Move is a clear and strong political response to the current extremely high young-generation unemployment rate in Europe. The main aim is to contribute to reducing the figure of over 5 million young people (under 25) who were unemployed in the EU-28 area in the second quarter of 2014, which represents an unemployment rate of 21.7% (23.2% in the euro area). This is more than twice the adult unemployment rate (9.0%). A total of 7.5 million young Europeans aged between 15 and 24 are neither in employment nor in education or training (NEETs).

The Digital Agenda for Europe[5] is the other relevant flagship initiative. The aim is to deliver sustainable economic and social benefits from a digital single market based on fast and ultra-fast Internet and interoperable applications. In other words it intends to speed up the roll-out of high-speed Internet and reap the benefits of a digital single market for households and firms (speeds 30 Mbps or above) by 2020, with 50% or more of European households subscribing to Internet connections above 100 Mbps (European Commission, 2010).

To achieve these objectives, the European Commission has made some suggestions that could enable better conditions:

- To provide a stable legal framework that stimulates investments in an open and competitive high-speed Internet infrastructure and in related services;
- To develop an efficient spectrum policy;
- To facilitate the use of the EU's structural funds in pursuit of this agenda;
- To create a true single market for online content and services (i.e. borderless and safe EU web services and digital content markets);
- To reform the research and innovation funds and increase support in the field of ICTs to reinforce Europe's technological strength in key strategic fields and create the conditions for high-growth SMEs to lead emerging markets and to stimulate ICT innovation across all the business sectors;
- To promote Internet access and take-up by all European citizens, especially through actions in support of digital literacy and accessibility.

To decouple economic growth from the use of resources and support the shift towards a low-carbon economy as well as increasing the use of renewable energy sources, the European Commission introduced the Resource-Efficient Europe flagship.[6]

At the EU level, the Commission aimed to mobilize financial tools (e.g. rural development and structural funds) as part of a concrete funding strategy to bring together the EU and the national

[5] Achieving a digital single market is one of the Commission's top priorities. DG CONNECT contributes to its implementation. The progress across Europe in digital policy is measured by the Digital Scoreboard. Other country-based actions help to carry out this task.

[6] Other measures have been implemented by the EU to reach the fixed objectives. Noteworthy are the acceleration and implementation of strategic projects with high European added value to address critical bottlenecks, in particular cross-border sections and inter-modal nodes (cities, ports, and logistic platforms) to complete the internal energy market and implement the strategic energy technologies (SET) plan. In addition, it has presented initiatives to upgrade Europe's networks, including the Trans-European Energy Networks, towards a European supergrid, "smart grid," and interconnections in particular of renewable energy sources to the grid (with the support of structural funds and the EIB). This includes promoting infrastructure projects of major strategic importance to the EU in the Baltic, Balkan, Mediterranean, and Eurasian regions. As the last important point, it aims to adopt and implement a revised Energy Efficiency Action Plan and promote a substantial program of resource efficiency (supporting SMEs as well as households) by making use of structural and other funds to leverage new financing through existing highly successful models of innovative investment schemes. This should promote changes in consumption and production patterns.

public and private funding instruments. This can be achieved through a set of measures such as infrastructure measures. Among them the early deployment of grid infrastructures of electrical mobility as well as intelligent traffic management and better logistics can help in pursuing the reduction of CO_2 emissions for road vehicles and for the aviation and maritime sectors.

The flagship initiative "An Industrial Policy for the Globalisation Era"[7] intends to improve the business environment, notably for SMEs, and support the development of a strong and sustainable industrial base that is able to compete globally.

The reasons that underlie the promotion of this initiative can be found in the difficulties that have struck industry and especially SMEs hard following the economic crisis. Moreover, all the sectors are facing the challenges of globalization and adjusting their production processes and products to a low-carbon global economy. The impact of these challenges differs from sector to sector; some sectors have to "reinvent" themselves, but for others these challenges represent new business opportunities.

The European Commission worked closely with stakeholders from different sectors (business, trade unions, academics, NGOs, and consumer organizations) and drafted a framework for a modern industrial policy with three goals:

- to support entrepreneurship;
- to guide and help industry to become fit to meet these challenges;
- to promote the competitiveness of Europe's primary, manufacturing, and service industries and help them to seize the opportunities of globalization and the green economy.

The European Commission has committed itself[8] to achieving these objectives, and it is working to establish an industrial policy creating the best environment in which to maintain and develop a strong, competitive, and diversified industrial base in Europe as well as supporting the transition of manufacturing sectors to greater energy and resource efficiency (European Parliament, 2011). In addition, the EU has adopted a horizontal approach to industrial policy, combining different policy

[7] Industrial competitiveness refers on one side to the ability of companies to compete in domestic and global markets; it relates on the other side to the capacity of EU countries to support the development of businesses. Competitiveness is a key determinant of growth and jobs in Europe, and it is very important for small and medium-sized companies (SMEs), which form the backbone of the EU economy.

[8] In addition to the mentioned objectives of the EU, to promote better the flagship "An Industrial Policy for the Globalization Era", there are seven other relevant points worth mentioning: i) to promote technologies and production methods that reduce natural resource use; ii) to promote the internationalization of SMEs; iii) to ensure that transport and logistics networks enable industry throughout the Union to have effective access to the Single Market and the international market beyond; iv) to develop an effective space policy; v) to enhance the competitiveness of the European tourism sector; and vi) to review regulations to support the transition of service and manufacturing sectors to greater resource efficiency, including more effective recycling, and so improve the way in which European standard setting works to leverage European and international standards for the long-term competitiveness of European industry. This will include promoting the commercialization and take-up of key enabling technologies. In conclusion, the aim is to renew the EU strategy to promote corporate social responsibility as a key element in ensuring long-term employee and consumer trust.

instruments (e.g. “smart” regulation, modernized public procurement, competition rules, and standard setting).

Special attention is being paid to the improvement of the business environment, especially for SMEs, particularly through reducing the transaction costs of conducting business in Europe. What is mentioned here represents just a small part of the several goals expressed in the initiatives.

The next flagship initiative is the “Agenda for New Skills and New Jobs.” The main aim is easy to understand: it aims to modernize labor markets and empower people to develop their skills throughout their life cycle, thus enabling our current and future workforce to adapt to new conditions and potential career shifts as well as reducing unemployment and raising labor productivity.

The ways in which the EU wants to achieve these results are diverse. First of all, it is defining and implementing the second phase of the flexicurity agenda, together with European social partners, for the sake of identifying better ways to manage economic transitions, to fight unemployment, and to raise activity rates. Secondly, the European Commission is adapting the legislative framework, in line with “smart” regulation principles, to evolving work patterns (e.g. working time and posting of workers) and new risks for health and safety at work.

Thirdly, and relevantly, it aims to facilitate intra-EU labor mobility and match the labor supply better with the demand with appropriate financial support from the structural funds, notably the European Social Fund (ESF), and to promote a forward-looking and comprehensive labor migration policy that will respond in a flexible way to the priorities and needs of labor markets.

Linked to this last point, there is an intention to give a strong impetus to the strategic framework for cooperation in education and training involving all stakeholders.

This should notably result in the implementation of lifelong learning principles (in cooperation with Member States, social partners, and experts), including flexible learning pathways between different education and training sectors and levels and reinforcing the attractiveness of vocational education and training.

The last flagship initiative within Europe 2020 is the “European Platform against Poverty.” Its aim is to ensure economic, social, and territorial cohesion, building on the current European year for combating poverty and social exclusion to raise awareness and recognize the fundamental rights of people experiencing poverty and social exclusion, enabling them to live in dignity and take an active part in society.

The EU intends to reach these goals through the transformation of the open method of coordination on social exclusion and social protection into a platform for cooperation, peer review, and exchange of good practice. It should become an instrument to foster commitment by public and private

players to reduce social exclusion and take concrete action.

Table 1 – The seven flagship initiatives under EUROPE 2020

1	INNOVATION UNION
2	YOUTH ON THE MOVE
3	A DIGITAL AGENDA FOR EUROPE
4	RESOURCE-EFFICIENT EUROPE
5	AN INDUSTRIAL POLICY FOR THE GLOBALIZATION ERA
6	AN AGENDA FOR NEW SKILLS AND JOBS
7	A EUROPEAN PLATFORM AGAINST POVERTY

While analyzing the flagships, it is possible to find a *fil rouge* linking the objectives proposed by each initiative: innovation. The concept of innovation crosses the flagships and their aims transversally, thus acting as the basis of the entire Europe 2020 strategy.

As a matter of fact, the European Commission has confirmed the crucial meaning of innovation in our context, underlining that, at a time of public budget constraints, major demographic changes, and increasing global competition, Europe's competitiveness, the capacity to create millions of new jobs to replace those lost in the crisis, and, overall, the future standard of living depend on the ability to drive innovation in products, services, business and social processes, and models. This is the reason why innovation has been placed at the heart of the Europe 2020 strategy (European Commission, 2011-b).

The above-mentioned Innovation Union initiative is surely the most representative strategy from which the European Commission's willingness to foster innovation throughout the 28 Member States emerges.

As is known, the Innovation Union aims to integrate a common strategic approach with clear and shared objectives that should be adaptable to the different contexts of the EU28.

The Innovation Union[9] gives a wide perspective on what is needed to face the challenges of our society and foster our potentialities.

Table 2 summarizes the ten core points of the entire Innovation Union, which exert a strong impact on all the European innovation policies.

[9] The "Innovation Union" is one of the seven flagships announced in the Europe 2020 strategy. It aims to improve the conditions and access to finance for research and innovation to ensure that innovative ideas can be turned into products and services that create growth and jobs (European Commission, 2011).

Table 2 – The crucial points of the Innovation Union strategy

1	The Member States need to continue to invest in education, R&D, innovation, and ICT
2	EU and national research and innovation systems have to be connected as much as possible
3	Excellence has to be the guiding principle for the sake of modernizing our education systems and attracting the top talented researchers
4	Researchers and innovators must be able to work and cooperate across the EU as easily as within national borders
5	Facilitating access to the EU enhances the leverage and boosts the framework program's contribution
6	Cooperation between academia and business sectors must be enhanced to gain more innovation from our research
7	Remove barriers for entrepreneurs to bring ideas to market and provide better access to finance, affordable IPR, and more resourceful regulation and targets
8	Tackle major societal challenges and boost the competiveness of the EU industry through the European Innovation Partnership[10]
9	Exploit our strengths in design and creativity
10	Open access to our R&D programs to work better with our international partners, which means both ensuring comparable conditions abroad and adopting a common EU front to protect our interests

From the analysis of these targets expressed through the flagships emerges the great relevance that the EU gives to academic, business, and governmental sectors in driving innovation throughout Europe. In fact, academia, business, and the public sector are the main beneficiaries of the investments allocated by the EU. Secondly, the EU asks for cooperation between them as a trigger to boost European growth.

The flagship initiatives and more generally the entire Europe 2020 strategy are delineative, not comprehensive. They represent an agenda, a vision of what the Commission would like the EU to look like in 2020. Moreover, it does not claim to be a "one-size-fits-all" approach but is a flexible tool to be adopted and adapted by each Member State.

Therefore, the European Commission suggests that these EU targets should be translated into national objectives and trajectories that are able to reflect the social, economic, and political contexts of each Member State.

[10] EIPs streamline, simplify, and coordinate better the existing instruments and initiatives and complement them with new actions where necessary. This should make it easier for partners to cooperate and achieve better and faster results than those that exist already. Therefore, they build on the relevant existing tools and actions and, when this makes sense, they integrate them into a single coherent policy framework. Flexibility is important; there is no "one-size-fits-all" framework (http://ec.europa.eu/research/innovation-union/index_en.cfm?pg=eip).

The EC is aware of the disparities in the levels of development and standards of living; nevertheless. it considers that the proposed targets can be relevant to all the Member States. As stated, the concept of innovation is a crucial element of the European Commission policies. Several authors[11] have tried to understand better what innovation means and whether it is possible to provide a comprehensive definition that is able to clarify the sometimes-abused term.

To gain a better understanding of the perspective of the European policies related to innovation and consequently the approach of the main funding instruments and tools that aim to foster and spread innovation throughout Europe, it is essential to deepen the concept of innovation.

1.2. The concept of innovation

Innovation may be considered as one of the hottest topics today in political and economic debates. In fact, innovation is constantly evoked as the main factor for growth, prosperity, and competitiveness:[12] "Innovation plays a vital role in our recovery and long term vitality. Our economic and social recovery requires innovation and competitiveness to create jobs and growth. Evidence shows that countries which invest in research and innovation have been the best equipped to get out of the economic crisis."[13]

Innovation can be interpreted as a very wide topic with different facets and meanings; therefore, it is complicated to define. What is surely accepted by many scholars and experts is that there is no unique definition of innovation that can be implemented in diverse scientific fields.

Innovation is a particularly elusive subject and is thus tough to define; furthermore, there is no easy mix, no *one-size-fits-all* solution, and no recipe *bonne a tout fair* (Granieri & Renda, 2012, p. 2). Additionally, the European Commission has recognized the ambiguity of the topic and confirmed the complicatedness of a homogeneous definition, advising, "… there is no one single definition. But as described in the Innovation Union plan broadly means change that speeds up and improves the way we conceive, develop, produce and access new products, industrial processes and services. Changes that create more jobs, improve people's lives and build greener and better societies" (European Commission, 2010, p. 1).

[11] Several authors have researched the concept of innovation and elaborated wide studies to provide a better understanding of this multifaceted concept. Among them are Peter Drucker with his work *Innovation and entrepreneurship* (1985), Michael Michalko with *Thinkertoys* (1991), and Nathan Rosenberg with *Inside the black box: Technology and economics* (1981).

[12] Relevant works focusing on this perspective have been developed by Nathan Rosenberg in his paper "Innovation and economic growth" (2004) and by Angelo Nicolaides in "Research and innovation – The drivers of economic development" (2014).

[13] Josè Manuel Barroso presented this perspective during his speech at the Second Innovation Convention held in Brussels. The Convention provides a platform on which experts and innovators can discuss the innovation in Europe. During the last Convention on 10–11 March 2014, more than 70 speakers from all over Europe were involved. http://ec.europa.eu/research/innovation-union/ic2014/index_en.cfm?pg=home

Moreover, currently there are multiple definitions of innovation that lead to an improvement of the unclear situation. Among the experts Cooper (1998) and Zairi (1994) underlined that one of the most sensitive challenges of innovation is the lack of a shared definition, which produces misunderstandings and uncertainty regarding the nature of innovation.

Therefore, a definition that conforms to the different disciplines would surely be helpful in gaining clarity and in improving the understanding; it will also enable researchers from different scientific fields to collaborate more closely.

The first influential definition has been attributed to Joseph Schumpeter in the 1930s,[14] which, from his economic perspective, gives five views of innovation: a) the introduction of a new product or a new species of an existing product; b) new methods of production or sales; c) the opening of a new market; d) the development of a new source of supply for raw material or other inputs; and e) a new industry structure, such as the creation or destruction of a monopoly position.

Meaningfully related to the concept of innovation is the definition of *creative destruction*,[15] elaborated by Joseph Schumpeter as a "process of industrial mutation, that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one" (Schumpeter, 1943, p. 83).

Following Schumpeter as progenitor, economists over the years have focused on two main sides of innovation: product and process. A product innovation is the action of bringing something new or something able to improve the quality of an existing product into a market, whilst a process innovation is a new method of making or delivering goods or services. From this perspective innovation can be defined as the application of a new idea to the products, processes, or other aspects of the activities of a firm that lead to increased value (Rogers, 1995).

Another relevant prospect in the innovation topic is the business point of view, which is naturally related to the economic perspective. For example, the Business Council of Australia[16] defined innovation as "something that is new or significantly improved, done by an enterprise to create added value either directly for the enterprise or indirectly for its customers" (Business Council of Australia, 1993, p. 3).

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[14] Joseph Schumpeter was an Austrian–American economist and social theorist. He was born in Triesch, Moravia (now in the Czech Republic), and educated at Vienna University. After visiting the United States as an exchange professor at Columbia University in 1913 and at Harvard University in 1927 and 1931, he received a permanent faculty appointment at Harvard in 1932 and became known for his theories of capitalist development and business cycles and for his views on the importance of entrepreneurs and innovation.

[15] A term coined by Joseph Schumpeter in his work entitled *Capitalism, socialism and democracy*, one of his most debated books.

[16] The Business Council of Australia facilitates the contribution of more than 100 of Australia's most successful business leaders to the development of public policy that supports long-term economic growth for the benefit of the nation and all Australians. The members, who number more than 130, determine the work program and policy positions through their participation in 4 policy committees, 4 special-issue task forces, and the BCA Board. Among the members worth noticing are Google, Coca-Cola, and McDonald's.

The *OSLO manual*,[17] released by the Organisation for Economic Cooperation and Development (OECD), set guidelines, fixed standards for the measurement of innovation, and offered its members a benchmark for innovation surveys and research. The last version of the manual[18] limited its definition of innovation to the first two categories outlined by Schumpeter (product and process), elaborating them from a technological viewpoint. As a matter of fact, it considered technological product and process (TPP) innovations that comprise technologically implemented new products and processes and significant technological improvements in products and processes. A TPP innovation has been implemented if it has been introduced to the market – product innovation – or used within a production process – process innovation (Holbrook, 2003).

To enlarge the perspective of the innovation definitions related to Schumpeter and to illustrate the diverse approaches used by many scholars, the following lines describe some examples.

Zahra and Covin (1994) proposed that "innovation is widely considered as the life blood of corporate survival and growth"; Bessant (2005), in greater detail, suggested that "innovation represents the core renewal process in any organization. Unless it changes what it offers the world and the way in which it creates and delivers those offerings it risks its survival and growth prospect."

Less recently but still applicable, Thompson (1965) stated: "Innovation is the generation, acceptance and implementation of new ideas, processes or services." More recently, a similar definition was proposed by Wong (2008), which argued that innovation can be defined as the effective application of processes and products that are new to the organization and designed to benefit it and its stakeholders.

A different and more comprehensive definition of innovation that moves beyond Schumpeter's first two guidelines was suggested by Kimberly (1981): "There are three stages of innovation: innovation as a process, innovation as a discrete item including products, programs and services; and innovation as an attribute of organizations." Apart from the economic perspective and focusing more on "newness" as the main characteristic of innovation, Van de Ven (1986) stated that: "As long as the idea is perceived as new to the people involved, it is an 'innovation' even though it may appear to others to be an 'imitation' of something that exists elsewhere."

Damanpour (1996) provided a detailed definition of innovation that has been quoted widely by scholars: "Innovation is conceived as a means of changing an organization, either as a response to

[17] The *Oslo manual* was first published in 1993 as a draft document by the OECD Committee of National Experts on S&T indicators (NESTI). The manual is both a textbook on the nature of innovation and the national system of innovation and a compendium of socio-economic questions on the nature of innovation in a free-market economy. http://www.oecd.org/sti/inno/oslomanualguidelinesforcollectingandinterpretinginnovationdata3rdedition.htm.

[18] The third edition of the *Oslo manual* was published in 2005 by the OECD.

changes in the external environment or as a pre-emptive action to influence the environment. Hence, innovation is here broadly defined to encompass a range of types, including new products".

From these last definitions, it is possible to understand that innovation does not belong exclusively to the science and technology field.

Innovation can emerge from diverse scientific disciplines, which define it in accordance with their own principles and peculiarities. Therefore, innovation can also be recognized within the social, artistic, administrative, educational, and sociological fields. For instance, in education Smith[19] considered innovation as a new approach that brings an improved result.

These innovations can be wide or large and mostly recognizable or entirely new and different. Similarly, in sociology the study of innovation is mainly focused on new organizational forms, the role of new social routines, and new social movements (Hill, 2010).

It is clear that there is an overlap of innovation definitions that make approaching the topic confusing. It can be useful to think about innovation as an abstract and liquid concept able to "take the shape" of the receptacle into which it is placed: a chameleon that adapts itself to the environment around it. In other words innovation is defined diversely from discipline to discipline, but it has some common features, transversal elements shared with all subjects – it always remains a chameleon! That is why sociological innovation is linked to technological and economic innovation.

For example, the use of smartphones has changed our ways to relate as well as our social behaviors. In this view the attempt by Anahita Baregheh, Jennifer Rowley, and Sally Sambrook to conceptualize a multidisciplinary definition of innovation is interesting (Baregheh et al., 2009).

The authors conducted a content analysis between 60 different definitions of innovation linked to disciplines such as economics, entrepreneurship, business and management, technology, science, and engineering to bring out the key attributes and propose a general and integrative definition able to encompass these disciplines.

The resulting definition is that "innovation is the multi-stage process whereby organizations transform ideas into new/improved products, service or processes, in order to advance, compete and differentiate themselves successfully in their marketplace."

[19] Kim Smith is the CEO and founder of the Pahara Institute, a national non-profit organization that aims to identify, strengthen, and sustain diverse high-potential leaders who are transforming public education.

1.3. Social innovation

As expressed in the previous paragraph, the adoption of a multidisciplinary definition of innovation can be the right way really to understand this concept and to apply it to different contexts (industrial, academic, and social). As a matter of fact, the concept of social innovation has gained great relevance in the last decades.

The main reason is that the existing policies and structures have found it impossible to fix some of the most crucial issues of our times, such as the worldwide epidemic of chronic disease, climate change, widening inequality, increasing poverty, and active ageing.

New paradigms are arising and thus presenting the need for changes of old and weak structures and institutions, in this way creating an ever-increasing gap. The main progresses are occurring in fields on which institutions and governmental policies place fewer constraints. For instance, there is more innovation around recycling and energy efficiency than around large-scale energy production and there is more innovation around active ageing than around pension provision.

The European Commission, within the framework program Horizon 2020,[20] confirmed the pressure on the mentioned issues.

Therefore, in the regulation that approved Horizon 2020 and the distribution of its financial provision,[21] the third pillar of the framework program – societal challenges – received the largest amount of the budget, €29.679 billion, equal to 38.53% of the total budget, whilst the first pillar – excellence in science – has €24.441 billion and the second – industrial leadership – has €17.016 billion. To recognize what social innovation is, it is essential to understand what exactly it means, that is, how it can be defined.

As previously analyzed, the definition of innovation as a whole is unclear, but the situation changes when stepping into a specific scientific discipline. Social innovation has been defined well by the European Commission, taking the meaning embraced by Murray, Grice, and Mulgan in their Open Book[22] on social innovation: "Social innovations are innovations that are social in both their ends and their means – new ideas (products, services and models) that simultaneously meet social needs (more effectively than alternatives) and create new social relationships or collaborations. They are innovations that are not only good for society but also enhance society's capacity to act. Social

[20] In the third chapter, all three pillars of the framework program Horizon 2020 will be analyzed deeply. The whole budget provided by Horizon 2020 is around €78.2 billion. This financial provision is valid for the period 2014–2020. In comparison with the previous FP7 (2007–2013), there has been an addition of €24 billion to the budget.

[21] Regulation (EU) No. 1291/2013 of the European Parliament and of the Council of December 11, 2013 establishing Horizon 2020 – the Framework Programme for Research and Innovation (2014–2020) – and repealing Decision No. 1982/2006/EC.

[22] The Open Book is the result of the cooperation between NESTA (National Endowment for Science, Technology and Arts) and the Young Foundation. The main purpose of these two organizations is to understand the role that social innovation can play in solving some of the most pressing issues. The Open Book has a pragmatic approach and collects various examples of social innovation initiatives and approaches. Moreover, it offers a wide perspective on the ways to support social innovation in Europe financially.

innovations take place across boundaries between the public sector, the private sector, the third sector and the household."

Phills, Deiglmeier, and Miller (2008, p. 36), in the *Stanford Social Innovation Review*,[23] defined social innovation as: "a novel solution to a social problem that is more effective, efficient, sustainable, or just than existing solutions and for which the value created accrues primarily to society as a whole rather than private individuals." A social innovation can be a product, production process, or technology (much like innovation in general), but it can also be a principle, an idea, a piece of legislation, a social movement, an intervention, or some combination of them" (Phills et al., 2008, p. 36).

Nesta[24] defined social innovation as: "innovation that is explicitly for the social and public good. It is innovation inspired by the desire to meet social needs which can be neglected by traditional forms of private market provision and which have often been poorly served or unresolved by services organized by the state. Social innovation can take place inside or outside of public services. It can be developed by the public, private or third sectors, or users and communities – but equally, some innovation developed by these sectors does not qualify as social innovation because it does not directly address major social challenges" (Murray, 2010, p. 12).

The above definitions, especially that furnished by Murray, emphasize the distinction in social innovation both in its outcomes and relationships and in the new forms of cooperation and collaboration that they bring. As a result, the processes, metrics, models, and methods used in innovation in the commercial or technological fields are not always directly transferable to the social economy.

A general overview of a best practice of the implementation of social innovation may help in understanding how social innovation is translated into pragmatic actions.

The example is a project that belongs to the *health and active ageing field*, one of the major and common societal challenges identified by the European Commission. Therefore, a dedicated program that leads to innovative and participative actions has been established: the European Innovation Partnership on Active and Healthy Ageing.[25]

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[23] The *Stanford Social Innovation Review* (SSIR) aims to inform leaders from around the world and from all sectors of society – non-profits, business, and government – of social changes. The main instruments are tools such as webinars, conferences, magazines, online articles, and podcasts. The SSIR has a wide perspective and bridges research, theory, and practice on a diverse range of topics, including human rights, impact investing, and non-profit business models.

[24] Nesta is an innovation charity located in England dedicated to supporting ideas that can help to improve people's lives, with activities ranging from early-stage investment to in-depth research and practical programs.

[25] The European Commission has identified active and healthy ageing as a major societal challenge that is common to all European countries and an area that presents considerable potential for Europe to lead the world in providing innovative responses to this challenge. The European Innovation Partnership on Active and Healthy Ageing will pursue a triple win for Europe: i) enabling EU citizens to lead healthy, active, and independent lives while ageing; ii) improving the sustainability and efficiency of social and health care systems; and iii) boosting and improving the competitiveness of the markets for innovative products and services, responding to the ageing challenge at both the EU and the global level, thus creating new opportunities for businesses.

The project is the *Living Lab on Wellbeing Services and Technology*.[26] It is an innovation platform that enables a new way of producing services for elderly people in a functional public–private–people partnership. Users participate actively in product development, service design, and usability testing processes. A key role in promoting the understanding of the social innovation definition has been played by the social sciences and humanities (SSH). Moreover, one of the benefits coming from the SSH research projects funded under the European financial instruments (framework programs) has helped national and European policy makers to realize policies based on concrete and tested developments.

To confirm this trend, within Horizon 2020 the DG Research and Innovation dedicated a separate section to the promotion of the social sciences and humanities dimension, such as the third pillar – societal challenges (in particular SC6) – and Science with and for Society.[27] The action Science with and for Society supports social innovation via mobilization and mutual learning action plans (MMLs), which contain a targeted number of areas. The MML characteristics are vehicles of social innovation and can be adapted to different focus areas.[28]

[26] The extended project title is "Living Lab on Wellbeing Services and Technology: Testing and Developing Technology to Enhance Seniors' Quality of Life." The project targets elderly people, especially those living at home, since coping and living independently can be challenging. The EU-funded Living Lab on Wellbeing Services and Technology project addresses this issue by developing intelligent welfare technology innovations to support elderly Finns in their everyday lives. Through user-friendly technology, it is possible to enhance older citizens' sense of safety, reduce their loneliness, and improve their quality of life. http://europa.eu/workingforyou/en/content/living-lab-wellbeing-services-and-technology-testing-and-developing-technology-enhance

[27] Research on social innovation has been supported for almost twenty years by the social science and humanities research funds of the framework programs for research. The connection between research projects and policy making has helped local and national authorities and the EU level to base policy developments on the results of research carried out in this new field. Under the last Seventh Framework Programme for Research (FP7), the current Science with and for Society was called Science in Society (SiS).

[28] There are 18 ongoing MMLs, which address issues including fisheries governance, environmental justice, technology assessment, sustainable food innovation, marine litter, a low-carbon society, sustainable seas and coasts, children as change agents, active and healthy ageing, water issues, urban development, infectious diseases, sustainable innovation, Internet governance, ethics' assessment, human enhancement, and synthetic biology.

1.4. Actors of innovation: Academic and non-academic institutions

Our era is one of a globalized world. The main issues of our society come from several different sources, so at the same time solutions have to come from a new perspective, which needs to be interdisciplinary. In this way the cooperation between different subjects belonging to different societal sectors/fields and with a different mindset is one of the innovation-driving elements.

As an example and field of analysis, the cooperation between academia and the non-academic sector has been selected, as these two categories involve the larger types of organizations (universities, research centers, companies, the third sector, and NGOs).

Therefore, a better integration between academic and non-academic organizations has for a long time been recognized as one of the crucial innovation drivers.[29] Thus, in the following lines, the cooperation between universities and companies, which can respectively represent the academic and the non-academic view, are taken into account as the best example for analysis. There is certainly a variety of non-academic and academic stakeholders (see the examples above) that could be considered as suitable for such an analysis, although the choice of focusing on university and company cooperation follows the European Commission priority of tight cooperation between universities and business.[30]

This current need for tighter cooperation between academic and non-academic fields has recently been addressed by the European Commission. For example, the communication *A new partnership for the modernization of universities: The EU Forum for University Business Dialogue* (European Commission, 2009) clearly exposes on one hand how universities should develop structured partnerships with industry to become significant players in the economy and able to respond better and faster to the demands of the market, and on the other hand the communication points out the role that enterprises should play in helping universities to shape new curricula that are more market-oriented. On this basis the European Commission launched the University–Business Forum as a

[29] Recently, on February 25, 2016 the theme of academic and business cooperation was discussed in Vienna. The event, sponsored by the European Commission and called "Cooperation between academia and business in Europe: Time to shift up a gear," named the approach between academic and non-academic sectors as an alliance for innovation. During the event the core meaning of such cooperation was expressed: "Innovation happens where ideas and experiences collide – in the interaction of different branches of science; across national borders; and where people with entrepreneurial skills work side by side with those who have frontier knowledge. The cooperation between universities and business has a vital role in driving more innovation for Europe's future."

[30] The European Commission established the University–Business Forum (held almost every year since 2008), which brings together higher education institutions, companies, business associations, intermediaries, and public authorities. It gives them a chance to meet at the European level to discuss, network, and exchange ideas and good practice. The Forum looks at the current situation in university–business cooperation and at the policy initiatives and programs that are needed to support this. The last forum took place in Brussels in March 2015, and the next one is being organized for spring 2017. Thematic forums are also held in cooperation with Member States to address key topics at the national and regional levels. Forums have taken place over the last year in Stockholm, Madrid, Rome, and Berlin. Among the results two major commission initiatives have emerged from the University–Business Forum discussions: HEInnovate (a self-assessment tool for higher education) and knowledge alliances (EU-funded partnerships between higher education institutions and companies).

European platform for dialogue between the two worlds.[31] The admirable work carried out during the meetings and workshops allowed the EC to come up with six main issues and challenges to be faced:

1) New curricula for employability

The *New Skills for New Jobs* initiative confirmed the urgent need for highly qualified and entrepreneurial graduates who will be the European workforce of tomorrow. This means a change within universities' curricula and learning methods; moreover, greater participation of the non-academic sector should be fostered.

2) Fostering entrepreneurship

The academic sector should provide a learning environment that is able to stimulate independence, creativity, and an entrepreneurial approach to knowledge independently of the scientific disciplines. Entrepreneurship should be at the disposal of everyone interested. It requires a change in culture through a regular flow of academic people to industry and the same from the other side.

3) Knowledge transfer: Putting knowledge to work

The challenge is to improve the use and exploitation of publicly funded R&D. Knowledge transfer between universities and enterprises will really work where there is a general framework that allows partnerships, joint programs, projects, and the exchange of people.

4) Mobility: Across borders and between business and academia

Internships, research mobility, and co-funded projects that allow students to work with or within companies should become an integral part of learning programs. Moreover, to guarantee a real change, the mobility should involve not only students or researchers but also universities' administrative staff. It could increase the capacity to anticipate the reshaping of universities' curricula.

5) Opening up universities for lifelong learning

Improving employability not only involves those who enter the labor market but is equally important for those who are already in the workforce. In this light continuing education seems to represent an important opportunity for modernization and development.

Changes should be promoted in legislation, funding arrangements, and incentives structures that are either not supportive of or hostile towards university–business cooperation. Here a change in

[31] The Sixth University–Business Forum took place shortly after the appointment of the new Juncker Commission, which set out the top priority to start Europe growing again and increase the number of jobs without creating new debt. The Commission's jobs, growth, and investment package focuses on cutting regulation, making smarter use of the existing financial resources, and making accessible use of public funds – to provide up to €300 billion in additional private and public investment over the next three years. Education, specifically higher education, remains one of the keystones of this process of innovation and growth in Europe, and part of the plan includes supporting projects and investments in key areas including education, research, and innovation.

mindset and a more innovative approach are also required. Moreover, university–business cooperation is seen as being significant for regional development.

Many regions, in particular in the USA, have achieved great success from a strong relation between university and business (Silicon Valley is the best example), but they were operating in a fertile context that was able to stimulate such cooperation. This was the result of the alignment involving universities, business, and the third actor of innovation: the Government.

Besides the European Commission, many authors have analyzed the issue of university–business cooperation from different points of view. For instance, Hermans and Castiaux (2007) examined university–industry cooperation from the knowledge management perspective. In other words they studied how knowledge flows within collaborative research projects between universities and companies using the famous knowledge creation theory of Nonaka and Takeuchi (1995).

Cunningham and Link (2014) carried out research mainly focusing on university–industry collaboration in research and development. They argued that a tight relationship is strategic, as a dimension of entrepreneurial activity can act as an important driver of economic growth and development. Moreover, they argued that business collaboration with universities increases the efficiency and effectiveness of industrial investments. The work concluded with an interesting suggestion to foster cooperation effectively: "for universities to accomplish this it means having internal incentives systems that reward individual scientist/research groups for their levels of industrial collaboration as well as providing internal research supports that makes the interaction and collaboration with industrial partners as easy as effective as possible."

1.4.1. A focus on the new role of universities

The above-mentioned needs have pushed universities to rethink their role in the current époque (Trencher, 2013). As matter of fact, many authors have analyzed the topic and elaborated interesting conceptual frameworks that are useful in gaining a better understanding of the new social role of universities (Brennan, King, & Lebeau, 2004) in the globalized era in which the growing importance of knowledge is definitely redefining our societal paradigms.

A brief historical review shows that, despite the political, economic, and social changes that have taken place during the centuries, universities remained somewhat stable institutions from their medieval roots until the second half of the twentieth century (Martin, 2000). Mainly two functions have been pursued: a) knowledge production in a range of academic disciplines; and b) the provision of a liberal education to an élite (Harloe & Perry, 2004).

On the whole there has been traditional disunion between the mission of universities and the immediate economic and social development needs of states and localities, with research being a driver of knowledge improvement rather than pragmatic application.

In different countries the links between universities, industry, and the state became stronger after 1945. Thus, a great quantity of applied research was accomplished by state research institutions. By the 1970s, however, the ability of science to deliver social and economic benefits was being questioned. Thus, the perspective changed to the way in which science may be applied directly to solve economic and social issues.

From the 1980s the new perspective of science as a strategic opportunity emerged, so the focus was on growth, national welfare, and the development of foresight university–industry partnerships (Ruvio, 1994). Essential in this recent shift was the diverse ideas of university functions in the relationship between state and market, which can be explained with the development of the concept of the *knowledge economy*.[32]

In this context science and social scientific knowledge assume increased importance in terms of their ability to shed light on issues of economic and social adaptation and change. Especially in the current era, the *third industrial revolution*,[33] with the Internet, mobile telephones, and digital

[32] Daniel Bell was among the first to note that, between 1909 and 1949 in the non-agricultural sectors, skills contributed more to economic growth than labor and capital. According to Bell (1973, p. 212), post-industrial society can be characterized as a knowledge society in a double sense: "first, the sources of innovation are increasingly derivative from research and development (and more directly, there is a new relation between science and technology because of the centrality of theoretical knowledge); second, the weight of the society – measured by a larger proportion of Gross National Product and a larger share of employment – is increasingly in the knowledge field." The same ideas were advanced by Castells when analyzing the key differences between previous modes of development with the societal dynamics of the digital world. According to Castells (1996, p. 17), "in the new, informational mode of development the source of productivity lies in the technology of knowledge generation, information processing, and symbol communication" (Väliima & Hoffman, 2008).

[33] http://www.economist.com/node/21553017

technologies, has revolutionized the concept of knowledge, which rather than "quality" has increased the "quantity speed and acceleration" of knowledge production (Harloe, 2003).

This puts those actors who made knowledge their lifeblood on the edge of change. In other words, how have the development of the knowledge economy and the necessity to extract economic and competitive benefits from knowledge production affected the role of universities? The answer was provided by Gibbons in 1994 in his work *The new production of knowledge*, which elaborated one of the most famous models of knowledge production.[34]

The main proposal claims the emergence of a diverse knowledge production system that has become "socially distributed."[35] Whereas knowledge production used to be placed primarily within scientific institutions and framed by scientific disciplines, its new spaces, practices, and principles are much more heterogeneous.

To clarify this assertion, it is appropriate to introduce a distinction between Mode 1 of knowledge production, which is already well known, and Gibbons's Mode 2. Five prime attributes of Mode 2 summarize how it differs from Mode 1. First, Mode 2 is generated in a context of application. Of course, Mode 1 knowledge can also result in practical applications, but these are always separated from the actual knowledge production in space and time. This gap requires a so-called knowledge transfer. In Mode 2 such a distinction does not exist (Hessels & van Lente, 2008).

The second feature is *transdisciplinarity*.[36] Transdisciplinarity moves beyond interdisciplinarity in the sense that the interaction among scientific disciplines is much more dynamic and the borders are more nuanced.

The third characteristic is the presence of various organizations in which knowledge is produced, resulting in an especially heterogeneous practice.

In fact, the dimension of probable habitats for knowledge generation involves not only the time-honored universities, institutes, and industrial labs but also research centers, government agencies, and high-tech spin-off companies. These sites are connected, and thus the research is carried out in mutual circumstances.

The fourth element is *reflexivity*. Mode 2 knowledge is a dialogic process and has the ability to absorb multiple perspectives. In this light researchers are becoming more aware of the societal

[34] In this provocative and broad-ranging work, the authors (Michael Gibbons, Camille Limoges, Helga Nowotny, Simon Schwartzman, Peter Scoot, & Martin Trow) argued that the ways in which knowledge – scientific, social, and cultural – is produced were undergoing fundamental changes at the end of the twentieth century. They claimed that these changes marked a distinct shift to a new mode of knowledge production, which is replacing or reforming the established institutions, disciplines, practices, and policies.

[35] Gibbons. (1994). *The new production of knowledge* (p. 4). Stockholm.

[36] Several articles have been written on the concept of transdisciplinarity. The following authors and papers are just a short representative list: Blassnigg, M., & Punt, M. (2013). *Transdisciplinarity: Challenges, approaches and opportunities at the cusp of history*. UK; Nicolescu, B. (2012). *Transdisciplinarity and sustainability*. Texas; Nowotny, H., Gibbons, M., (2001) *The potential of transdisciplinarity*.

consequences of their work. In addition, the traditional discipline-based peer review systems are supplemented by additional criteria of an economic, political, social, or cultural nature.

Due to the wider set of quality criteria, it becomes more difficult to determine "good science," since this no longer is limited to the judgment of disciplinary peers (Hessels, 2008). As a consequence, Mode 2 of knowledge production and the social and political priority given to knowledge in the economy framework have profoundly pushed the academic side to re-imagine its approaches and activities in this different type of society. Thus, could it be possible to admit the existence of a Mode 2 university? Harloe (2003) outlined the main characteristics that a Mode 2 university should have. Firstly, it is closer to government and market and more responsive to national and regional needs in teaching. Secondly, it conducts research following an interdisciplinary approach.

Thirdly, it is innovative, interacts in a number of different networks, and is a key player in evolving systems of regional and local governance (Harloe, 2003).

Other authors, such as Betts and Carolyn (2004), have provided a more delineative indication of the features of universities nowadays, arguing that there are five main characteristics of universities in the current context:

1) University as trainer

This refers to the university's role in providing the economy with a constant and ample supply of young, skilled graduates. In other words industries that experience rapid technological change require highly educated workers to implement these changes, and universities provide these workers.[37]

2) University as innovator

This refers to the direct production and commercialization of knowledge generated by universities that work apart from the private sector. Perhaps is it possible to enlarge this definition. Firstly, it could involve the *social role* of universities that creates people connections, thus improving the quality of relations and stimulating new ideas. It is an innovation itself. Moreover, the explanation given by Betts and Carolyn is closer to the definition of a *university as a company*, and it is too tailored to technical universities' features.

Speaking about universities requires the non-technical side to be taken into account as well. It will surely not contribute to creating high-tech solutions, but it is a factor of innovation. For instance, considering the number of spin-offs generated, technical universities surely constitute a large majority compared with non-technical ones. What about their quality? Technical universities

[37] Econometric studies have shown that technological change is skill-biased (e.g. Berman, Bound, and Griliches (1994) for the United States and Betts (1997) for Canada). More concretely, Bartel and Lichtenberg (1987) documented that, in the United States, industries with newer capital stocks (and hence newer technologies) tend to employ greater shares of highly educated workers.

promote prevalently high-tech entrepreneurial ideas. Instead, entrepreneurial initiatives within non-technical universities produce a very wide range of entrepreneurial ideas, from art to culture, social science, and tourism, but they also act in the high-tech field.

Of course, this does not mean that technical and non-technical universities have the same peculiarities in promoting innovation. The point is to recognize the potentialities to innovate coming from non-technical contexts.

3) University as partner

The university as a partner means the supply of technical know-how to firms through fee-for-service agreements. Two methods usually subsist: less formal consulting by university professors and more formal joint ventures with companies helping university researchers to commercialize the idea of a university-owned patent. This role is mainly identifiable just within technologically related sectors. In other sectors, such as the creative and cultural industries, the role of the university is not currently comparable to the hi-tech field, even though it is rapidly emerging.

4) University as talent magnet

The term talent magnet means any way in which the presence of a university increases the attractiveness of a place as a whole to talented innovative entrepreneurs, scientists, researchers, and students.[38]

5) University as facilitator

Another role that universities can play is to create a venue to facilitate networking among the actors of innovation from both the private and the public sector. This can include the creation of networking events and conferences at which industry representatives and academics can meet each other and exchange thoughts and visions. Moreover, universities should ensure that these appointments have wide participation from young students and researchers, who constitute the next entrepreneurial generations.

A further key element of universities acting as facilitators is to enable firms to access knowledge from the global pipelines of international academic research networks.[39]

[38] Regarding this concept of "university as talent magnet," the following work is relevant: Bramwell, A., & Wolfe, D. A. (2008). "Universities and regional economic development: The entrepreneurial University of Waterloo." The authors expressed the concept that, beyond generating commercializable knowledge and qualified research scientists, universities produce other mechanisms of knowledge transfer, such as generating and attracting talent to the local economy and collaborating with local industry by providing formal and informal technical support.

[39] Bramwell and Wolfe, in their paper "Universities and regional economic development: The entrepreneurial University of Waterloo," explained well the importance of universities acting as facilitators: "Universities play a crucial role in facilitating access to these global flows of knowledge. Scientific knowledge flows easily between researchers around the world in its codified form of published journals and academic conferences, but additionally, new information and communications technology has facilitated the development of international formal and informal research networks ranging from bilateral ties between individuals in related departments to complex multidisciplinary networks, twinning arrangements and institutional consortia."

1.4.2 The ultimate concepts: The triple helix and entrepreneurial universities

The triple-helix model (Etzkowitz & Leydesdorff, 2000) is the last step of integration that the academic and non-academic sectors need to reach. It derives from the enhanced role of knowledge in the economy and in our societies. The role of universities in this context is claimed to be its third mission (Etzkowitz, 1997). It is widely acknowledged that universities' first mission is to teach and their second mission is to conduct research. Their third mission, instead, has been defined as the bundle of activities that generate, use, apply, and exploit knowledge and other university capabilities – outside academic environments (Molas-Gallart et al., 2002).

The triple-helix model is based on the assumption that industry, university, and government are increasingly interdependent, thus implying a comprehensive study. The model can be seen as a heuristic forcing researchers to take into account all three spheres systematically when studying the dynamics of knowledge production and innovation (Helles & van Lente, 2008). According to Etzkowitz, the triple-helix model has three basic elements. First, it suggests a more prominent role for universities in the innovation process and at the same level of industry and government in a knowledge-based economy.

Second, there are reciprocal collaborative relationships leading to a policy innovation as the result of an interaction rather than a prescription of government. Third, each institutional sphere takes the role of the other operating on a y-axis of their new role as well as an x-axis of their traditional function (Etzkowitz & Klofsten, 2005). In other words, in the triple-helix model, the academic sector plays a role as a source of firm formation in addition to its classical function as a provider of skilled persons and based knowledge.

Industry takes the role of the university in training and research often with the same high level as academia, and the government supports developments through suitable normative changes, new funding programs, and the promotion of cooperation projects.

To allow the triple helix to rotate continuously and generate innovation and development effectively, the university needs to follow a totally different perspective from previously; therefore, it plays an active role in economic and social development, rather than merely playing a supportive role as a provider of skilled workers. This is the main feature of an entrepreneurial university (Etzkowitz & Klofsten, 2005). Moreover, a precondition for a university to adopt an entrepreneurial approach is the ability to set its own strategic direction (Clark, 1998) and see its own knowledge production put at the service of the local communities and society at large.

Next, training programs able to introduce students to entrepreneurship are required when it is not already fixed in the academic culture. For instance, humanistic universities do not often provide those kinds of activities in their curricula.

A remarkable example from this perspective is the University of Macerata, Italy, which, despite its social science and humanities nature, promotes a wide range of entrepreneurial activities and programs to stimulate students and researchers coming from "soft knowledge" to undertake entrepreneurial activities mainly in cultural and creative fields.[40]

The discussion above is useful for understanding the importance of academic and non-academic players in developing innovation. Try to imagine the development of innovation as a soccer match. The team makes the difference.

The composition, organization, and integration among the players in the team determine the success or otherwise of the match. Likewise, the development of innovation needs the composition of a good team, a good organization during the long (years) match, and good (very good) integration between the players who are at the core of the issue; every team has players, some of whom are either more useful than others or play a key role in a specific match or in a moment of it.

Thus, the actors of innovation are fundamental. In this way, following the triple-helix approach, universities, companies, and governments are three essential players that have to participate; moreover, they have to play on the same team!

The elements such as composition, organization, and integration listed above are endogenous elements, but there are also exogenous factors that affect the result considerably. Taking again the example of a soccer match, the condition of the game field and the experience and ability of the coach can decisively determine the success of the match. In other words the external conditions surrounding the players involved in developing innovation are crucial to allow them to play a good match.

The game field has to be well cared for (normative frameworks at the regional, national, and European levels), and the coach (usually the policy makers and leaders within an organization) needs to be an expert.

As explained above, in Europe the U-I relation is a particularly relevant political argument. Thus, from the 1980s the European Union has been trying to take care of the *soccer field* as well as possible and thus offering players (governments, universities, companies, and others) the chance to play together. Many programs and specific actions foster U-I cooperation, and, as always when speaking of huge numbers, sometimes they succeed and sometimes they fail. However, the starting point is to have the possibility to play fairly.

[40] A relevant example is LUCI – a humanistic laboratory for creativity and innovation. LUCI aims to promote an innovative and entrepreneurial attitude among young people to support the creation of innovative business initiatives that are driven by the social sciences and humanities.

CHAPTER II

European Framework Programmes

This chapter offers a brief historical/social, political, and legal analysis of the European Framework Programmes that, since 1984 with the launch of FP1, have been considered to be a crucial tool for the development of innovation and economic growth in Europe. The core will be a specific perspective on the previous European Framework Programmes, that is, from FP1 to FP7. Moreover, the chapter provides a description of the key programs' priorities and features. The evolution of the social dimension and the inclusion of the social sciences and humanities are relevant aspects. The aim of the chapter is to offer a comprehensive perspective on the path that the European Community and then the European Union followed during these decades, considering the priorities and formulation of one of the most important tools of innovation, the framework programs.

2.1. The legal, historical, and social dimensions of the European Framework Programmes

The European Framework Programmes (EU-FPs) are key policy elements of the European Union in fostering the innovation and competitiveness of European science and industry and promoting the European integration within the Member States. The roots of the European framework programs can be found in the first European attempts to fill the technology gap with Japan and the USA as well as to foster European development in regard to the ICT fields.[41] Therefore, in the 1950s early EU research funding was limited to a few industrial sectors, such as coal, steel, and atomic energy: the industry fields deemed to be the key economic engine of that era.

Of course, the evolution of the European Framework Programmes has been related to the changing nature of global competition and the main historical and political events as well as the cultural trends over the years.

Thus, they have developed and grown in parallel with major changes in the ambitions of industry and innovation policies in Europe and beyond and in the rules governing competition and the relation between the Member States and their industrial suppliers or champions of the era.[42] Thus, the technological optimism of the 1960s triggered large, state-led investments in building national technological champions.

[41] A relevant report illustrating this European run-up to US and Japanese development was delivered by the DG Research of the European Commission in 2011. The document provided a good evaluation of the impact of FPs from their first appearance until the current decade. The report is *Understanding the long term impact of the framework programme* published by the EC in December 2011.

[42] A relevant paper to be taken into account is that realized by Prof. Erik Arnold, who in October 2011 presented *Understanding the long term impacts of the EU framework programme of research and technological development*.

A good example is the military[43] companies that were at the top of the state economies' priorities in that period and at the center of the historical debate (Cold War), so these tended to function in a parallel development with national agencies or state-owned companies, such as airlines, railways, telephone companies, and power generators.

Therefore, the state effectively shared the technological risk of innovation with the producers, thus reducing the commercial risk both by buying the first products and by providing "reference sales" that could be used to persuade subsequent customers of the value and quality of the products. Successively, liberalization at the national and European levels brought about increasing difficulties in operating such double developments, in that liberalization meant in many fields a reduced role for the state. Formal and *de facto* standardization power moved up from the national level, through the European level, and towards the global level. It evolved rapidly away from the national style of the 1960s into something more responsive to and careful of the needs of wider stakeholders. Therefore, initially the FPs were an effort to support European industrial competitiveness. Then, they evolved to become a larger and more powerful tool for funding and coordinating scientific research as well as innovation-driving technology across Europe.

Picture 2.1 aims to give a clear and comprehensive historical perspective of the main steps leading to the current European political framework, underlining the milestones in European political and economic development.

Moreover, the picture clarifies the context in which the EU-FPs were framed and which role they have played during the decades to answer questions such as "when," "why," and "how" the EU-FPs have been so crucial in the European context.

[43] The military–industrial complex (MIC), or military–industrial–congressional complex, comprises the policy and monetary relationships that exist between legislators, national armed forces, and the arms industry that supports them. These relationships include political contributions, political approval for military spending, lobbying to support bureaucracies, and oversight of the industry. The term MIC is most often used in reference to the system behind the military of the United States, where it gained popularity after its use in the farewell address of President Dwight D. Eisenhower on January 17, 1961. The term is applicable to any country with a similarly developed infrastructure.

Picture 2.1 – Milestones in the European Union

Source: Horizon Magazine, EU research framework programs 1984–2014 (2014, p.5)

2.2. The framework programmes from FP1 to FP7: FP1 (1983–1987)

The first European framework program was established on May 20, 1983 when the Commission, further to its December 1982 Communication and in response to the Council's reactions of February, transmitted a proposal to set the first framework program for the Community's scientific and technical activities.[44] The official act for FP1 was established through a resolution in July 1983 in accordance with Article 235 of the EEC[45] and Article 7 of EURATOM[46].

[44] The document *Framework programme for research 1984–87* was prepared by the Commission of the European Communities on May 17, 1983 in Brussels.

[45] The Treaty of Rome, officially the Treaty establishing the European Economic Community (TEEC), is an international agreement that led to the founding of the European Economic Community (EEC) on January 1, 1958. It was signed on March 25, 1957 by Belgium, France, Italy, Luxemburg, the Netherlands, and West Germany. The TEEC proposed the progressive reduction of customs duties and the establishment of a customs union. It proposed to create a common market of goods, workers, services, and capital within the EEC's Member States. It also proposed the creation of common transport and agriculture policies and a European social fund. Furthermore, it established the European Commission. Specifically, article 235 stated that "If any action by the Community appears necessary to achieve, in the functioning of the Common Market, one of the aims of the Community in cases where this Treaty has not provided for the requisite powers of action, the Council, acting by means of a unanimous vote on a proposal of the Commission and after the Assembly has been consulted, shall enact the appropriate provisions."

[46] The Euratom Treaty, officially the Treaty establishing the European Atomic Energy Community, established the European Atomic Energy Community. It was signed on March 25, 1957 at the same time as the Treaty establishing the European Economic Community (EEC Treaty). The Euratom treaty is less well known due to the lower profile of the organization that it founded. While the EEC has evolved into what is now the European Union, Euratom has remained much the same as it was in 1957. The Euratom treaty has seen very little amendment due to the later sensitivity surrounding nuclear power among European public opinion. Because of this, some argue that it has become too out-dated, particularly in the areas of democratic oversight. It was not included as part of the Treaty establishing a Constitution for Europe, which sought to combine all the previous treaties, over fears that including nuclear power in the treaty would turn more people against it. It is therefore still in force today but as a separate legal treaty. It forms part of the active treaties of the European Union.

After considering the Commission's proposal, the Council meeting of June 28, 1983 approved a resolution (formally adopted on July 25) for the framework program for the Community's research, development, and demonstration activities, that is, the first framework program from 1984 to 1987.[47]

For the first time, a common strategy with shared priorities was applied equally among the Member States. The aim was to promote competitiveness and growth within specific scientific and technological fields as well as to improve the management of raw materials and energy resources and the living and working conditions. Specifically, the priorities to be taken into account were:

(a) agricultural competitiveness

(b) industrial competitiveness (with special attention to new technologies)

(c) scientific competitiveness

(d) stepping-up of aid to developing countries

(e) adaptation of R&D activities already undertaken by means of their incorporation into the overall strategy: energy, raw materials, environment, and health and safety

(f) development of analysis and forecasting capacity

(g) reorganization of structures and procedures on the basis of the proposed strategy

(h) systematic evaluation

Looking at the priorities, it is clear that the focus of the European Community was mainly connected to the scientific, technological, and energy fields. As a matter of fact, there is no trace of a social dimension in FP1. It provides just a small segment dedicated to "life science," but it is not really relevant. Among the priorities the greatest role was played by energy and ICT development. A glance at the historical period can provide a clue to why the social dimension was underestimated.

In the 1980s the economic boom of the post-World War II[48] period had already been left behind along with the wellness in societies generated by the scientific and technological development.

[47] This resolution paved the way for programs such as ESPRIT, RACE, and BRITE. The first ESPRIT program was adopted by the Council on February 28, 1984. The decision did not lay down any general objectives other than that the program would comprise pre-competitive research and development projects. The first definition phase of RACE was adopted on July 25, 1985. It referred to several statements by heads of state emphasizing the "importance of telecommunications as a major source for economic growth and social development" and mentioned the assessment of the European Parliament, stressing the key role of telecommunications. The aim of the definition phase was to prepare a general European framework for the development of advanced systems of communication for the future and promote technical and industrial cooperation.

[48] The post-World War II economic expansion, also known as the post-war economic boom, the long boom, and the Golden Age of Capitalism, was a period of economic prosperity in the mid-twentieth century, which occurred following the end of World War II in 1945 and lasted until the early 1970s. It ended with the collapse of the Bretton Woods monetary system in 1971, the 1973 oil crisis, and the 1973–1974 stock market crash, which led to the 1970s recession.

Moreover, in Europe there was a parallel comparison with the USA, where the hi-tech industries were flourishing, spreading richness and well-being over the continent.

In Europe the situation was less amenable, due to the different political tumults that resulted in the 1980s acting as a turning point for the future of Europe and the world as a whole. It is necessary to give a brief perspective on the main historical events to grasp the context in which the first framework program was born. In the summer of 1980, the Polish Solidarity trade union and its leader Lech Walesa become famous in Europe and across the world.

The shipyard workers in the Polish city of Gdansk held strikes for more rights, and in August the Government capitulated and Solidarność[49] was created as an independent trade union. Gradually, the Government reaffirmed its power and imposed martial law in December 1981, thus putting an end to the brief encounter with people power in Poland. However, the seeds had been sown.

A few days after the events in Poland, the European Union saw its number of Member States grow to ten. In fact, on January 1, 1981, Greece became the tenth member of the European Community.[50] The country could join the EU after the fall of the military regime and the return to democracy in 1974.

Some years later, after notable work carried out by Altierio Spinelli, the European Parliament approved by a large majority the draft of the Treaty establishing the European Union: the Spinelli Draft.[51] The approval of the Spinelli Draft coincided with the beginning of FP1, and this is a meaningful element in understanding the strategies followed towards the realization of the EU as we know it today. Moreover, one year later the European Council agreed to the accession of Spain and Portugal to the Community and expressed its agreement regarding the Integrated Mediterranean Programmes[52] proposed by the Commission. A wind of political innovation was blowing over Europe, and several Member States began to believe in the possibilities of fostering concretely the political/institutional and economic development. Accordingly, the White Paper entitled "Completing the Internal Market"[53] that the Commission put forward to the European Council on

[49] The first independent trade union in the Soviet bloc through the Catholic labor movement. After a long and difficult season of confrontation with the Communist regime, it came to the leadership of Poland, carrying out a peaceful revolution that, starting from the common Catholic roots, gave back the freedom of the Polish people.

[50] The enlargement of January 1, 1981 with the inclusion of Greece was the third of the European Community enlargements, reaching ten participants: Italy, Germany, France, Luxembourg, Belgium, the Netherlands, the United Kingdom, Denmark, and Greece.

[51] The Italian politician Altiero Spinelli was one of the fathers of the European Union. He was also a key figure behind the European Parliament's proposal for a treaty on a federal European Union, the so-called "Spinelli Plan." The latter was adopted by Parliament in 1984 with an overwhelming majority and was a great inspiration for the consolidation of the EU Treaties in the 1980s and 1990s.

[52] The Integrated Mediterranean Programmes (IMPs) were established in response to a 1981 memorandum from the newly elected socialist Government of Greece, which had joined the Community on terms negotiated by the previous center-right Government. Basically, the memorandum expressed dissatisfaction with Greece's terms of accession and asserted that the country's special problems needed special help.

[53] The European Commission submitted to the Council its White Paper on the completion of the internal market, which set out a timetable for the measures required for the completion of the single market by December 31, 1992 at the latest.

June 14, 1985 is crucial. It was signed in Schengen and represents the ground for the future Schengen Treaty on June 19, 1990.

Another step forward was taken on February 17, 1986, when the EU decided to solve the difficulties related to customer duties, which had already been eliminated in 1968 but never really correctly put in place because of differences in the national legislation. To solve these issues, the Single European Act of 1986[54] provided the launch of a comprehensive program that lasted for six years. The Act also gave greater powers to the European Parliament and strengthened the EU's powers in environmental protection.

FP1 was elaborated during the German Presidency (first half of 1983) led by the German Research Minister Heinz Riesenhuber,[55] who gave the name to the criteria adopted by FP1: "The Riesenhuber Criteria." They express clearly and for the first time a systematic approach to the justification of European research activities according to their European value-added.[56]

They were not a list of selection criteria, but they had the function of identifying which activities carried out at the European level could represent the European value-added. In other words, activities can be justified when they present advantages (added value) in the short, medium, or long term from the point of view of efficiency and financing or from the scientific and technical point of view as compared with national activities (public or private). Hence, Community action could be justified in the following cases:

- research on a very large scale for which the individual Member States could not, or could only with difficulty, provide the necessary finance and personnel;
- research of which the joint execution would offer obvious financial benefits, even after taking account of the extra costs inherent in all international cooperation;
- research that, because of the complementary nature of work being carried out nationally in part of a given field, enables significant results to be obtained in the Community as a whole for the case of problems for which the solution requires research on a large scale, particularly geographically;

[54] The Single European Act (SEA) was the first major revision of the 1957 Treaty of Rome. The Act set the European Community the objective of establishing a single market by December 31, 1992 and codified the European Political Cooperation, the forerunner of the European Union's Common Foreign and Security Policy.

[55] Heinz Riesenhuber was born on December 1, 1935 in Germany. He was a member of the CDU and served as Minister of Scientific Research under Chancellor Helmut Kohl from 1982 to 1993.

[56] European added value (EAV) is additional to the value created by the actions of individual Member States. It may result from different factors, for example coordination gains, legal certainty, greater effectiveness, or complementarities. It reflects broader European relevance and the significance of the action with a view to presenting models and mechanisms that can be applied not only regionally or nationally but also across the EU. *Funding under the 3rd Health Programme 2014–2020*. (2010). Brussels.

- research that helps to strengthen the cohesion of the common market and to unify the European scientific and technical area and research leading, where the need for the establishment of uniform standards is felt.

Regarding the legal basis of the first framework program (and for the following ones), it is worth highlighting the following articles, which represent the normative structure of the EU framework program. The Single European Act[57] added Title VI to the Treaty on Research Activities for the first time and provided the legal basis for the framework program and its objectives in Article 130. This is a crucial point, because, even though some modifications have been applied during the years, these articles are still the current legal basis in force for the existing framework program (Horizon 2020). The FP definition provided by Article 130i is described as follows:

> The Community shall adopt a multi-annual framework programme setting out all its activities. The framework programme shall lay down the scientific and technical objectives, define their respective priorities, set out the main lines of envisaged activities and set the necessary amount, detailed rules of financial participation by the Community in the programme as a whole and the breakdown of this sum between the various activities envisaged.

Moreover, the Single European Act provides further elements and objectives that are spelled out in Article 130i:

> 1) The Community's aim shall be to strengthen the scientific and technological basis of European industry and encourage it to become more competitive at international level.
> 2) In order to achieve this, it shall encourage enterprises including small and medium-sized enterprises, research centres and universities in their research and technological

[57] The Single European Act (SEA) was the first major revision of the 1957 Treaty of Rome. The Act set the European Community the objective of establishing a single market by December 31, 1992 and codified the European Political Cooperation, the forerunner of the European Union's Common Foreign and Security Policy. It was signed in Luxembourg on February 17, 1986 and in The Hague on February 28, 1986. It came into effect on July 1, 1987 under the Delors Commission. The SEA's signing grew from the discontent among European Community members in the 1980s about the *de facto* lack of free trade among them. Leaders from business and politics wanted to harmonize the laws among countries and resolve policy discrepancies. The Treaty was drafted with the aim of implementing parts of the Dooge report on institutional reform of the Community and the European Commission's white paper on reforming the Common Market. The resultant treaty aimed to create a "single market" in the Community by 1992, and, as a means of achieving this, it adopted a more collaborative legislative process, later known as the cooperation procedure, which gave the European Parliament a real say in legislating for the first time and introduced more majority voting in the Council of Ministers. Under the procedure the Council could, with the support of Parliament and acting on a proposal by the Commission, adopt a legislative proposal by a qualified majority, but the Council could also overrule a rejection of a proposed law by the Parliament by adopting a proposal unanimously.

development activities. It shall support their efforts to cooperate with one another, notably aiming to enable enterprises to exploit the Community's internal market potential to the full, especially through the opening up of national public contracts, the definition of common standards and the removal of legal and fiscal barriers to that cooperation.

3) In the achievement of these aims, special account shall be taken of the connection between the common research and technological development effort, the establishment of the internal market and the implementation of common policies, particularly regarding competition and trade.

Point 2 mentions the concept exploited in the previous chapter about the importance of the relation between academia and non-academia. The fact that it is also provided in the legal basis of the European framework programs strengthens their role as actors of innovation and underlines the need to create an environment able to promote this cooperation. It is relevant to highlight that this concept is not laid down in an anonymous speech by policy makers but provided within the Single European Act.

2.3. The Second Framework Programme: FP2 (1987–1991)

The adoption of the Second Framework Programme on September 28, 1987 was a fundamental point in the history of the European framework research programs. The entry into force of the Single European Act in 1987 enabled the Community to develop an individual competence in research and technology along with a brand new institutional dimension of the framework program concept, which considerably enlarged its range of action.

Since then, the Single European Act has brought together Community activities covering many objectives with the aim of optimizing the potential of the internal market[58] (scientific, technological, and economic objectives as well as standardization and economic and social cohesion). An overview of the FP2[59] general objectives is the best starting point to identify the trends that the European Communities aimed to promote at the beginning of the 1990s:

1 – Reinforce the scientific and technological base of European industry and in particular SMEs, especially in the strategic areas of high technology;

[58] The section of the Single European Act dedicated to the internal market regulation is number II and specifically sub-section I.

[59] The reference document is that provided by the Commission of the European Communities (SEC – 92, 675 final), released on April 22, 1992 in Brussels.

2 – Encourage the development of European industry's international competitiveness by promoting the technological base, allowing it to acquire sufficient critical mass through networks set up between large companies, SMEs, research centers, and universities;
3 – Contribute to reinforcing social and economic cohesion in the Community, in particular through the added value obtained from activities on the Community scale and with the Single Market in mind.
Like FP1, FP2 also mentioned the relevance of U-I cooperation as the second element of the general objectives. Moreover, it is clear that the priorities in 1987 aimed to push primarily the technological development throughout Europe. It is detectable by looking at the priorities promoted under the second framework program:

1 – Quality of life
2 – Towards a large market and an information and communication society
3 – Modernization of the industrial sector
4 – Exploitation and optimum use of biological resources
5 – Energy
6 – Science and technology for development
7 – Exploitation of the sea bed and use of marine resources
8 – Improvement of European S/T cooperation

Noteworthy is the view provided by the FP2 evaluation report[60] about the value generated from a tighter relation between universities and industries. The purpose then, as today, was to empower the critical mass through networking activities to enable research to be undertaken within industries and vice versa.
Therefore, the Commission of the European Communities in the evaluation report of FP2 underlined that "the most notable impact of the Framework Programme is without doubt in the encouragement it has given to collaborative working between research organizations which have up till now had limited opportunities to work together: SMEs, large companies, universities and research centres of different nationalities."[61]
The benefit of the FPs was initially to set clear and common purposes to be reached by diverse organizations and to convince them to cooperate and share the risks and rewards of large-scale

[60] Commission of the European Communities. (1992). *Evaluation of the Second Framework Programme for research and technological development*. Brussels.
[61] Commission of the European Communities. (1992). *Evaluation of the Second Framework Programme for research and technological development* (p. 12). Brussels.

projects based on a new type of partnership. The FP2 evaluation report identified this crucial concept well, pointing out that the benefits derived collectively from multinational cooperation exceed considerably the extra costs involved. In particular, the benefits include privileged access to other sources of knowledge, skills, and equipment and an accelerated transfer of innovations within permanent cooperative structures and networks.

Considering the social dimension within FP2, it follows the line drawn by FP1. Therefore, there is no specific or relevant mention of the social dimension in the outlined priorities. This is a significant element, as it represents the main priorities during the 1980s and 1990s. Actually, Annex III of FP2[62] gives a very timid introduction to the social dimension that talks about the "social cohesion" aspect. It remains linked to the strengthening of the technical and scientific quality: "research which contributes to the strengthening of the communities' economic and social cohesion as well as to the promotion of its harmonious and widespread development, while maintaining its consistency with the objective of technical and scientific quality."

However, the social dimension was increasing its relevance throughout Europe following some historical events in Europe that began to underline the relevance of the social dimension. The European Council held in Hannover on June 27–28, 1988 emphasized the importance of the social aspects to achieving the objectives foreseen in 1992.[63] Moreover, the Hannover Council was a real turning point in the process of European economic and monetary integration; in fact the heads of state and government participating in the summit decided to entrust a committee of experts, chaired by Jacques Delors,[64] to study and propose concrete stages to achieve an economic and monetary union.

The main event that would change the European power and political equilibrium as well as the future of the European Communities is well known: the fall of the Berlin Wall on November 9, 1989. The Berlin Wall[65] (Berliner Mauer) divided Berlin from 1961 to 1989. Constructed by the German Democratic Republic (GDR, East Germany), starting on August 13, 1961, the Wall completely cut off (by land) West Berlin from the surrounding East Germany and from East Berlin until government officials opened it on November 9, 1989. Contrary to popular belief, its

[62] Commission of the European Communities. (1983). *Framework programme for research 1984–87*. Brussels.
[63] The European Council. (1988). *Hanover European Council*. Hanover.
[64] He is a French economist and politician, previously the eighth President of the European Commission and the first person to serve three terms in that office (between January 1985 and January 1995). He is the former first secretary (leader) of the Socialist Party of France.
[65] The Berlin Wall was officially referred to as the "Anti-Fascist Protective Wall" (German: Antifaschistischer Schutzwall) by the GDR authorities, implying that the NATO countries and West Germany in particular were considered equal to "fascists" by GDR propaganda. The West Berlin City Government sometimes referred to it as the "Wall of Shame," a term coined by mayor Willy Brandt while condemning the Wall's restriction on freedom of movement. It came to symbolize the "Iron Curtain" that separated Western Europe and the Eastern Bloc during the Cold War.

demolition officially began on June 13, 1990 and was completed in 1992. The events that led to the Wall's fall began in the countries belonging to Eastern Europe under Soviet control.

Accordingly, in 1989 a series of radical and political tumults occurred in the Eastern Bloc, associated with the liberalization of the Eastern Bloc's authoritarian systems and the erosion of political power in the pro-Soviet governments in nearby Poland and Hungary. After several weeks of civil unrest, the East German Government announced on November 9, 1989 that all GDR citizens could visit West Germany and West Berlin. The fall of the Berlin Wall paved the way for German reunification, which was formally concluded on October 3, 1990.

What happened on November 9, 1989 had a huge influence on the process of relaunching the European integration project.

Moreover, the prospect of rapid German reunification and the collapse of communism in the East were positively welcomed by Western public opinion.

Europe emerged from the "scary balance" of a nuclear conflict between Moscow and Washington, although some European leaders viewed with concern the end of the Cold War balance, which would reinforce Germany.

As a consequence, the political leaders[66] began to imagine a Germany with a stronger community structure and a common currency that could sterilize the dangers inherent to a reunified German State. The result of these efforts was the Maastricht Treaty.[67]

[66] Leaders like François Mitterrand, Jaques Delors, and Helmut Kohl could not give up defending the salient features of Western Europe, including for example some forms of social protection and the principle of solidarity. To these demands would respond more progressive integration of a political nature, the launch of the "European social dialogue," the action of the structural funds, not surprisingly aimed to reinforce economic and social growth, in other words Europeanization, and the nations of southern Europe became part of the Community between 1981 and 1985.

[67] The Maastricht Treaty (formally the Treaty on European Union or TEU) undertaken to integrate Europe was signed on February 7, 1992 by the members of the European Community in Maastricht, the Netherlands. On December 9–10, 1991, the same city hosted the European Council, which drafted the treaty. Upon its entry into force on November 1, 1993 during the Delors Commission, it created the European Union and led to the creation of the single European currency, the euro. The Maastricht Treaty has been amended by the treaties of Amsterdam, Nice, and Lisbon. The treaty established the three pillars of the European Union – one supranational pillar created from three European Communities (which included the European Community (EC), the European Coal and Steel Community, and the European Atomic Energy Community), the Common Foreign and Security Policy (CFSP) pillar, and the Justice and Home Affairs (JHA) pillar. The first pillar was where the EU's supra-national institutions – the Commission, the European Parliament, and the European Court of Justice – had the most power and influence. The other two pillars were essentially more intergovernmental in nature, with decisions being made by committees composed of Member States' politicians and officials. All three pillars were extensions of the existing policy structures. The European Community pillar was the continuation of the European Economic Community with the "Economic" being dropped from the name to represent the wider policy base given by the Maastricht Treaty. Coordination in foreign policy had taken place since the beginning of the 1970s under the name of European Political Cooperation (EPC), which had first been written into the treaties by the Single European Act but not as part of the EEC. While the Justice and Home Affairs pillar extended cooperation in law enforcement, criminal justice, asylum and immigration, and judicial cooperation in civil matters, some of these areas had already been subject to intergovernmental cooperation under the Schengen Implementation Convention of 1990.

2.4. The Third Framework Programme: FP3 (1990–1994)

The Third Framework Programme of Community activities in the field of research and technological development was adopted by the Council of the European Ministers in April 1990 with a four-year duration.[68] The legal basis of the Third Framework Programme was the new Title VI, articles from 130f to 130q of the EEC Treaty, as set forth in the Single European Act adopted in 1987.[69]

The following lines laid down the new relevant normative provisions that determined the functioning of the next FPs. Specifically, Article 130f stated that the purpose of the Community is to improve the scientific and technological basis of European industry and to foster greater competitiveness at the international level. Article 130g provided a series of activities to complement the initiatives carried out in the Member States:

- implementation of research, technological development, and demonstration programs by promoting cooperation with undertakings, research centers, and universities;
- promotion of cooperation in the field of Community research, technological development, and demonstration with third countries and international organizations;
- dissemination and optimization of the results of activities in Community research, technological development, and demonstration;
- stimulation of the training and mobility of researchers in the Community.[70]

Another two relevant aspects were introduced in the EEC Treaty. The first is coordination (article 130h), which provides that Member States have to coordinate the policies and programs carried out at the national level among themselves. The second is cooperation (articles 130i and 130k), which introduces the legal basis for the framework program for Community research.

Like FP1 and FP2, the objective of FP3 was always related to the improvement and spreading of the European technological development and the European added value.[71]

In other words, FP3 aimed to strengthen the scientific and technological basis of European industry and to encourage it to become more competitive at the international level. Overall the measures identified intended to support enterprises (including small and medium-sized undertakings),

[68] Cordis web portal: http://cordis.europa.eu/programme/rcn/164_en.html

[69] It provided a stronger legal basis for Community research policies by introducing Title VI "Research and technological development" (Articles 130f to 130q) into the EEC Treaty.

[70] It is the legal support for the several European actions related to the mobility of researchers within European countries. For instance, the Marie Curie Actions provided in the current Horizon 2020 find their justification in this article.

[71] EARMA Conference. (2013). *30th anniversary of the EU RTD framework programme: Achievements and lessons learned* (p. 11). Vienna.

research centers, and universities in their research and technological development activities and in their efforts to cooperate with one another. The structure and the criteria of FP3 were mainly the same as those provided in FP2:

1) <u>Enabling technologies</u>

- *Information and communications technologies (ECU 2,516 million):*
  - Information technologies (ECU 1532 million);
  - Communication technologies (ECU 554 million);
  - Development of telematic systems of general interest (ECU 430 million);
- *Industrial and materials technologies (ECU 1,007 million):*
  - Industrial and materials technologies (ECU 848 million);
  - Measurement and testing (ECU 159 million).

2) Management of natural resources

- *Environment (ECU 587 million):*
  - Environment (ECU 469 million);
  - Marine sciences and technologies (ECU 118 million);
- *Life sciences and technologies (ECU 840 million):*
  - Biotechnology (ECU 186 million);
  - Agriculture and agro-industrial research, including fisheries (ECU 377 million);
  - Biomedical and health research (ECU 151 million);
  - Life sciences and technologies for developing countries (ECU 126 million).
- *Energy (ECU 1,063 million):*
  - Non-nuclear energies (ECU 217 million);
  - Nuclear fission safety (ECU 228 million);
  - Controlled nuclear fusion (ECU 568 million).

3) Management of intellectual resources

- *Human capital and mobility (ECU 587 million).*

It is clear from the priorities above that the focus of the European Community has not really changed from the previous FPs (FP1–FP2).

In fact, the focus initiatives were mainly related to the enabling technologies field. In other words, there is no explicit trace of the social dimension and in particular of initiatives linked to the social science and humanities field, which it is currently a scientific field taken into high consideration by

the European Union.[72] It is important to understand that the relevance of SSH was not still included in the European priorities, maybe because the world was focused more on technological innovation than on social innovation or maybe because the societies at large were not aware of the societal challenges, for example the ageing population, social inclusion, and environmental protection, that we are now facing. If we compare the past situation with the current one in terms of the inclusion of the social dimension and scientific fields such as the social sciences and humanities in the framework programs, the picture is quite different.

As a matter of fact, the social dimension as well as the social sciences and humanities gained huge relevance in Horizon 2020,[73] which allocated the largest amount of its budget to societal challenges. This specific aspect will be discussed in the following chapter.

Nevertheless, the Third Framework Programme contained diverse innovative elements that characterized it as the first to be strongly oriented towards promoting the participation of small and medium-sized enterprises.

The program CRAFT was actually a brand-new scheme for SMEs (1990–1994). It was built to assist groups of SMEs to join together and contract the necessary research work to a third party. In particular, the funding scheme of CRAFT was addressed to specific SME groups with common and specific needs.

Moreover, during FP3 an important mutation occurred related to the European political scenario, which completely and definitely changed the cards on the table: the Maastricht Treaty. The Treaty of the European Union (TEU), also known as the *Treaty of Maastricht* due to having been signed in that Dutch town, constituted a turning point in the European integration process. It was signed on February 7, 1992 by the members of the European Community.

Upon its entry into force on November 1, 1993 during the Delors Commission, it created the European Union and led to the creation of the single European currency.

The Maastricht Treaty has been amended by the treaties of Amsterdam, Nice, and Lisbon[74] by modifying the previous treaties of Paris and Rome and the Single European Act. The Treaty of

[72] During the last two decades, the role of the social dimension and in particular of the social sciences and humanities has become highly relevant. There are numerous documents, papers, and communications from the European Commission that underline this crucial role. Among them, the following mention can be considered one of the most important: "Embedding SSH research across Horizon2020 is essential to maximise the returns to society from investment in science and technology. Integrating the socio-economic dimension into the design, development and implementation of research itself and of new technologies can help find solutions to societal problems. Indeed, the idea to focus Horizon2020 around "Challenges" rather than disciplinary fields of research illustrates this new approach" (European Commission. (2016). *Science, technology and innovation in Europe* (p. 42). Brussels).

[73] The current budget dedicated to the third pillar of Horizon 2020 – "societal challenges" – is €29 billion. It is the largest amount of money dedicated to the socio-economic and humanities field.

[74] The Treaty of Amsterdam was signed on October 2, 1997 and entered into force on May 1, 1999. It amended the Treaty of the European Union and the Treaties establishing the European Communities. The Treaty of Nice was signed by European leaders on February 26, 2001 and came into force on February 1, 2003. It amended the Treaty of Rome. It reformed the institutional structure of the European Union to withstand eastward expansion, a task that was originally intended to have been performed by the Amsterdam Treaty but failed to be addressed at the time. The more recent Treaty of Lisbon (initially known as the Reform Treaty) is an

Maastricht changed the official denomination of the EEC; henceforth, it would be known as the European Union. The term Union was used from the very beginning of the Treaty to convey clearly the advancement in the historical project. Accordingly, article 2 of the Treaty of the European Union affirmed: "This Treaty marks a new stage in the process of creating an ever closer union among the peoples of Europe."

It worth underlining the significant Maastricht criteria that constitute the legal and political basis of the European Union as it is known today.

The four criteria were defined in article 121 of the Treaty establishing the European Community. They concern the control over inflation, public debt and the public deficit, exchange rate stability, and the convergence of interest rates.

Other relevant aspects linked to European funding programmes are the introduction of important financial instruments such as Socrates, Erasmus, and Leonardo Da Vinci, which remain in force today (they are all gathered within the current *Erasmus+* program – 2014/2020). They had a significant impact on the European youth generation involving millions of people, among whom the great part were students and teachers, to facilitate contacts and combined work.[75]

international agreement that amended the two treaties that form the constitutional basis of the European Union (EU). The Treaty of Lisbon was signed by the EU Member States on December 13, 2007 and entered into force on December 1, 2009. The stated aim of the treaty was to complete the process started by the Treaty of Amsterdam and by the Treaty of Nice with a view to enhancing the efficiency and democratic legitimacy of the Union and to improving the coherence of its action. Opponents of the Treaty of Lisbon, such as the former Danish Member of the European Parliament (MEP) Jens-Peter Bonde, argued that it would centralize the EU and weaken democracy by "moving power away" from national electorates. Supporters argued that it would introduce more checks and balances to the EU system, with stronger powers for the European Parliament and a new role for the national parliaments.

[75] The data gathered by the European Commission revealed that more than 3 million students have benefitted from EU Erasmus grants since the exchange scheme's launch in 1987. The statistics, covering an academic year, showed that the program enabled more than 250 000 Erasmus students to spend part of their higher education studies abroad or to take up a job placement with a foreign company to boost their employability.

More than 46 500 academic and administrative staff also received support from Erasmus to teach or train abroad, an experience designed to improve the quality of teaching and learning in the 33 countries that participated in the scheme. The current program, Erasmus+, aims to offer opportunities for 4 million people to study, train, teach, or volunteer abroad by 2020.

2.5. The Fourth European Framework Programme: FP4 (1994–1998)

Decision No. 1110/94/EC by the European Parliament and the Council on April 26, 1994 began the Fourth Framework Programme of the European Union in the field of research and technological development and demonstration. The total budget provided was €11.8 billion.

FP4, like the previous framework programs, was based on a set of common and clear principles that were aligned towards pushing technological innovation. A new and fundamental element was introduced for the first time in a framework program: the social dimension. It gathered different facets ranging from socio-economic research to specific research on social challenges, such as integration and exclusion.

After ten years of framework programs, this new factor represented a milestone in their evolution. Indeed, the inclusion of a social dimension within the FP4 activities paved the way for the prominence of societal challenges in the future FPs as well. In other words, it marked the beginning of a profound reflection at the European level on the role and even more on the needs of contemporary European society.

Due to the great attention paid to technology and industrial development, the social dimension had mostly been left behind for many years. In fact, when the word "social" emerged within the previous FPs, it was mostly related to technological development (see the example above relating to FP2).

Consequently, after this first inclusion, the social dimension would never leave the European Framework Programmes' priorities; rather, it kept increasing its meaning and relevance and its budget allocation up to its peak in Horizon 2020.[76]

The structure of the Fourth Framework Programme was very much aligned with that of the previous FPs. It was divided into seven main fields of action, each of which was sub-divided into different specific actions of intervention.

In the total program budget of almost €9.5 billion, the top three positions regarding the amount of dedicated budget can easily be guessed: *information technology* (€1.9 billion), *industrial and material technologies* (€1.7 billion), and *non-nuclear energy* (€1 billion).[77] For the debut of the social dimension, correctly named *targeted socio-economic research*, the amount of dedicated budget was just €138 million, specifically 1.4% of the total budget provided.

[76] The current budget provision dedicated to the third pillar of Horizon 2020 – societal challenges – is around €29 billion. http://cerneu.web.cern.ch/horizon2020/budget

[77] The European Parliament, Decision No. 1110/94, 1994, Annex 1, p. 126/4.

The official perspective/explanation expressed by the European Parliament within the official Decision no. 1110/94/EC [78] on *why* the societal needs must be encompassed within FP4 is interesting: "The close inter-relationship between economic, political and social conditions on the one hand and technology, growth and employment on the other hand is the essential feature of the context in which RTD activities in this line should be carried out.

The latest developments in the Community also indicate an increasing need for public understanding of science and for strengthening the interface between science, research and society."

The approach found within sub-action C was even more addressed to a social dimension. It was titled "Research into social integration and social exclusion in Europe," and the aims were "purely" oriented towards facing concrete societal challenges, such as social integration, poverty, and social exclusion. Accordingly, it focused its research on the various forms taken by social exclusion, on its causes, and on possible solutions. Specifically, the actions undertaken were:

- forms and processes of social exclusion, including demographic and regional/urban aspects
- causes, including unemployment
- migration
- experiences at the national and Community level with integration policies
- the contribution of technological developments to social integration

The first point, which already takes into account issues such as demographic change and urban aspects, is noteworthy, as they remain on the list of societal challenges provided by the European Union; they have now evolved into active ageing issues and elderly life conditions within the urban context.[79]

A quick glance at the entire structure of the FP4 is useful to gain the complete picture of the priorities. FP4 was divided into four main activities, each of which contained sub-activities and specifications.

First activity: *Implementation of research, technological development, and demonstration programs by promoting cooperation with and between undertakings, research centers, and universities*

[78] European Parliament and Council. (1994). *Concerning the Fourth Framework Programme of the European Community activities in the field of research and technological development and demonstration*. Brussels. Retrieved from http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A31994D1110

[79] Currently the same issues are contained in the first action within the societal challenges pillar in Horizon 2020: *SC1 – health, demographic change and well-being*. The comparison shows the decisive shift of priorities at the European level that has occurred over 20 years. SC1 has an amount of dedicated budget of €7.472 billion.

This activity covered a major part of the Community's activities in the field of research and technological development. The basic approach was the participation of a transnational group of organizations, research centers – including the Joint Research Centre (JRC), universities, and enterprises:

- Information and communication technologies
- Industrial technologies
- Environment
- Life sciences and technologies
- Non-nuclear energy
- Transport
- Targeted socio-economic research

Second activity: *Promotion of cooperation in the field of Community research, technological development, and demonstration with third countries and international organizations.*

The second activity covered various related forms of Community intervention. Scientific and technical cooperation would be developed and would also include international research collaboration activities hitherto undertaken outside the framework program:

- Scientific and technological cooperation in Europe
- Cooperation with industrialized non-European third countries
- Scientific and technological cooperation with developing countries

Third activity: *Dissemination and optimization of the results of activities in Community research, technological development, and demonstration*

This activity aimed to ensure wide dissemination of research results; to facilitate their optimal exploitation by encouraging, with the assistance of the actors concerned, the transformation of the results obtained into innovations; to support technology transfer, in particular to small and medium-sized undertakings; and to support initiatives at the national or regional level to give them a Community dimension:

- Dissemination and exploitation of research results
- Dissemination of technologies to enterprises
- The financial environment for the dissemination of technology
- Scientific services for Community policies

Fourth activity: *Stimulation of training and mobility of researchers in the Community*

The objective of this activity was to promote the training and mobility of Community researchers in fields, including those of fundamental research, that were not eligible for support under the first activity.

- Networks of laboratories in different countries
- Access to large-scale facilities
- Training through research and stimulation of mobility

All the activities listed above aimed to tackle the general objectives of the Community, such as promoting sustainable development and improving the quality of life of the Community's citizens. Any activities could have been affected by the historical events occurring in that period of time. It is necessary to identify some connections between the FP4 provisions and the main happenings. For instance, the *first activity* of FP4 contained a dedicated action named *non-nuclear energy*, which is one of the consequences arising from 30 years of the Cold War, with nuclear energy at center of the daily challenge between the USA and Russia, and the Chernobyl disaster occurring in 1986, which caused a great sensation in Europe.

Therefore, during the Fourth Framework Programme, on May 11, 1995, the Treaty on *non-proliferation of nuclear weapons* was extended for an unlimited period. Moreover, to avoid the use of nuclear energy for weapon construction, on November 7, 1996 a brand new *Erratum–Us* agreement on the peaceful use of nuclear energy was signed.[80] These events paved the way for a cultural and political route change addressed to a major interest in renewable energy sources.

As a matter of fact, on November 26, 1997, the European Commission adopted a white paper on renewable energy sources,[81] and the following year, from December 1 to December 10, 1997, one of the most effective International Conferences on Climatic Change was held in Kyoto,[82] Japan, and concluded with commitments by industrialized countries to reducing greenhouse gas emissions.

[80] This is even more remarkable within FP3, which was built in the period 1990–1994, when the Chernobyl disaster was still at the center of debate. In fact, the quantity of actions aimed to improving the safety of nuclear fusion provided a clear signal of understanding: energy (ECU 1,063 million); non-nuclear energies (ECU 217 million); nuclear fission safety (ECU 228 million); and controlled nuclear fusion (ECU 568 million).

[81] European Commission. (1997). *Energy for the future: Renewable sources of energy, white paper for a Community strategy and action plan*. Brussels. Retrieved from http://europa.eu/documents/comm/white_papers/pdf/com97_599_en.pdf

[82] The Kyoto Protocol was adopted in Kyoto, Japan, on December 11, 1997 and entered into force on February 16, 2005. There are currently 192 parties (Canada withdrew effective from December 2012) to the Protocol. The Kyoto Protocol implemented the objective of the UNFCCC to fight global warming by reducing greenhouse gas concentrations in the atmosphere to "a level that would prevent dangerous anthropogenic interference with the climate system" (Art. 2). The Protocol is based on the principle of common but differentiated responsibilities: it puts the obligation to reduce the current emissions on developed countries on the basis that they are historically responsible for the current levels of greenhouse gases in the atmosphere.

2.6. The Fifth Framework Programme: FP5 (1998–2002)

The Fifth Framework Programme was adopted on December 22, 1998 with Decision no. 182/1999/EC[83] of the European Council and European Parliament. The total budget provided was €13.7 billion: an increase of 15% compared with FP4.

FP5 was conceived to help solve problems and respond to major the socio-economic challenges that the EU is facing. Therefore, it focused on a number of objectives and interdisciplinary areas combining all the selected priorities: technological, industrial, economic, social, and cultural aspects. These priorities were selected on the basis of a set of common criteria reflecting the major concerns of increasing industrial competitiveness and the quality of life for European citizens. Specifically, the criteria were divided into three main categories:

- Criteria related to the Community "value added" and the subsidiarity principle
- Criteria related to social objectives
- Criteria related to economic development and scientific and technological prospects

In addition, from the beginning of the program description, the shift towards the relevance of the social dimension was clear. As already mentioned, the social dimension was not included in the first three FPs. After its first inclusion in FP4, it even became one of the criteria at the basis of the entire FP5. This shows a big change in the range of priorities between the 1990s and the 2000s that would continue to increase within the following FPs.

FP5 differed considerably from its predecessors in some crucial points. First of all, to maximize its impact, it focused on a limited number of research areas combining technological, industrial, economic, social, and cultural aspects.

In addition, FP5 provided a different important novelty that positively affected the European policies in the following years: the concept of key actions. They are undoubtedly the major innovation within the Fifth Framework Programme. The concept of "key actions" is still part of European policy terminology.[84]

The objectives of these flexible instruments are targeted to achieving solutions to problems of great concern in the European context. The "key actions" aim to mobilize a wide range of scientific and technological disciplines required to address a specific problem to overcome the barriers that exist

[83] European Parliament and of the Council. (1998). *Concerning the Fifth Framework Programme of the European Community for research, technological development and demonstration activities*. Brussels. Retrieved from http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ%3AL%3A1999%3A026%3ATOC

[84] Currently the exact term used is key initiative. Under the Europe 2020 strategy, 13 initiatives are provided that are deemed crucial to achieving the main objective of the strategy.

not only between disciplines but also between the programs and the organizations concerned. The key actions have been thought as problem-oriented and clearly defined tools on the basis of the common set of criteria listed above.[85]

To gain a clear picture of the program and to understand better the political choices made, it is interesting to analyze the structure of FP5 and its specific priorities. The Fifth Framework Programme (FP5) is composed of two main parts:

1. **The Fifth (EC) RTD Framework Programme**, comprising *four* focused thematic programs implementing research, technological development, and demonstration activities and *three* wide-ranging **horizontal** programs;
2. **The Fifth (Euratom) Framework Programme**, comprising a focused thematic program implementing research and training activities in the nuclear sector.

   Each of the framework programs also contained a specific program covering the direct RTD actions to be implemented by the European Commission's Joint Research Centre (JRC), which comprised research, scientific, and technical support of an institutional nature.

The EC RTD Framework Programme was the core of FP5 and the recipient of the greater part of the budget. It had a multi-theme structure, consisting of the seven specific programs of which four are thematic programs:

- Quality of life and management of living resources (Quality of Life)
- User-friendly information society (IST)
- Competitive and sustainable growth (GROWTH)
- Energy, environment, and sustainable development (EESD)

The other three horizontal programs aimed to underpin and complement the thematic programs by responding to common needs across all research areas. They were at the crossroads of the Community's research policy and its policies for external relations, innovation, SMEs, human resources, and social and employment issues. They were organized as follows:

[85] The key actions included within the Fourth Framework Programme were gathered under the five main groups that composed the FP5. In the first group, "quality of life," there were seven key actions: food, nutrition, and health, control of infectious diseases, environment and health-sustainable agriculture, fisheries and forestry, integrated development of rural areas, the ageing population, and disabilities. The second group, "user-friendly information society," contained the following key actions: systems and services for the citizen, new methods of work and electronic commerce, multimedia content and tools, and essential technologies and infrastructures. In the third group, "competitive and sustainable growth," there were four key actions: innovative products and processes, organization-sustainable mobility, intermodality, land transport and marine technologies, and new perspectives for aeronautics. In the last group, "energy, environment, and sustainable development," there were eight key actions: sustainable management and quality of water, global change, climate and biodiversity, sustainable marine ecosystems, the city of tomorrow and cultural heritage, cleaner energy systems, including renewables, economic and efficient energy for a competitive Europe, and controlled thermonuclear fusion (Euratom)–nuclear fission (Euratom).

- Confirming the international role of Community research (INCO 2)
- Promotion of innovation and encouragement of SME participation
- Improving the human research potential and the socio-economic knowledge base

Another essential new characteristic that differentiates the Fifth Framework Programme from the Fourth Framework Programme is the integrated approach between the different actions to push the participants from different scientific and cultural fields to cooperate. It was the prelude of the interdisciplinary principle, which nowadays has become one of the pivotal points of the European policy. These integrations emerged in the connection between:

- Key action concepts in the thematic programs
- Horizontal and thematic programs' objective
    - *International cooperation*
    - *Innovation and participation of SMEs*
    - *Socio-economic and training aspects*

After the introduction of the socio-economic aspects in FP4, it gained even more space and value in FP5. As a matter of fact, socio-economic research could be funded by both the thematic programs and the key action on "improving the socio-economic knowledge base." Moreover, it appears in the horizontal program on "improving the human research potential and the socio-economic knowledge base."

The social dimension and related innovation initiatives have gained importance within every FP. This is due to the even-increasing relevance of the social dimension at the European level. As a matter of fact, during the implementation of FP5, several initiatives were taken that aimed to increase the awareness of the major societal challenges in Europe. For instance, on June 15–16, 1998, the European Council held in Cardiff[86] in the UK set out the essential elements of the European Union strategy for further economic reform to promote growth, prosperity, jobs, and *social inclusion*.

Noteworthy are both the Economic and Social Committee, which on July 30, 1999 launched the First Convention on the "Role and contribution of organised civil society in European integration," and the release of the European Social Agenda in December 1999.

[86] Within the final document of the European Council of Cardiff, there was a specific provision whereby the concept of social inclusion was expressed as follows: "The Cardiff European Council has taken further steps in this process by: setting out essential elements of the European Union strategy for further economic reform to promote growth, prosperity, jobs, and *social inclusion*.

2.7. The Sixth Framework Programme: The new FP6 (2002–2006)

The Sixth Framework Programme (FP6) was launched with Decision no. 1513/2002/EC[87] carried out by the European Parliament and the Council on June 27, 2002 for the established period 2002–2006. FP6 was carried out with the same objectives as the previous FP4 and FP5, which were laid down in the well-known Article 163 of the Treaty.

As the first proposal, the Commission suggested a name such as "The New Framework Programme," but the title was changed by the Swedish Presidency[88] to the definitive FP6. Actually, there are some important innovative elements that would have justified the first suggestion. The most important was the introduction of the European Research Area within the scheme of FP6.

In the past the European Union had fifteen individual national research programs, all with a similar set of priorities, and the framework programs were additional programs. In this situation the European context suffered from duplication of effort and dissipation of resources, which did not allow European research to be referred to as a single entity in the same way as it is possible to talk about American research or Japanese research.

As a consequence, the EU agreed at the highest political level to launch the European Research Area[89] (ERA).

At the same time, it was suggested to open up trade markets that could lead to a single market, which, together with the opening up of research into a single common area, would benefit research generally at the European level.

The ERA is a concept that gained great space and resonance at the European level after its first appearance, and it is nowadays a milestone that aims to unify the leading research in Europe and to develop an area for coherent and coordinated research activities and policies to enable researchers, scientific knowledge, and technology to circulate freely.

The structure of FP6 was built to achieve more effective results and thus contribute better to realizing the European Research Area objectives. FP6 was organized with the following three headings:

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[87] European Parliament and Council. (2002). *Concerning the sixth framework programme of the European Community for research, technological development and demonstration activities, contributing to the creation of the European Research Area and to innovation*. Brussels. Retrieved from http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32002D1513

[88] On January 1, 2001, Sweden would pick up the gavel of the EU presidency. The three areas that declared as the highest priorities for its six-month term were: EU enlargement, job promotion, and increased environmental consideration in EU cooperation.

[89] The European Research Area (ERA) was proposed by the Commission in January 2000. It has since been endorsed by the Heads of State and Government and is now the major research policy debate in Europe. The architect of the ERA was Commissioner Philippe Buskin. The main objectives were as follows: making it possible to establish a critical mass of potential excellence by networking the capacities present in different Member States, particularly through the intensive use of information and communication technologies; releasing people and teams from the protection of national barriers, thus introducing competition and increasing the general level of excellence; and attracting to Europe the best researchers from the rest of the world, in the same way that American campuses are currently attracting researchers.

1. Focusing and integrating Community research

The activities carried out under this heading represented the major part of the efforts deployed under this program and were intended to integrate research efforts and activities on the European scale. A quick overview of the thematic areas involved and the related budget is useful to understand the main priorities and objectives framed at the beginning of the 2000s. The thematic priorities were the following:

1. Life sciences, genomics, and biotechnology for health (€2.25 billion)
2. Information society technologies (IST) (€3.6 billion)
3. Nanotechnologies and nanosciences, knowledge-based multifunctional materials, and new production processes and devices (€1.3 billion)
4. Aeronautics and space (€1.07 billion)
5. Food quality and safety (€685 million)
6. Sustainable development, global change, and ecosystems (€2.12 billion)
7. Citizens and governance in a knowledge-based society (€225 million)

It is clear that the focus was inevitably the information and technology field, but, for the first time in a framework program, a considerable amount of money was provided for *food quality* and *safety*. In this case some historical events also played a relevant role in fixing the priorities. As a matter of fact, it was the consequence of the food crisis related to *bovine spongiform encephalopathy* (BSE) that highlighted both the complexity of food safety issues in Europe and the fact that in most cases they have international and cross-border implications.[90]

At the same time, the social dimension and its need for developing social innovation increased. FP5 provided a set of actions with a social dimension. These actions were not isolated to one specific field but spread across the program, in accordance with the nature of social issues, which are cross-sectional.

Conversely, within FP6 the thematic priority *citizens and governance in a knowledge-based society* aimed to carry out activities to mobilize the European research capacities in a coherent effort in economic, political, and social sciences and humanities.

[90] Bovine spongiform encephalopathy (BSE) was commonly known as mad cow disease. In the United Kingdom, the country worst affected by the epidemic in 1986–98, more than 180,000 cattle were infected and 4.4 million slaughtered during the eradication program.

This more social inclination from political efforts was able to put the social challenges in Europe on the table. The Council in Lisbon in March 2000[91] was one of these efforts. The discussion led to important statements. In particular, in the section "the way forward," it was decided that the Union would set itself a new strategic goal for the next decade: to become the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion. Achieving this goal required an overall strategy aimed at:

- preparing the transition to a knowledge-based economy and society by better policies for the information society and R&D as well as by stepping up the process of structural reform for competitiveness and innovation and by completing the internal market;
- modernizing the European social model, investing in people, and combating social exclusion;
- sustaining the healthy economic outlook and favorable growth prospects by applying an appropriate macro-economic policy mix.

2. Structuring the European Research Area

These activities were intended to stimulate technological innovation, the utilization of research results, the transfer of knowledge and technologies, and the setting up of technology businesses in the Community and in all its regions.

FP6 undertook fundamental actions towards a wide innovation concept; moreover, it would be significantly increased in the next framework program, FP7, and even more within the current Horizon 2020.

Concrete activities have been undertaken to create bridges among the main actors of innovation (universities and companies), such as the networking of stakeholders and users in the European innovation system and the promotion of studies to foster the exchange of experience and good practices and to engage users better in the innovation process.[92]

[91] The European Council held a special meeting on March 23–24, 2000 in Lisbon to agree a new strategic goal for the Union to strengthen employment, economic reform, and social cohesion as part of the knowledge-based economy. At the start of the proceedings, an exchange of views was conducted with the President of the European Parliament, Mrs Nicole Fontaine, on the main topics for discussion.

[92] The activities carried out under this heading were intended to support the development of abundant world-class human resources in all the regions of the Community by promoting transnational mobility for training purposes, the development of expertise, or the transfer of knowledge, in particular between different sectors. It aimed to support the development of excellence and helping to make Europe more attractive to third-country researchers.

This should be undertaken with the aim of making the most of the potential offered by all the sectors of the population, especially women and younger researchers, and taking appropriate measures for this purpose, including those taken towards creating synergies in the area of higher education in Europe. Promoting transnational mobility is a simple, particularly effective, and powerful means of boosting European excellence as a whole as well as its distribution throughout the different regions of the Union. It creates opportunities for significantly improving the quality of the training of researchers, promotes the circulation and exploitation of knowledge, and helps to establish world-class centers of excellence that are attractive throughout Europe.

3. Strengthening the foundations of the European Research Area

The activities carried out under this heading were intended to serve as support for the previous two priorities and in particular to step up the coordination and to support the coherent development of research and innovation stimulation policies and activities in Europe.

2.8. The Seventh Framework Programme: FP7 (2007–2013)

FP7, or better the *Seventh Framework Programme for Research and Technological Development*, was approved by the European Parliament and the Council through Decision no. 1982/2006/EC[93] on December 18, 2006. FP7 was a key tool promoted by the Europe Union to respond to the emerging needs in terms of jobs and competitiveness in Europe and to maintain leadership in the global knowledge economy.

Since their launch in 1984, the framework programs have played a lead role in multidisciplinary research and cooperative activities in Europe and beyond. Consequently, FP7 is the natural successor to the previous program (FP6), but, due to its largeness and importance, it was built after years of consultation with the research community from both the public and the private sector, with economic actors, and with political decision makers in Europe.[94]

The Seventh Framework Programme had the same general objective as provided for its predecessors and two different main strategic objectives:

- to strengthen the scientific and technological base of European industry;
- to encourage its international competitiveness while promoting research that supports policies.

Even though the general objectives followed by the FPs are the same, FP7 has some key differences from earlier EU research programs. Actually, it was a groundbreaking, innovative framework program that has definitely changed the way of thinking about and perspective on the importance and quality of research. The first innovative element was the great increase in the budget. The FP7 budget represented a 63% increase from FP6 at the current €50.5 billion. It also sent a strong political message to the EU Member States, which committed to increasing their research spending from 2% of their GDP to 3% in 2010.

[93] European Parliament and Council. (2006). *Concerning the Seventh Framework Programme of the European Community for research, technological development and demonstration activities*. Brussels. Retrieved from http://cordis.europa.eu/documents/documentlibrary/90798681EN6.pdf

[94] European Commission. (2006). *FP7: Tomorrow's answers start today*. Brussels.

The second noteworthy element was the creation of the European Research Council (ERC),[95] which aimed to fund more high-risk yet potentially high-gain European research at the scientific frontiers. The third innovative element was the *Regions of Knowledge*,[96] which brought together the various research partners and *actors of innovation* within a territory: universities, research centers, multinational firms, regional authorities, and SMEs.

The fourth ingredient was the risk-sharing finance that aimed to enhance the participation of private investors in research projects and improve access to loans from the European Investment Bank (EIB) for large European research actions. The last point was the creation of the Joint Technology Initiatives[97] (JTIs) tool, which survives today within Horizon 2020. The JTIs are a new concept that brings together different partners to face those areas of research aiming for long-term success.

Despite the size of FP7, its structure was projected to guarantee an easy understanding of priorities and activities. It contains five major building blocks, each of which gathers diverse actions:

- Cooperation
- Ideas
- People
- Capacities
- Nuclear research

The core of FP7, representing two-thirds of the overall budget, was the *cooperation* program. It fostered collaborative research across Europe and other partner countries through projects by transnational consortia of industry and academia. The cooperation program was divided into ten thematic areas, corresponding to major fields of interest in science and research but also gathering non-technological priorities, such as the SSH and food fields.

[95] The ERC aims to encourage the highest quality of research in Europe through competitive funding and to support investigator-driven frontier research across all fields on the basis of scientific excellence. Currently, the ERC complements other funding activities in Europe, such as those of the national research funding agencies; moreover, it is a flagship component of Horizon 2020, the European Union's Research Framework Programme for 2014 to 2020.

[96] The actions undertaken in this area will enable European regions to strengthen their capacity for investing in and carrying out research activities. https://ec.europa.eu/research/fp7/index_en.cfm?pg=know

[97] Joint Technology Initiatives (JTIs) are a means to implement the Strategic Research Agendas (SRAs) of a limited number of European Technology Platforms (ETPs). In these few ETPs, the scale and scope of the objectives is such that loose coordination through ETPs and support through the regular instruments of the Framework Programme for Research and Development are not sufficient. Instead, effective implementation requires a dedicated mechanism that enables the necessary leadership and coordination to achieve the research objectives. To meet the needs of this small number of ETPs, the concept of "Joint Technology Initiatives" was developed. Horizon 2020 provides five JTIs: the Innovative Medicines Initiative (IMI), Aeronautics and Air Transport (Clean Sky), Fuel Cells and Hydrogen (FCH), Embedded Computing Systems (ARTEMIS), and Nanoelectronics Technologies 2020 (ENIAC).

A brief overview of the ten thematic areas is useful to understand better which priorities were fixed at the European level. The cooperation program was composed of ten different priorities, which are summarized in the following table:

- Health
- Food, agriculture and fisheries, and biotechnology
- Information and communication technologies
- Nanosciences, nanotechnologies, materials, and new production technologies
- Energy
- Environment (including climate change)
- Transport (including aeronautics)
- Socio-economic sciences and the humanities
- Space
- Security

The IDEAS program was the second pillar of FP7, with a budget provision of €7.4 billion. It was elaborated to support "frontier research" solely on the basis of scientific excellence. An innovative point was the possibility to carry out research in any area of science or technology, including engineering as well as the socio-economic sciences and the humanities (ERC).
The IDEAS program was uniquely flexible in its approach to EU research, and it was implemented by the new European Research Council (ERC). A prominent point was the new cross/transdisciplinary approaches that the ERC promoted in the IDEAS programme.
Starting from FP7, the inter/multi/transdisciplinary approach to research and collaboration has been identified as a key element towards innovation. Since then this concept has become crucial in the European development and innovation policies.[98]
The third pillar of FP7 was the PEOPLE program (€4.7 billion). The name immediately clarifies the main purposes of the program. In fact, it provides support for mobility and career development for researchers both within the European Union and internationally. It was mainly implemented via a set of Marie Curie Actions,[99] providing fellowships and other measures to help researchers to build

[98] The concept behind IDEAS is that first-rate researchers are best placed to identify new opportunities and directions at the frontiers of knowledge. These in turn will feed back into society, find their way to the industries and markets, and translate into the broader social innovations of the future.
[99] The Marie Skłodowska-Curie actions, named after the double Nobel Prize-winning Polish–French scientist famed for her work on radioactivity, support researchers at all stages of their career, irrespective of their nationality. Researchers working across all disciplines, from life-saving health care to "blue-sky" science, are eligible for funding. The MSCAs also support industrial

their skills and competences throughout their careers. The specific activities provided were as follows:

- Initial training of researchers – Marie Curie Networks
- Industry–academia partnerships
- Co-funding of regional, national, and international mobility programs
- Intra-European fellowships
- International dimension – outgoing and incoming fellowships
- International cooperation scheme and reintegration grants
- Marie Curie Awards

Through the PEOPLE's initiative, the European Union aimed to push researchers to stay in Europe (brain drain) whilst at the same time attracting the best researchers in the world with the European research excellence and infrastructures. In this way Europe could play a significant role in supporting innovation and knowledge creation, sharing and transferring it between countries and sectors. The Marie Curie Actions have played, and still do play, a crucial role in developing the European research excellence.

They aimed primarily to improve the human potential in Europe with specific actions by covering all the stages of researchers' professional life. Considerable importance has also been given by the relation with the industry partners.[100]

The main objective still remains to build long-term cooperation between academia, industry, and SMEs. As underlined in the first chapter, they are at the center of the innovation system, and they have to cooperate to create a lasting bridge for exchanging knowledge and experiences. These kinds of actions have also been included in the last framework program, Horizon 2020, in which actions such as the Marie Curie Actions, in particular RISE, aim to create the best U-I connection.

The last program, called "Capacities," represented the will of the European Union to provide the right environment for research. In other words, it aimed to strengthen the research capacities that Europe needs if it is to become a thriving knowledge-based economy. The main activities covered by the program are the following:

- Research infrastructures
- Research for the benefit of SMEs

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doctorates, combining academic research study with work in companies and other innovative training that enhances employability and career development.

[100] Accordingly, MSCAs are a set of actions with the crucial objective of the exchange of people between the academic and the non-academic sector. The specific action is RISE (Research Innovation Staff Exchange).

- Regions of knowledge
- Research potential
- Science in society
- Specific activities of international cooperation

In the next paragraphs, an analysis of the level of the social dimension in different framework programs will be offered. In particular, the analysis focuses on a specific scientific field that is nowadays at the center of the European political debate: social science and the humanities – SSH – which have increased their role appropriately during the decades.

This chapter has concerned the inclusion of the social dimension, which can be considered at least as the conceptual container of social science and the humanities. Drawing the path of the social dimension through the framework programs, it is possible to say that the social dimension (socio-economic research) was first exploited in the Fourth EU Research Framework Programme in the context of "targeted socio-economic research" (1994–1998), with a small budget provision of €130 million. Then, the social dimension grew in budget allocation and prominence in the following framework programs. In fact, under the Fifth Framework Programme (1998–2002), socio-economic sciences were funded in the key action "improving the socio-economic knowledge base" with a budget of €165 million.

Then, in the Sixth Framework Programme (2002–2006), the social dimension and social sciences finally obtained program status, being the seventh of seven thematic priorities, "citizens and governance in a knowledge-based society," with a budget of €245 million.

The social dimension enlarged its program status under FP7, while for the *first time* explicitly claiming inclusion and participation for the social sciences and humanities (SSH).[101] The large budget increase from FP6 to FP7 (€623 million) is not as spectacular as it may initially appear, because FP6 lasted for a duration of four years while FP7 covers seven years.

Theme 8, "socio-economic sciences and humanities," of the Seventh Framework Programme was at that time the world's largest research funding program for the socio-economic sciences and the

[101] Decision No. 1982/2006/EC of the European Parliament and of the Council of December 18, 2006 (p. 15) provides the following significant provisions: "The escalating economic and societal demands, together with the continued mainstreaming of ICT and the need to push further the limits of technology as well as to develop innovative high-value ICT-based products and services set a growing agenda for research. To bring technology closer to people and organisational needs means: hiding technology complexity and revealing functionality on demand; making technology functional, very simple to use, available and affordable; providing new ICT-based applications, solutions and services that are trusted, reliable, and adaptable to the users' context and preferences. Driven by the demand of more-for-less, ICT researchers are involved in a global race focussing on miniaturisation, mastering the convergence of computing, communications and media technologies, including further interoperability between systems and the convergence with other relevant sciences and disciplines, and building systems that are able to learn and evolve. From these diverse efforts a new wave of technologies is emerging. ICT research activities will also draw on a broader range of scientific and technological disciplines including bio- and life sciences, chemistry, psychology, pedagogy, cognitive and social sciences and the humanities."

humanities (SSH) and at the same time the smallest of the ten theme-oriented programs within the *cooperation* pillar (see the budget allocation above).

The scope of the topics in the SSH Work Programme reflects the complexity of the EU policies. Therefore, the SSH research was designed to provide policy makers and stakeholders with the evidence-based knowledge required to maintain and enhance Europe's competitiveness and the well-being of its people. The priorities gathered under the annual work programs[102] are appealing and give us an exact perspective on which were settled (and mostly currently are) as the main social challenges:

1. Growth, employment, and competitiveness in a knowledge society
2. Combining economic, social, and environmental objectives from a European perspective
3. Major trends in society and their implications
4. Europe in the world (covering a.o. migration, poverty, crime, and conflict)
5. The citizen in the European Union
6. Socio-economic and scientific indicators
7. Foresight activities, such as the future implications of global knowledge, migration, and ageing.

Some results are available on the European portal CORDIS, which are helpful in capturing the dimension and the impact of the SSH under FP7. The more than 1,700 proposals that have been submitted with over 130 projects that have received funding, associated with over 1,500 institutions, are prominent.

A total of 14,700 partners have participated in proposal submission, and circa 1,170 partners have been funded.[103] The cross-cutting approach of the SSH is relevant. Hence, in addition to Theme 8, "SSH," socio-economic and humanities research questions were integrated into transversal issues of other themes of the specific program *Cooperation*.

Likewise, SSH research was funded under specific programs such as Ideas (ERC), People (Marie Curie Actions), and Capacities (e.g. *Science in Society*). In addition, in Theme 6, "Environment," up to 50% of topics included socio-economic research aspects, albeit to differing degrees, and the security program *Society and Security* also has an SSH-relevant focus.

[102] European Commission. (2012). *Work Programme 2013, Cooperation THEME 8 Socio-economic sciences and humanities*. Brussels, 9 July.

[103] These data are the result of the notable research conducted by Net4Society within the commentary *SSH experience in FP7.*

Chapter III

The Role of the Social Sciences and Humanities in Horizon 2020

This chapter aims to analyze the role of the SSH in the last framework program for 2014–2020: Horizon 2020. It summarizes the role of the SSH in the previous FPs and provides the up-to-date state of the art of the relevance of social science and humanities within research projects at the European level. The new concept of the SSH embedding and incorporation into Horizon 2020 is an important part of the analysis.

3.1. The past and present roles of the SSH

In the previous chapter of this thesis, the role of the social sciences and humanities was briefly hinted at within the diverse framework programs occurring during the period from 1984 to 2013. The analysis showed that the SSH gained relevance during these decades, both in the public debate and at the European policy level.

There are several factors that contributed to increasing the awareness of the relevance of SSH. Many of them can be found in relation to the critical societal issues that European societies have faced in the last 50 years: from the strong technological development and the transformation of communication to demographic changes, the ageing society, and migration flows.

Table 3 below refers to the increase in the population of Europe from 1960 to 2016. The graphic, created by Eurostat,[104] shows that on January 1, 2016 the population of the EU-28 was estimated at 510.1 million people, which was 1.8 million more than a year before.

The increase in population numbers during 2015 was bigger than that recorded during 2014, when the population of the EU-28 had risen by 1.3 million. Over a longer period, the population of the EU-28 grew from 406.7 million in 1960 to 510.1 million in 2016, an increase of 103.4 million people.

[104] Eurostat is the statistical office of the European Union, situated in Luxembourg. Providing the European Union with statistics at the European level that enable comparisons between countries and regions is a key task. Eurostat was established in 1953 to meet the requirements of the Coal and Steel Community. Over the years its task has broadened, and, when the European Community was founded in 1958, it became a Directorate-General (DG) of the European Commission.

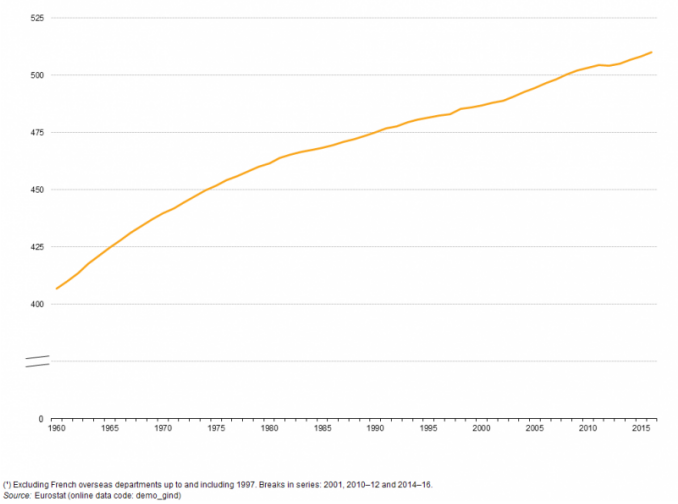

Table 3 – **The EU-28 population, 1960–2016**

(at January 1, million persons)

Source: Eurostat

Table 4 shows the ageing population in Europe, which is another big challenge of our time and for the coming year. The European Union is making huge efforts to understand better how to generate development and wellness from an ageing society.

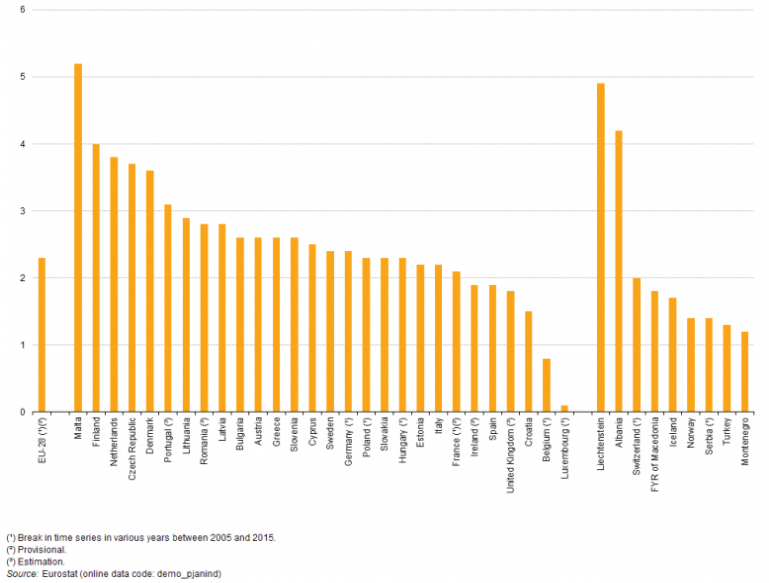

Table 4 –

Increase in the share of the population aged 65 years or over between 2005 and 2015

Source: Eurostat

Eurostat explained that, within the EU-28 in the period covered by Table 4, the number of young people (0 to 14 years old) made up 15.6% of the EU-28's population. The estimated number of

persons considered to be of working age (15 to 64 years old) accounted for 65.6%, and persons aged 65 or over had an 18.9% share.

In this scenario the European Union tried to bring up the idea of putting the society and people at the center of the policy debate with the purpose of giving more relevance to these emerging issues to develop innovative solutions.

To gain a clearer picture of the social dimension within the framework programs, it is worth briefly retracing its inclusion through the decades in the table below (see Table 5). In the table the last framework program – Horizon 2020 – is included. As it is clearly shown, the dedicated budget for the social dimension has increased enormously compared with the previous FPs.

It can be clarified that the third pillar – societal challenges – of Horizon 2020 contains not only social topics but also a large spectrum of themes other than social ones. The choice of the term *social dimension* instead of the SSH is not a case. The intention is to give a wider space of inclusion to different subjects in this category.

Speaking straightaway about the SSH for the "targeted socio-economic research" within FP4 (1994) would be misleading. In fact, the current concept of the SSH within the European framework programs was the result of the evolution of a long process that took decades. Table 5 illustrates the path of the *social dimension* through the different framework programs. The list collects the titles used in the FP through which the social dimension was expressed as well as the dedicated budget. The table presents the results starting from the first mention in FP4 to the last within Horizon 2020.

Table 5 – The social dimension in the Framework Programmes

Framework program	Name of the "action/theme/program"	Dedicated budget
Fourth Framework Programme (1994–1998)	*Targeted socio-economic research*	€130 million
Fifth Framework Programme (1998–2002)	*Improving the socio-economic knowledge base*	€165 million
Sixth Framework Programme (2002–2006)	*Citizens and governance in a knowledge-based society*	€245 million
Seventh Framework Programme (2007–2013)	*Socio-economic sciences and humanities*	€623 million
Horizon 2020 (2014–2020)	*Societal challenges (third pillar)*	€31.748 million (€31 billion)

The concept of the social sciences, which can be taken as the hub of the social sciences and humanities, was developed during a long process over the centuries, from the Age of the Enlightenment to the twenty-first century. It is necessary to describe briefly the evolution of the

social sciences during the "recent" history to stimulate a better understanding of the current definition as well as the different facets that it contains.

The path of the social sciences began during the Age of the Enlightenment,[105] which saw a great change in natural philosophy, specifically in the basic framework by which people understood what was intended by "scientific." In addition, a relevant influence on social sciences was brought about by the Age of Revolutions,[106] including both the Industrial and the French Revolution.

In this way the social sciences developed from the sciences (experimental and applied), or the systematic knowledge bases or prescriptive practices, relating to the social improvement of a group of interacting entities.

In the modern period, the term *social sciences* was first used to refer to a distinct conceptual field influenced by positivism and focusing on knowledge based on an actual positive sense of experience. Several authors contributed to increasing the understanding of the social sciences. Among the many, some played a crucial role, such as Auguste Comte,[107] Henri de Saint-Simon, Charles Fourier, Étienne Cabet, and Robert Owen, who contributed to the Utopian Socialism concept,[108] as well as Émile Durkheim,[109], studying "social facts," and Vilfredo Pareto[110].

Finally, Max Weber[111] championed the methodological dichotomy in which social phenomena were identified with and understood, paving the way to the correlation of knowledge and social values that lead to methodological antipositivism.

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[105] Science came to play a leading role in Enlightenment discourse and thought. Many Enlightenment writers and thinkers had backgrounds in the sciences and associated scientific advancement with the overthrow of religion and traditional authority in favor of the development of free speech and thought. Broadly speaking, Enlightenment science greatly valued empiricism and rational thought and was embedded with the Enlightenment ideal of advancement and progress.

[106] The Age of Revolution is the period from approximately 1774 to 1848, in which a number of significant revolutionary movements occurred in many parts of Europe and the Americas. The Age of Revolution includes the American Revolution, the French Revolution, the Haitian Revolution, the Greek Revolution, the revolt of the slaves in Latin America, the First Italian War of Independence, the 1848 revolutions in Italy, and the independence movements of the Spanish and Portuguese colonies in Latin America. In a way it includes the Industrial Revolution.

[107] He was a French philosopher who founded the discipline of sociology and the doctrine of positivism. He is sometimes regarded as the first philosopher of science in the modern sense of the term. Comte first described the epistemological perspective of positivism in *The course in positive philosophy*, a series of texts published between 1830 and 1842.

[108] The term is most often applied to those socialists who lived in the first quarter of the nineteenth century who were ascribed the label "utopian" by later socialists as a pejorative to imply naiveté and to dismiss their ideas as fanciful and unrealistic. Utopians believe that people of all classes can voluntarily adopt their plan for society if it is presented convincingly. They feel that their form of cooperative socialism can be established among like-minded people within the existing society and that their small communities can demonstrate the feasibility of their plan for society.

[109] He was a French sociologist, social psychologist, and philosopher. He formally established the academic discipline and – with Karl Marx and Max Weber – is commonly cited as the principal architect of modern social science and the father of sociology. His first major sociological work was *The division of labour in society* (1893). In 1895 he published *The rules of sociological method* and set up the first European department of sociology, becoming France's first professor of sociology.

[110] He was an Italian engineer, sociologist, economist, political scientist, and philosopher, now also known for the 80/20 rule, named after him as the Pareto principle. He made several important contributions to economics, particularly in the study of income distribution and in the analysis of individuals' choices. He was also responsible for popularizing the use of the term "elite" in social analysis.

[111] He was a German sociologist, philosopher, jurist, and political economist whose ideas profoundly influenced social theory and social research. Weber was a key proponent of methodological antipositivism, arguing for the study of social action through interpretive (rather than purely empiricist) means, based on understanding the purpose and meaning that individuals attach to their own actions. Unlike Durkheim, he did not believe in monocausality and rather proposed that for any outcome there can be multiple causes. Weber's main intellectual concern was understanding the processes of rationalization, secularization, and "disenchantment"

The interdisciplinary and cross-disciplinary nature of scientific inquiry into human behavior and the social and environmental factors affecting it made many of the natural sciences interested in some aspects of social science methodology. This increased the integration of quantitative research and qualitative methods in the study of human action and its implications and consequences.

In conclusion, based on the evolution of time, the term "social sciences" may refer either to the specific *sciences of society* established by the above-mentioned thinkers or more generally to all disciplines outside "noble science" and arts. This brief summary intends to glance at the evolution of the ancient notion of the social sciences to their current innovative frame in the European context.

A great contribution to the development of the social sciences and humanities in Europe and the Member States was achieved by their exploitation within the FPs, which enhanced the awareness of the crucial role of the social sciences' in sustainable and inclusive growth.

Nevertheless, the definitions of the social sciences and humanities can differ across scholarly institutions and groups. In general the humanities are those disciplines that investigate the human condition, mainly by analytical, critical, or speculative methodologies. The subjects that can be included within the SSH conceptual hub are several. The Federation for the Humanities and Social Science explained that "The humanities include (but are not limited to) ancient and modern languages, literature, history, philosophy, religion, and visual and performing arts such as music and theatre."[112]

Furthermore, the Federation added other subjects, distinguishing them from fields of study that may involve more empirical methods to consider society and human behavior. Consequently, they gathered anthropology, archaeology, criminology, economics, education, linguistics, political science and international relations, sociology, geography, law, and psychology. On the other hand, the American Academy of Arts and Sciences, through its Commission on Humanities and Social Sciences,[113] gave a tighter definition of the SSH as well as a shorter list of included subjects. Precisely it expressed that "According to the 1965 National Foundation on the Arts and the Humanities Act, the humanities include, but are not limited to, the study of the language, both modern and classical; linguistics; literature; history; jurisprudence; philosophy; archaeology;

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that he associated with the rise of capitalism and modernity and that he saw as the result of a new way of thinking about the world. Weber is best known for his thesis combining economic sociology and the sociology of religion, elaborated in his book *The protestant ethic and the spirit of capitalism*.

[112] The quote comes from the Foundation of Humanities and Social Science, which promotes research and teaching for the advancement of an inclusive, democratic, and prosperous society. More details can be found on the following website: http://www.ideas-idees.ca.

[113] The American Academy of Arts and Sciences was founded in 1780 aiming to serve the nation as a champion of scholarship, civil dialogue, and useful knowledge. Currently the Academy's membership of 4,900 Fellows and 600 Foreign Honorary Members includes many of the most accomplished scholars and practitioners worldwide.

comparative religion; ethics; the history, criticism and theory of the arts; those aspects of social sciences which have humanistic content and employ humanistic methods; and the study and application of the humanities to the human environment with particular attention to reflecting our diverse heritage, traditions, and history and to the relevance of the humanities to the current conditions of national life."[114]

These two definitions are aligned regarding the subjects that need to be included in the social sciences and humanities. The ones provided by the Commission on Humanities and Social Sciences offer a wider perspective, which reaches beyond mere involvement of the related themes to include also those aspects of the social sciences that have humanistic content and employ humanistic methods.

Another interesting opinion, which differs from the previous ones, comes from the Idaho Humanities Council at the University of Idaho and firmly distinguishes social sciences from humanities. In the paper "The humanities and the social sciences: Contrasting approaches,"[115] it was expressed that "while the disciplines and approaches of the humanities and the social sciences each seek to understand and appreciate the human condition, they rely on contrasting ways of knowing and methodologies to do so. What distinguishes the humanities from the social sciences, for example, is not so much a subject matter and topic – a playwright, a behavioral psychologist, a historian, and a literature professor could each be dealing with the same subject, for example, gender identity – but it is rather the mode of approach to any given question and the resulting analysis or interpretation."

The difference underlined between humanities and social sciences is relevant and can be found in relation to the first and last steps of the application of the concepts: approach and interpretation. It means that there is adherence in terms of contents. Moreover, to justify the distinction, the paper analyzed the origins of the social sciences, setting as the basis the different scientific paradigms linked to critical ontological principles that can be traced back to Aristotelian materialism (Aristotle of the fourth century BC) and to the Cartesian dualism (René Descartes of the seventeenth century). On the other hand, it explained that the humanities are a discipline that can be traced back to such playwrights and poets as Shakespeare and the personal essay and memoir writing of Montaigne, both from the sixteenth century.

"The humanities continue the ontological premise of Cartesian Dualism. The humanities still seek to provide an imagery of what is on the other side of the glass pane, but substitute the

[114] The quote can be found on the following website, which contains further relevant information about the American Academy: http://www.humanitiescommission.org/AboutHumanitiesSocialSciences/FactSheet.aspx.

[115] "The humanities and the social sciences: Contrasting approaches" (September 2013, p. 1). Developed for ISEM 101 Integrative Seminars.

role of material reductionism and formal objectivity with an emphasis on the role of various forms of human thought, from rational thinking, to imaginative and reflexive thinking.
In the instance of reflexive thinking, it can result in the subject and object tending to become interwoven and indistinguishable, hence the cracks and holes in the glass pane".[116]

Table 6 below better clarifies the main differences between social sciences and humanities found by the Idaho Humanities Council.

Table n. 6 – Differences among social sciences and humanities

Social sciences	1. Application of an empirical, rational, and objective methodology (use of validity and reliability tests) to present the "facts" 2. The function is to analyze, explain, and possibly predict human behavior (as groups and/or individuals) 3. And to generate and produce new knowledge (factual information)
Humanities	1. Application of an interpretative methodology (use of text analysis, reflective thinking, and acknowledgement of the audience) to render something meaningful for others 2. The function is to appreciate better the meaning and purpose of the human experience – both broadly in the nature of the human condition and within each unique individual, that is, his or her self-identity and purpose 3. And to reveal wisdom – to explore and address better the "big questions" and meet the challenges in the human condition

As previously stated, the SSH in Europe have gained relevance during the last decades. One of the reasons lies in the emerging societal challenges of our time and the new solutions that need to be developed with as comprehensive a view as possible. In this way an important contribution has been made by the framework programs since 1984 and their achievements.

The main purpose of the European Union is to create a European Research Area where the SSH can contribute to facing the ongoing societal challenges. Europe is in need of research that actively contributes to tackling these challenges through the creation of knowledge and tools useful for policy makers and citizenry.

Nowadays the cross-cutting nature of the societal problems necessitating joint solutions to be developed by different disciplines is widely accepted, requiring change in the traditional discipline-based approach. Thinking only with one discipline's mindset is no longer sufficient and useful.

[116] "The humanities and the social sciences: Contrasting approaches" (September 2013, p. 2). Developed for ISEM 101 Integrative Seminars.

Individual disciplines cannot generate a solid and complete evidence base distinct from other science fields to address the kind of societal challenges that Europe is facing. The communication from the European Commission on Horizon 2020 stressed that those challenges require us to bring together resources and knowledge from different fields, technologies, and scientific disciplines. We need to become better at helping the so-called "hard" sciences and the so-called "soft sciences" (social sciences and the humanities) to work together.

Consequently, high-quality SSH research is clearly fundamental to conducting and elaborating excellent inter/transdisciplinary research and solutions. This lead to a strong need to integrate the social sciences and humanities better in the European research and innovation initiatives, as reflected in the wide space given to them in the third pillar of the last framework program: Horizon 2020.

Therefore, it is useful to look at the subjects that have been selected by the European Commission as being included in the SSH. In this way it will be possible to see the complete picture that determines the current priority at the European level. Table 7 offers the list of SSH subjects sponsored by the European Union.

Table 7 – List of SSH subjects recognized at the European level

Social sciences, education, business, and law	
Social and behavioral sciences	Economics, economic history, political science, sociology, demography, anthropology (except physical anthropology), ethnology, futurology, psychology, geography (except physical geography), peace and conflict studies, human rights
Education science	Curriculum development in non-vocational and vocational subjects, educational policy and assessment, educational research
Journalism and information	Journalism, library and museum sciences, documentation techniques, archival sciences
Business and administration	Retailing, marketing, sales, public relations, real estate, finance, banking, insurance, investment analysis, accounting, auditing, management, public and institutional administration
Law	Law, jurisprudence, history of law
Humanities and the arts	

Humanities	Religion and theology, foreign languages and cultures, living or dead languages and their literature, area studies, native languages, current or vernacular language and its literature, interpretation and translation, linguistics, comparative literature, history, archaeology, philosophy, ethics
Arts	Fine arts, performing arts, graphic and audio-visual arts, design, crafts

The list is extremely extensive in comparison with that provided within FP7. It is comprehensive of a multitude of matters that reflect the will to foster an interdisciplinary, or in this case also a transdisciplinary, approach to the new research era at the European level.

3.2. The SSH, Horizon 2020, and the Third Pillar

In the last framework program launched in December 2014 – Horizon 2020 – the social sciences and humanities play a crucial role. They contribute to strengthening Europe's position and role in a changing world, fostering mechanisms for smart and sustainable growth as well as for social, cultural, and behavioral transformations within European societies.

A crucial role is played by the SSH in promoting social innovation and in building resilient, inclusive, participatory societies in Europe, taking into account and trying to face the biggest societal challenges (migration, integration, and demographic change) through the involvement of the civil society at large, paying particular attention to making use of the potential of all generations. Europe wants to gain relevance from the global perspective, being the promoter of European values across the new globalized world. Therefore, Europe plays a notable role regarding human rights and global justice, mutual influence and ties between world regions, and outsiders' view of European cultures.

A primary aim of SSH research is also embodied in the basis of our European culture. As a matter of fact, the social sciences and humanities foster topics such as: European heritage, memory, and identity; integration and cultural interaction and translation; European countries' and regions' history, literature, and art; philosophy and religions; and contemporary European diversity. As already mentioned in Chapter II in the analysis of the path that the SSH followed through the framework programs, it is clear that the European Commission has supported SSH research over the last four consecutive framework programs. The EC sealed this commitment by dedicating a specific theme to these disciplines in the Seventh Framework Programme (FP7).

Now examining in depth the current framework program – Horizon 2020 – and its relation with the SSH subjects, it is notable that they are widely spread across the entire program and not just confined to the third pillar – societal challenges. Social sciences and humanities are a cross-cutting

issue of wide relevance, so they have been fully integrated into each of the general objectives of Horizon 2020.[117] The choice of integrating SSH research across Horizon 2020 is the key point to enhance and tackle both the industrial leadership and the societal challenges proposed in the third pillar.

One of the forms of added value provided by the development of the SSH is the fact that they offer the needed insights into the cultural and human dimensions in such diverse areas with a genetic transdisciplinary approach. The SSH analyze the cultural, behavioral, psychological, social, and institutional changes that are shaping Europe and its global environment. Moreover, the SSH help in proposing new ideas, strategies, and governance structures for overcoming the crisis in Europe, innovating the public sector and business models as well as promoting social innovation and fostering creativity in the development of new forefront services.

Horizon 2020 is the biggest research program in comparison with all the previous ones. It is designed in a simple and comprehensive way to simplify the access into it. Horizon 2020 has the largest dedicated budget for a framework program ever. In fact, the total provision is almost €80 billion running from 2014 to 2020 with the objective of achieving the aims stated within the Europe 2020 strategy of inclusive, sustainable, and smart growth.

Horizon 2020 is divided into three main pillars, which compose the structure of the program: *excellent science*, *industrial leadership*, and *societal challenges*. Each pillar contains specific and identified scientific fields with different and defined objectives. The following two tables summarize respectively the entire structure of Horizon 2020 and its budget breakdown.

[117] The document released by the European Commission, *Horizon2020 in brief*, offered a summarized but complete version of the main objectives of Horizon 2020. The document paid great attention to the role of the SSH, pointing out that "Embedding SSH research across Horizon 2020 is essential to maximise the returns to society from investment in science and technology. Integrating the socio-economic dimension into the design, development and implementation of research itself and of new technologies can help find solutions to societal problems. Indeed, the idea to focus Horizon 2020 around 'Challenges' rather than disciplinary fields of research illustrates this new approach" (European Commission. (2014). *Horizon 2020 in brief* (p. 18). Brussels).

Table 8 – Horizon 2020 and its pillars[118]

FIRST PILLAR – EXCELLENT SCIENCE	• European Research Council (ERC) • Future and emerging technologies (FET) • Marie Sklodowska Curie • Research infrastructure
SECOND PILLAR – INDUSTRIAL LEADERSHIP	• Leadership in enabling and industrial technologies (LEIT) • Nanotechnologies • Advanced materials • Biotechnology • Advanced manufacturing and processing • Space • Access to finance • Innovation in SMEs
THIRD PILLAR – SOCIETAL CHALLENGES	• Health, demographic change, and well-being • Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and the bioeconomy • Secure, clean, and efficient energy • Smart, green, and integrated transport • Climate action, environment, resource efficiency, and raw materials • Europe in a changing world – inclusive, innovative, and reflective societies • Secure societies – protecting the freedom and security of Europe and its citizens

[118] The data contained in Table 5 are available on the Participant Portal of Horizon 2020 – http://ec.europa.eu/research/participants/portal/desktop/en/home.html.

Table 9 shows the budget provided for each scientific field along with the percentages.

Table 9 – Budget breakdown

Horizon 2020 – BUDGET	
EXCELLENT SCIENCE	**€24.598 million**
European Research Council (ERC)	€13.268 million
Future and emerging technologies	€3.100 million
Marie Sklodowska Curie Actions	€5.752 million
European research infrastructure	€2.478 million
INDUSTRIAL LEADERSHIP	**€17.938 million**
Leadership in enabling and industrial technologies	€13.781 million
Access to risk finance	€3.538 million
Innovation in SMEs	€619 million
SOCIETAL CHALLENGES	**€31.748 million**
Health, demographic change, and well-being	€8.033 million
Food security, sustainable agriculture, marine and maritime research, and the bioeconomy	€4.152 million
Secure, clean, and efficient energy	€5.782 million
Smart, green, and integrated transport	€6.802 million
Climate action, resource efficiency, and raw materials	€3.160 million
Inclusive, innovative, and secure societies	€3.819 million
TOTAL BUDGET	**€77.606 million**[119]

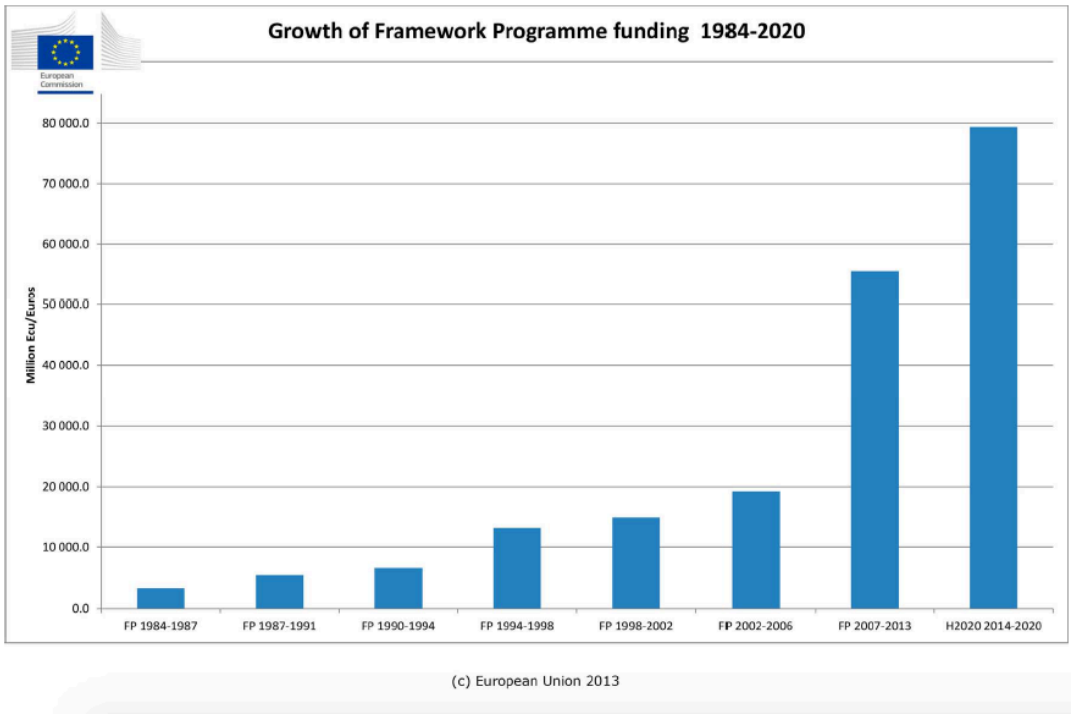
The budget does not include the EURATOM REGULATION, JRC, and EIT (European Institute of

[119] The initial proposal of the Commission in November 2011 set the budget for Horizon 2020 at €87.7 billion. The final decision in December 2013, after consideration under the ordinary legislative procedure, reduced that budget to €77 billion. In June 2015 the adoption of the European Fund for Strategic Investments (ESFI) further lowered the amount to €74.8 billion. Between 4% and 5% of the program's budget will be used for its administrative management, leaving an operational budget for the program of slightly under €70 billion.

Innovation and Technology), which produce an addition of (+/-) €2.000 million to the total budget. As it is clear from the table, the third pillar – societal challenges – is the biggest one. In percentage terms it accounts for circa 38% of the entire budget with respect to circa 31% for excellent science and circa 22% for industrial leadership. As mentioned in the last chapter, Horizon 2020 has the largest budget in comparison with FP7 and all the previous framework programs from 1984 up to now.[120]

Figure 1 below is provided by the European Commission and describes well the considerable development of the European framework programs in terms of budget allocation.

Figure 1 – Growth of Framework Programme funding 1984–2020



Source: European Commission

Eurostat

It worth investigating the third pillar to understand the way in which the social sciences and humanities have been fostered. As already stated, the SSH are a cross-cutting topic that is spread across the entire program; they are not just included within the third pillar, which, however, is their biggest container.

[120] Chapter II shows the different budgets implemented for each framework program from 1984 to 2013.

3.3. The societal challenges pillar

The EU has identified seven priority challenges as the main issues that it is currently facing as a whole. The EU wants to foster targeted investment in research and innovation related to these fields to produce a real impact on citizens' life all over the EU-28. The first societal challenge (SC1) is health and well-being. The projects supported under the first societal challenge aim to realize different and fundamental objectives at the European level, such as: to improve the quality of life of EU citizens; to position the EU as a central player in the global context; to stimulate the high quality of European research and innovation (R&I); and to achieve industrial competitiveness by mobilizing relevant European R&I performers, both public and private.

The headline goal of the "health, demographic change, and well-being" societal challenge is to disseminate better health over Europe. At the policy level, it aims to improve health and well-being outcomes as well as to promote healthy and active ageing[121] (one of the most relevant issues in Europe) and market growth, job creation, and the EU as a global leader in the health area.

The challenges related to this goal derive mainly from the ageing of the European population, which, if not actively managed through a life-course approach, will increase the burden of several chronic diseases on individuals, on existing health and care systems, and on society.

This will lead to an increase in the public expenditure coupled with labor force and productivity losses. To face these issues, societal challenge 1 (SC1) implements several research projects within several priorities:

- personalized medicine, rare diseases, human bio-monitoring, mental health,
- comparative effectiveness research, advanced technologies, e/m health, robotics,
- patient empowerment, active and healthy ageing, data security, big data, valorization,
- anti-microbial resistance, infectious diseases including vaccines, maternal and child health, and the silver economy

The second challenge (SC2) is related to food security and the sustainable use of biological resources. The overall objective of societal challenge 2 is to help Europe to create a solid basis able

[121] The DG Employment, Social Affairs, and Inclusion identified the increase in elderly people as one of the biggest challenges to face. The reasons found by the DG are the following: the proportion of older people in our societies is increasing fast, due to low birth rates, ageing "baby-boomers," and rising life expectancy; between 2010 and 2060, the number of people over 65 will grow from 17.4% to 29.5% of the total population; the number of people over 80 will nearly triple to 12%; during the same time, the working-age population in the EU is expected to decline by 14.2%; and pensions, health care, and long-term care systems risk becoming unsustainable, with a shrinking labor force that is no longer able to provide for the needs of the growing number of older people.

to sustain food security and the sustainable growth path, adapting and innovating to find resilient and efficient alternatives to our fossil-based economy.

In particular, SC2 addresses and demonstrates effective solutions to major challenges affecting the bioeconomy on land and sea as well as pushing innovation to unlock the potentials of the available bio-resources in the different bioeconomy and blue-economy sectors in a sustainable and socially responsible way.

Societal challenge 2 will leverage research and innovation activities to address the related major societal challenges identified by the most important international organizations. As a matter of fact, according to the FAO, the world needs to meet the increasing food demand to feed a global population projected to be over 9 billion by the year 2050. Therefore, a 60% increase in global agricultural production is necessary.[122]

Linked to this point, Europe has to ensure food and nutritional security along with resource efficiency and facing climate change. This challenge needs to be met in the context of increasing resource scarcity by minimizing food safety risks and adapting to/mitigating climate change. "It will be essential to develop win-win solutions that bring together the primary sector and the food industry, considering nutrition, health, water and energy efficiency, zero waste and environmental sustainability in a holistic way."[123]

Another relevant field of action relates to oceans and seas. The main purpose is to unlock the potential of seas and oceans across the wide range of marine and maritime industries, which requires an integrated approach to ensure responsible management of resources and to maximize the synergies between activities and boost growth and employment in coastal areas.

SC2 also gives great relevance to the bioeconomy, which, along with the various sectors accounted for, are already worth EUR 2 trillion in annual turnover and account for more than 22 million jobs. For example, it has been estimated that the volume growth of EU bio-based chemical products could be over 3% per year up to 2020, resulting in a market worth EUR 40 billion and 90,000 new jobs.[124] Furthermore, the food industry is the largest industrial sector in the EU, and there is still further potential to grow, with new businesses and industries emerging in both traditional and novel non-food sectors.

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[122] The overview offered by the FAO can be found in the report *How to feed the world in 2050* released by the FAO. "By 2050 the world's population will reach 9.1 billion, 34 percent higher than today. Nearly all of this population increase will occur in developing countries. Urbanization will continue at an accelerated pace, and about 70 percent of the world's population will be urban (compared to 49 percent today). Income levels will be many multiples of what they are now. In order to feed this larger, more urban and richer population, food production (net of food used for biofuels) must increase by 70 percent. Annual cereal production will need to rise to about 3 billion tonnes from 2.1 billion today and annual meat production will need to rise by over 200 million tonnes to reach 470 million tonnes."

[123] European Commission. (2016) *Horizon 2020, work programme 2016–2017, Food security, sustainable agriculture and forestry, marine and maritime and inland water research and the bioeconomy*. Brussels.

[124] European Commission. (2016). *Horizon 2020 societal challenge 2 stakeholders' consultation*. Brussels.

The third challenge (SC3) is focused on sustainable energy. It refers to the objectives expressed by the European Energy Union, which laid them out in the recent framework strategy.[125] The main aims are as follows: increased energy security, solidarity, and trust; a fully integrated European energy market; improved energy efficiency; contributing to the moderation of demand and the decarburization of the economy; and increased efforts regarding research, innovation, and competitiveness.

The projects developed under SC3 are a key instrument to address the above-mentioned aims as well as important improvements to EU consumers, for example to provide households and businesses with secure, sustainable, competitive, and affordable energy.

Achieving these purposes requires a fundamental transformation into Europe's energy system and within the energy consumption approach of European citizens. Therefore, some important milestones for this transformation are the EU's energy and climate targets[126] for 2030, which also underpin Europe's leading role in the fight against climate change.

An innovative approach applied to SC3 is the participation of consumers in the energy transition and the improvement of the efficiency of the energy system, especially as regards the building stock.

The promotion of citizens' participation is also crucial for a wide range of other activities within SC3, which includes:

- facilitating the market uptake of energy technologies and services
- fostering social innovation
- removing non-technological barriers
- promoting standards and accelerating the cost-effective implementation of the Union's energy policies

This needed transformation of the energy system encompasses an interdisciplinary system composed of technological, societal, cultural, economic, and environmental aspects and claims a more important role for citizens and communities. Therefore, new approaches have to be stimulated as regards business models, competitive services, and an increasingly smart and dynamic system utilizing, wherever possible, a multi-disciplinary approach, integrating different fields of the social

[125] European Commission. (2015). *State of the Energy Union 2015*. Brussels.

[126] The targets have been identified as follows: at least 40% domestic reduction in greenhouse gas emissions compared with 1990, at least 27% for the share of renewable energy consumed in the EU, at least 27% improvement of energy efficiency, and an electricity interconnection target of 10%. (http://ec.europa.eu/clima/policies/strategies/2030)

sciences and humanities. This derives from the fact that energy is a cross-cutting issue and has to set synergies with other relevant areas.

The fourth challenge is linked to green and integrated mobility. The transport challenge "smart, green, and integrated transport"[127] aims to achieve a European transport system that is resilient, resource-efficient, and climate- and environment-friendly to the benefit of all citizens, the economy, and society. Mobility drives employment, economic growth, prosperity, and global trade as well as providing vital links between people and communities.

However, today's transport systems and the way in which we use them are unsustainable, and transport-related problems – congestion, road safety, and atmospheric pollution – exert an impact on our daily lives and health. Therefore, the funding priorities are geared towards the present and future needs of citizens, businesses, and EU markets and strive to maximize value for the transport sector and people.

The fifth challenge relates to one of the biggest current issues, that is, climate action, the environment, resource efficiency, and raw materials.

The era of never-ending cheap resources is coming to an end: access to raw materials and clean water can no longer be taken for granted. The solution proposed by the EU is to invest now in innovation to support a green economy – an economy that is in sync with the natural environment – to meet the needs of a growing global population within the limits of the planet's natural resources and eco-systems.

Dealing with climate change is a cross-cutting priority in Horizon 2020, which set a series of primary objectives to be achieved through the projects funded by SC5:

- resource- and water-efficient and climate change-resilient economy and society
- protection and sustainable management of natural resources and ecosystems
- sustainable supply and use of raw materials

To achieve the greatest possible impact of the research and innovation activities in Europe, SC5 gives priority to actions that take a systemic approach[128] to promote a more resource-efficient, greener, and more competitive economy as a key part of smart, inclusive, and sustainable growth in

[127] European Commission. (2016). *Horizon 2020 work programme 2016-2017*. Brussels.

[128] "Systemic innovation is understood as innovation that aims at responding to a societal challenge by obtaining a system-wide transformation through affecting the system's economic, social and environmental dimensions as well as their interconnections. This implies a trans-disciplinary perspective that integrates technology, business models and economic organisation, finance, governance and regulation as well as skills and social innovation. Systemic innovation therefore calls for the adoption of a challenge-driven, solutions-oriented research and innovation strategy that crosses disciplinary boundaries and involves co-creation of knowledge and co-delivery of outcomes with economic, industrial and research actors, public authorities and/or civil society." European Commission. (2016). *Work programme 2016–2017, climate action, environment, resource efficiency and raw materials*. Brussels.

accordance with the Europe 2020 strategy and the General Union Environment Action Programme. There is a strong need to demonstrate the potential for systemic innovation and the market uptake of technological and non-technological solutions in Europe through large-scale demonstration projects. The contribution of social sciences and humanities will be essential to inform successful solutions able to consider not only the technical perspective of the problem but also the social dimension to produce more comprehensive explanations.

Concluding, SC5 plays the role of a trailblazer for ensuring that the investment of 35% for climate action and 60% for sustainable development across the whole Horizon 2020 Framework Programme will deliver the best impact for economic, environmental, and social sustainability.

The following challenge is the one with the strongest SSH perspective: SC6 – Europe in a changing world: inclusive, innovative, and reflective societies.

The European integration project has contributed for over six decades to the advancement of peace and reconciliation, democracy, and human rights in Europe, and it is a world example of balancing prosperity and social welfare. However, the EU is currently facing manifold challenges within and beyond its borders. On one hand, inequality is growing and undermines its potential to create prosperity and provide stability. Approximately 6 million people lost their job during the crisis, more than 120 million people are at risk of poverty, and 14 million youths (15–29 years) are not in education, employment, or training (NEETs).[129]

At the same time, the inclusion of fairness in the objectives of the European Commission means that social dialogue should be enhanced to meet the social demands of inclusive growth and, more generally, a better life. The innovation gap is evident: private investments in research and innovation are falling short of the target, while there is a growing brain drain mostly from regions that were strongly hit by the crisis and the austerity that followed.

Another key issue is migration, which has recently being challenging Europe's capacity to act in a coherent and unified way.

The large influx of refugees and other migrants largely caused by conflicts, geopolitical shocks, and poverty poses short-, medium-, and long-term challenges. In particular, it has shown the fragile entity of the political cohesion in Europe, which most of the time aimed for financial stability instead of social stability. This is a mistake that could lead to a new and unpredictable political asset

[129] A complete definition of NEET was given by EUROSTAT: "The indicator young people neither in employment nor in education and training, abbreviated as NEET, corresponds to the percentage of the population of a given age group and sex who is not employed and not involved in further education or training. The numerator of the indicator refers to persons meeting these two conditions: they are not employed (i.e. unemployed or inactive according to the International Labour Organisation definition); they have not received any education or training in the four weeks preceding the survey. The denominator is the total population of the same age group and sex, excluding the respondents who have not answered the question 'participation to regular education and training'."

of Europe.

This context demonstrates a need to reflect on the past to understand better the emergent instability and risks as well as to provide the opportunity to contribute actively to shaping more inclusive, innovative, and reflective societies that empower and protect all the citizens in Europe and can help to enhance the EU's capacity to tackle regional and global geopolitical changes. Therefore, Horizon 2020 already states in its regulation[130] the need to foster a comprehensive and interdisciplinary understanding of these issues through more inclusive, innovative, and reflective European societies.

The specific objective of the societal challenge "Europe in a changing world: inclusive, innovative and reflective societies" will support social sciences and humanities research by focusing on inclusive, innovative, and reflective societies (Horizon 2020 Specific Programme).

It worth clarifying the meaning of an inclusive, innovative, and reflective society by looking at the themes that can be developed. The scheme below identifies a classification of concepts to facilitate the understanding of what can be developed under the inclusive, innovative, and reflective societies challenge.

Inclusive societies	Smart, sustainable, and inclusive growth Building resilient, inclusive, participatory, open, and creative societies Europe's role as a global actor Sustainable and inclusive environments – spatial and urban planning
Innovative societies	Strengthening the evidence base and support for the IU and ERA New forms of innovation, social innovation, and creativity Innovative, creative, and productive potential of all generations Cooperation with third countries
Reflective societies	European heritage (memory, identity) European countries' and regions' history Europe's role in the world; intercultural relations

[130] The need for more inclusive and reflective societies was included in the important report released by the Expert Advisory Group, which worked on the 2018–2020 Work Programme: "foster a greater understanding of Europe, provide solutions and support inclusive, innovative and reflective European societies in a context of unprecedented transformations and growing global interdependencies." Moreover, the report explained in a very effective manner the rationale at the basis of SC6: "The rationale and objective of Societal Challenge 6 (SC6) is to foster greater understanding of a culturally and socially rich and diverse Europe and how it needs to adopt new paradigms for change in a context of unprecedented transformations amid growing global interdependence. Although the challenges are great, so too are the opportunities to turn these into European strengths through European diversity and creativity across all areas of the economy, society, culture and governance. SC6 is a core component of the research, innovation and technological development actions foreseen within Horizon 2020 in responding to these challenges to promote sustainable development and to address people's concerns about their livelihoods, safety and social cohesion" (Expert Advisory Group. (2016). *Recommendations on 2018–2020 work programme, Horizon 2020: societal challenge 6: Europe in a changing world – Inclusive, innovative and reflective societies*. Brussels).

The last challenge involves a theme that is prominent now in Europe: secure societies – protecting the freedom and security of Europe and its citizens. Nowadays the security theme is at the center of the public debate. Recently, Europe has been shattered by several terroristic attacks, which have upset our consciousness and souls.

Inevitably, security and safety have become a core matter on the European Union's priorities' table. Therefore, SC7 has attracted great attention from policy makers, who have to respond within their own countries to the security need of citizens. In other terms, the Member States have to keep people safe, which means fighting crime and terrorism, protecting communities from natural and man-made disasters, thwarting cyber-attacks, and guarding against illegal trafficking in people, drugs, and counterfeit goods.

In this way EU research and innovation is developing new technologies to protect our societies while respecting privacy and upholding fundamental rights – two core values at the heart of EU security research.

3.4. The SSH embedding: an overview

The analysis carried out in the previous paragraphs on the definition of SSH themes and their role within the European Framework Programmes gave a clear picture of the great relevance of SSH to Horizon 2020. In comparison with FP7, in which SSH had their own dedicated and limited field, the European Commission decided to give a genetic SSH imprinting to the Horizon 2020 structure. Actually, it was one of the main purposes stated by the EU for the Eighth Framework Programme to allow an inter/transdisciplinary perspective on all three pillars. This comprehensive approach has paved the way to the introduction of the SSH embedding concept.

Embedding the SSH across Horizon 2020 is a crucial step to enhance the returns to society from the great amount of investments dedicated to research and in particular to the science and technology field, which normally receives more funds. Good integration of the social sciences and humanities dimension into the design, development, and implementation of research (technological and non-technological) can help to find innovative solutions to the societal issues previously mentioned.[131]

To obtain a clear picture of the European intention to integrate SSH into Horizon 2020, the explicit provisions stated in the Framework Regulation are noteworthy; the SSH embedding has been conceptualized as well as the approach undertaken by the EC.

Social sciences and humanities research will be fully integrated into each of the priorities of Horizon 2020 and each of the specific objectives and will contribute to the evidence base for policy making at international, Union, national, regional and local level. In relation to societal challenges, social sciences and humanities will be mainstreamed as an essential element of the activities needed to tackle each of the societal challenges to enhance their impact. (Horizon 2020 Framework Regulation, L347/121)

This unprecedented systematic, strategic, and large integration of SSH into Horizon 2020 offers several opportunities mainly linked to the fact that the SSH encompass a wide range of disciplines, such as sociology and economics, psychology and political science, history and cultural sciences, law, and ethics. Accordingly, the contributions that could come from this research and the activities related to that field can help to generate new knowledge, support evidence-based policy making, develop key competences, and produce interdisciplinary solutions to both societal and technological

[131] The great document released by the European Commission, *2016 science, technology and innovation in Europe*, pointed out the role of social sciences and humanities in Horizon 2020 and how it can provide benefits to all the other scientific fields: "Embedding SSH research across Horizon2020 is essential to maximise the returns to society from investment in science and technology. Integrating the socio-economic dimension into the design, development and implementation of research itself and of new technologies can help find solutions to societal problems. Indeed, the idea to focus Horizon2020 around 'Challenges' rather than disciplinary fields of research illustrates this new approach" (European Commission. (2016). *2016 science, technology and innovation in Europe* (p. 42). Brussels).

issues.

Therefore, a cross-cutting methodology has been used in promoting the SSH topics over the three pillars. As mentioned in the previous chapter, the main representative pillar for the SSH is the third one and specifically SC6 (societal challenge 6) – Europe in a changing world: inclusive, innovative, and reflective societies. Probably, it is the purest SSH "ambassador" in Horizon 2020 and the most fertile field in which SSH actors have found more space for development and success.[132] Because the SSH are a cross-cutting issue, they are not easy to insert within the other scientific fields, while the inclusion needs to occur from the very beginning of the design process. These short lines intended just to glance at one of the issues arising with the embedding of SSH.

3.4.1. The SSH embedding in practical terms

This part aims to provide a wide perspective on and deep understanding of how the social sciences and humanities have been spread concretely over the three pillars of Horizon 2020. This passage will help to highlight the SSH dimension in the different parts of Horizon 2020 and to evaluate their real and concrete relevance.

Sometimes, when SSH researchers are looking for funding, they focus just on the third pillar of Horizon 2020 and on SC6, which represents absolutely the first "ambassador" of the SSH subjects, but it is not the only one. In fact, SSH have also been included in the other pillars in different measures and with different characteristics. This has brought about issues linked to both the sometimes-misaligned inclusion and design. These issues are arising nowadays from studies and evaluations realized by the European Commission and other relevant stakeholders, which at the same time suggest interesting solutions that could be taken into account by the work groups and at the European level.

The following analysis is conducted following two great and relevant works released by Net4society[133] and the European Commission, in which the SSH embedding perspective has been explained completely and developed.

[132] It is confirmed in the Monitoring Report realized by the European Commission – DG Research and Innovation – which focused on the real inclusion of SSH in Horizon 2020. The analysis shows interesting results referable to all the SCs: "The quality of integration differs considerably across the various Societal Challenges and LEIT parts. In Societal Challenge 6 all funded projects show a good integration of SSH. Societal Challenge 2 and 7 also perform well with respectively 75% and 74% of the projects showing a fair or good integration of SSH. In contrast, only 31% and 44% of the projects funded under Societal Challenge 5 and LEIT-ICT show a fair or good integration of SSH. It is worth noting that more than half of the projects in SC4, SC5, LEIT-ICT and LEIT-SPACE show either no integration or weak integration of SSH" (DG Research and Innovation. (2016). *Integration of social science and humanities in Horizon 2020: Participants, budget and disciplines*. Brussels).

[133] Net4Society is the international network of national contact points for societal challenge 6 ("Europe in a changing world: inclusive, innovative, and reflective societies") in Horizon 2020. National contact points (NCPs) are set up to guide researchers in their quest to secure EU funding.

3.4.2. SSH in Horizon 2020: Excellent science and industrial leadership

The Horizon 2020 pillar "excellent science" has already been introduced in the previous chapter; here, it is worth adding just a crucial objective, elaborated by the EC, which relates to SSH and is laid down within the introductory documents of the framework program.

A good explanation was provided by Net4society and its notable work *Report on the integration of socio-economic science and humanities in Horizon2020*.[134] As a matter of fact, excellent science will foster scientific collaboration across disciplines on radically new, high-risk ideas and accelerate the development of the most promising emerging areas of science and technology. Therefore, these activities are forward-looking per se and are intended to build skills and capacities in the long term.

Following these objectives, relevant examples of the SSH dimension within the first pillar can be found in the possibilities given to SSH researchers to participate and make use of the grants available under the ERC, as it is specifically designed for projects across science, engineering, humanities, and social sciences.[135]

Moreover, even though future and emerging technology (FET) has no dedicated SSH-specific activity, its objectives declare it to be visionary, transformative, and unconventional, which means that the FET program appeals to radical breakthroughs with an innovative impact, increasingly relying on intense collaboration across disciplines in science and technology and with the arts, behavioral sciences, and humanities.

Moreover, some SSH aspects are contained in the first Work Programme 2014/15 dedicated to FET, which provides ten topics in total. Among these, three are flagged as being relevant to SSH, but just one of the topics explicitly claims the inclusion of SSH disciplines in the realization of the projects. In this case the SSH subjects involved regard (risk) management, political and economic dimensions, and SSH perspectives on cognition.

A different perspective focuses on the Marie Sklodowska Curie Actions, which have often been framed as an alternative funding source for SSH. The MSCAs explicitly promote the involvement of research institutions, businesses, SMEs, and other socio-economic actors.[136] It should be taken with the widest possible meaning, therefore giving relevance to the well-known interdisciplinary approach to research.

Moreover, the MSCAs are bottom-up approach actions, which means that there is freedom for the participants to choose the topic and the scientific field of the proposal to be submitted.

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[134] It was published in 2014 and is a deliverable of the European-funded projects: *Trans-national co-operation among national contact points for socio-economic sciences and the humanities (SSH NCPs)*.

[135] The statistics on the ERC website – https://erc.europa.eu/projects-and-results/statistics – show relevant results on the number of SSH grants awarded to researchers belonging to the social sciences and humanities scientific field. In fact, during the last year (2016), 87 projects on SSH were funded. In total, since 2007 681 grants have been awarded to SSH researchers.

[136] The whole list of objectives can be found in *Work programme 2016–2018* published by the European Commission in July 2016.

The last part of the first pillar is *research and infrastructures*. It provides a wide spectrum of actions dedicated to enhancing the structures developed for research. The SSH has some space. As a matter of fact, the last work program for research and infrastructures contained 22 topics in total, among which 13 were flagged as SSH-relevant by the EC. Anyway, it is very difficult to assess the real involvement of the SSH because of the large spectrum offered by the research and infrastructures activities.

To summarize the results, the first pillar, excellent science, has no top-down research topics in the area (the ERC and Marie Skłodowska-Curie Actions); therefore, it is not easy to analyze the effective SSH dimension in depth. However, there are a number of funding opportunities that can provide the right chance for SSH researchers and organizations to develop bottom-up proposals offering a high level of SSH integration.

The second pillar of Horizon2020, "industrial leadership: leadership in enabling and industrial technologies," has been already introduced in the previous chapter. It is worthwhile summarizing its main objective, which aims to underpin Europe's businesses and to provide dedicated support for research, development, and demonstration on ICT, nanotechnology, biotechnology, advanced materials, and advanced manufacturing. Likewise, for the other pillars, the inter/transdisciplinary approach across and between the different types of technologies and knowledge is requested. This part of the program, due to its "nature," follows a technology-driven approach to realize projects enabling technologies suitable for several diverse applications.

The described peremptory aim allows the inclusion of social sciences and humanities. In fact, within the specific program it is stated that "where appropriate, social sciences and humanities will contribute to taking into account user needs preferences and acceptance as well as ensuring societal engagement and informed consumer choice."[137]

The ICT-specific program has no particular activity lines dedicated to the SSH, although they have been included as marginal aspects in the other activities provided, such as the *cross-cutting dimension*, which promotes the interaction between humans and technology, or "Future Internet: Software, hardware, infrastructures, technologies and services" as well as "Content technologies and information management: ICT for digital content and for cultural and creative industries,"[138] which aim to develop new tools to create, access, exploit, preserve, and reuse all forms of digital content in any language and to model, analyze, and visualize vast amounts of data (big data). These include new technologies for arts, language, learning, interaction, web design, and media.

The nanotechnologies-specific program also makes is no mention of activity dedicated to the SSH.

[137] European Commission. (2013). *Official Journal of the European Union, Part II – Industrial leadership*. (p. 989). Brussels.
[138] https://ec.europa.eu/programmes/horizon2020/en/h2020-section/content-technologies-and-information-management

The SSH aspects arise more at the governance level to define the proactive, science-based governance of nanotechnologies as well as to provide validated scientific tools, methods, and platforms for hazard, exposure, and risk assessment. A relevant role can be played by the SSH in the management throughout the entire life cycle of nanomaterials and nanosystems, identifying the human and physical needs of nanotechnology.[139]

This role of the SSH more at the management and assessment level, as well as new approaches to development and societal engagement, also emerge within the next specific programs of the second pillar: advanced materials, biotechnology, advanced manufacturing, and space. In all of these, social sciences and humanities take on a supporting role.[140] This means that they are mostly applied in helping to solve issues that are not at the core of the research but that remain within the external area of the core activity, for example evaluation and dissemination activities as well as societal engagement, raising awareness, and in the impact/monitoring and evaluation process.

To sum up the outcomes from the second pillar, the integration of SSH is still limited. There are no actions dedicated to socio-economic research or activities that are mainly SSH-driven. Thus, it is not necessary to look now at the third pillar and how the SSH have been incorporated concretely, on one hand because the third pillar of Horizon 2020 was built to host the SSH dimension (specifically SC6) and on the other hand because it was already described in the previous chapter in relation to all its seven challenges.

From the embedding of the social sciences and humanities some issues also arise targeting better inclusion of the SSH throughout the entire program.

Any suggestions identified by Net4society in the *Report on the integration of the SSH in Horizon2020* offer the chance to understand the way in which the SSH community and, moreover, the European Commission should move in the future to guarantee better and more in-depth involvement of the SSH dimension in Horizon 2020.

As the prime step, the involvement of experts with a relevant SSH background should be taken into account from the beginning phase of the discussion. For instance, they should be present in all the Horizon 2020 Advisory Groups, thus enhancing the relevance of the SSH from the agenda setting. In the same way, the SSH dimension within the specific calls should extend the accessory or collateral role further, thus allowing the SSH aspects to penetrate at the "genetic" level of the calls.

In this respect the Working Group on SSH embedding at the European Commission (DG Research and Innovation) confirmed that the improvement of quality of topics is a crucial point to enable

[139] Net4society. (2014). *Report on the integration of SSH in Horizon2020* (p. 25). Germany.

[140] European Commission. (2016). *Work Programme 2016–2017, Nanotechnologies, advanced materials, biotechnology and advanced manufacturing and processing*. Brussels. Retrieved from http://ec.europa.eu/research/participants/data/ref/h2020/wp/2016_2017/main/h2020-wp1617-leit-nmp_en.pdf

SSH to be an integral element of the development process for new research questions.

Another common point of improvement is that regarding the evaluation sessions. Both Net4society and the Working Group agreed on the necessity of major involvement of SSH experts in the evaluation panels, which "must be complemented with evaluation criteria that reflect the interdisciplinary character of the proposals."[141]

The last issue regards the mechanism for monitoring the embedding of SSH in Horizon 2020. It is an open question and one of the most difficult to answer. The goal should be to evaluate the degree of involvement of the social sciences and humanities throughout the project implementation as well as in the ex post assessment of the outcomes. Another open research question, similarly difficult to answer, concerns the development of criteria or indicators enabling the measurement of the level of the SSH dimension in a project.

[141] Net4society. (2014). *Report on the integration of SSH in Horizon2020* (p. 51). Germany.

3.5. SSH embedding: Examples of application

This paragraph provides a map of European-funded projects with a strong SSH dimension. The main objective is to show which projects have been identified by the European Commission as being able to foster the SSH throughout Horizon 2020 and to understand the extension of the SSH dimension within Horizon 2020. The data come from the European web portal CORDIS,[142] which gathers all the European-funded projects under Horizon 2020, and from the previous framework programs. Moreover, a crucial contribution was made by the DG Research and Innovation of the European Commission, which furnished precious information on how to develop better the concept of SSH embedding.

The collection of data was conducted by the utilization of specific keywords to find as large a number of projects as possible without any limit of year, actions, or pillar. It offered a result of heterogeneous projects from different scientific fields. The keywords used for collecting the projects are shown below:

- social science and humanities
- SSH
- social relevance
- inclusion
- reflective
- societies
- social innovation
- culture heritage

To tighten in the best way possible the concept of SSH embedding explained in the last paragraphs, the mention of the Focus Group at the European Commission (DG Research and Innovation) is noteworthy as well as the important *Report on the integration of SSH into Horizon2020: Participants, budget, disciplines*[143] released in 2015. The creation of such a focus group at the European Commission is a sign of the great interest in social sciences and humanities themes and the will of the EC to evaluate the results obtained in Europe.

The report is a monitoring report on SSH-flagged projects funded in 2014 under the societal challenges and industrial leadership pillars. The outcomes resulted from the analysis of 308 selected funded projects related to 97 topics. The document offered a clear picture of the real application and integration of the SSH within the projects funded as well as on the effective inclusion of SSH

[142] CORDIS is the European Commission's primary portal for results of EU-funded research projects. It contains the projects funded by FP1 up to Horizon 2020.

[143] It is a monitoring report on SSH-flagged projects funded in 2014 under the societal challenges and industrial leadership pillars. It was edited by Laura Hetel, Tom-Espen Møller, and Julia Stamm. The version described in the chapter was published in Luxemburg in 2015.

actors. Specifically, the main themes outlined by the work group are the following:

- Budget intended for the SSH
- Involvement of SSH partners
- SSH partners by country affiliation
- SSH partners by type of activity
- SSH coordinators by country affiliation
- Discipline prevalence
- Quality of integration

Among these points there are specific data that well fit with the content of this work and in particular are linked to the previous paragraph, for instance the results outlined in terms of the real involvement of SSH partners in the funded projects and the SSH partners by country of affiliation.
The outcomes related to the first point (*involvement of SSH partners*) are very interesting, because they give an overview of the real engagement of entities with SSH expertise. As a matter of fact, 26% of the consortium partners in projects funded under SSH-flagged topics within the third and second pillars of Horizon 2020 have SSH expertise.[144] Moreover, looking at the specific SC categories, the percentage increases to 88% in SC6, 39% in SC7, and 29% in SC2.[145]
Further data are available on the presence of at least one SSH partner in the project. A total of 219 out of 308 (71%) projects funded under SSH-flagged topics in the societal challenges and the LEIT parts of Horizon 2020 have at least one. Regarding the single SC categories, the share of the projects reaches the highest point in SC2 with 95% and the lowest in the LEIT–SPACE with 43%.
The data on SSH partners gathered by country of affiliation also show relevant outcomes. In fact, the greater part of SSH partners are affiliated with EU Member States (93%), with the remaining 7% affiliated with associated countries (5%) or third countries (2%). The relevant results are those related to the EU-28, and there is a clear divide between the EU-15 and the EU-13. As a matter of fact, 83% of all SSH partners are affiliated with the EU-15, while only 10% come from the EU-13. The best in class is the UK, which brings 146 partners, accounting for 16% of the total SSH partners. Germany follows in second position, with 95 partners and a share of 10%, then the Netherlands, with 80 partners and a share of 9%. Our nation, Italy, ranks in the fourth place, with 77

[144] European Commission, DG Research and Innovation. (2015). *Report on the integration of SSH into Horizon2020: Participants, budget, disciplines* (p. 8). Luxemburg.
[145] European Commission, DG Research and Innovation. (2015). *Report on the integration of SSH into Horizon2020: Participants, budget, disciplines* (p. 12). Luxemburg.

partners and a share of 8%.[146] The complete overview shows a big misalignment among countries in that 64% of the SSH partners are affiliated with only 7 countries.

The following list of projects does not intend to represent a selection of SSH best practices, which should be in the charge of the European Commission as future development, but it aims to offer some real examples of the application of the SSH in Europe so far. Otherwise, it risks remaining just a theoretical concept without any concrete application in real life.

[146] European Commission, DG Research and Innovation. (2015). *Report on the integration of SSH into Horizon2020: Participants, budget, disciplines* (p. 12). Luxemburg.

Lifepath

Project title	**Life course biological pathways underlying social differences in healthy ageing**
Project acronym	**LIFEPATH**
Project reference	633666
Funded under	H2020-PHC-2014-two-stage
Project Duration	**From** 2015-05-01 **to** 2019-04-30
Total cost	€7 259 113,16
EU contribution	€5 999 756
Coordinator	IMPERIAL COLLEGE OF SCIENCE, TECHNOLOGY, AND MEDICINE
Brief Description	The dramatic differentials in healthy ageing, quality of life, and life expectancy between individuals of different socioeconomic groups is a major societal challenge facing Europe. The overarching aim of the LIFEPATH project is to understand the determinants of diverging ageing pathways among individuals belonging to different socio-economic groups. This will be achieved via an original study design that integrates social science approaches with biology (including molecular epidemiology), using existing population cohorts and omics measurements (particularly epigenomics). The specific objectives of the project are: (a) to show that healthy ageing is an achievable goal for society, as it is already experienced by individuals of high socio-economic status (SES); (b) to improve the understanding of the mechanisms through which healthy ageing pathways diverge by SES, by investigating life course biological pathways using omic technologies; (c) to examine the consequences of the current economic recession on health and the biology of ageing (and the consequent increase in social inequalities); (d) to provide updated, relevant, and innovative evidence for healthy ageing policies (particularly "health in all policies") that address social disparities in ageing and the social determinants of health, using both observational studies and an experimental approach based on the existing "conditional cash transfer" experiment in New York. To achieve these objectives, we will use data from three categories of studies: 1. Europe-wide or national surveys combined with population registry data; 2. cohorts with intense phenotyping and repeat biological samples (total population > 33,000); and 3. large cohorts with biological samples (total population > 202,000). The cohorts will provide information on healthy ageing at different stages of life, based on the concepts of life-course epidemiology ("build-up and decline") and multimorbidity.

Nanorestart

Project title	**NANOmaterials for the REStoration of works of ART**
Project acronym	**NANORESTART**
Project reference	646063
Funded under	H2020-NMP-2014-two-stage
Project Duration	**From** 2015-06-01 **to** 2018-11-30
Total cost	9 178 647,25 €
EU contribution	7 918 397 €
Coordinator	CONSORZIO INTERUNIVERSITARIO PER LO SVILUPPO DEI SISTEMI A GRANDE INTERFASE
Brief Description	Currently there is a lack of methodologies for the conservation of modern and contemporary artworks, many of which will not be accessible in very short time due to extremely fast degradation processes. The challenge of NANORESTART (NANOmaterials for the REStoration of works of ART) will be to address this issue within a new framework with respect to the state of the art of conservation science. NANORESTART is devoted to the development of nanomaterials to ensure long term protection and security of modern/contemporary cultural heritage, taking into account environmental and human risks, feasibility and materials costs. The market for conservation of this heritage is estimated at some €5 billion per year, and could increase by a significant factor in the next years due to the wider use of nanomaterials. The new tools and materials developed will represent a breakthrough in cultural heritage and conservation science and will focus on: (i) tools for controlled cleaning, such as highly-retentive gels for the confinement of enzymes and nanostructured fluids based on green surfactants; (ii) the strengthening and protection of surfaces by using nanocontainers, nanoparticles and supramolecular systems/assemblies; (iii) nanostructured substrates and sensors for enhanced molecules detection; (iv) evaluation of the environmental impact and the development of security measures for long lasting conservation of cultural heritage. Within the project the industrial scalability of the developed materials will be demonstrated. NANORESTART gathers centres of excellence in the field of synthesis and characterization of nanomaterials, world leading chemical Industries and SMEs operating in R&D, and International and European centres for conservation, education and museums. Such centres will assess the new materials on modern/contemporary artefacts in urgent need of conservation, and disseminate the knowledge and the new nanomaterials among conservators on a worldwide perspective.

Carisma

Project title	**Coordination and Assessment of Research and Innovation in Support of Climate Mitigation Actions** **Segnalato EU**
Project acronym	**CARISMA**
Project reference	642242
Funded under	H2020-SC5-2014-one-stage
Project Duration	**From** 2015-02-01 **to** 2018-07-31
Total cost	2 066 653,75 €
EU contribution	2 064 403,75 €
Coordinator	STICHTING KATHOLIEKE UNIVERSITEIT
Brief Description	The CARISMA project has two overall objectives. First, through effective stakeholder consultation and communication leading to improved coordination and assessment of climate change mitigation options, it aims to benefit research and innovation efficiency as well as international cooperation on research and innovation and technology transfer. Second, it seeks to assess policy and governance questions that shape the prospects of climate change mitigation options, and discuss the results with representatives from the CARISMA target audiences to incorporate what can be learned for the benefit of climate change mitigation. The experienced, interdisciplinary and diverse CARISMA consortium has an extensive track record of collaborating in Framework Programme projects. It combines capacity for technological, environmental, economic and social assessment with deep expertise across a range of climate change mitigation options, encompassing mature and emerging technologies as well as practices and governance, which are increasingly identified as important areas to achieve deep greenhouse gas emission reductions. Communication with, and support to, the CARISMA target audiences are an integral part of the project. In all inventory and assessment activities envisaged in the project, interaction with stakeholders is a key part. To facilitate coordination and avoid overlap, these activities are overseen by a dedicated work package. The target audiences include national and local policymakers, innovation and strategy managers in business and industry, research funding organisations and the research community. The CARISMA project will result in online platform services, face-to-face interactions, policy briefs and publications and increased capacity in the EU, Accession Countries and beyond, to address the climate change challenge and move towards a green, innovative and thriving global economy

Aide

Project title	Adaptive Multimodal Interfaces to Assist Disabled People in Daily Activities
Project acronym	**AIDE**
Project reference	645322
Funded under	H2020-ICT-2014-1
Project Duration	**From** 2015-02-01 **to** 2018-01-31
Total cost	3 409 431,25 €
EU contribution	3 409 431,25 €
Coordinator	UNIVERSIDAD MIGUEL HERNANDEZ DE ELCHE
Brief Description	Around 80 million people in the EU, a sixth of its population, have a disability. Beside this, accessibility is a basic right for all persons with disabilities according to the article 9 of the United Nations Convention on the Rights of Persons with Disabilities signed by the European Commission in 2010. The purpose of accessibility is to enable persons with disabilities to live independently and to participate in all aspects of life. The AIDE project has the ambition to develop and pre-clinical validate a novel and revolutionary modular and adaptive multimodal human-machine interface to allow that moderately and severely impaired people interact with intelligent devices to perform daily activities and to fully participate in society. It will, furthermore, focus on the development of a totally new shared-control paradigm for assistive devices that integrates information from identification of residual abilities, behaviours, emotional state and intentions of the user on one hand and analysis of the environment and context factors on the other hand. A series of applications for the AIDE system have been identified across several domains in which disabled people could greatly benefit: communication, home automation, wearable robots for assisting in activities of daily living and entertainment. The validation of AIDE system will be deployed during 8 months to 5-10 users in the UK at Cedar Foundation. The final goal of this process will be to provide the "proof of concept" of the advantages of the AIDE system based on a novel modular, natural and adaptive multimodal interface and a shared control system to assist disabled people in accordance with specific user needs.

Aria-Valuspa

Project title	Artificial Retrieval of Information Assistants - Virtual Agents with Linguistic Understanding, Social skills, and Personalised Aspects
Project acronym	ARIA-VALUSPA
Project reference	645378
Funded under	H2020-ICT-2014-1
Project Duration	**From** 2015-01-01 **to** 2017-12-31
Total cost	2 949 318,76 €
EU contribution	2 949 318,76 €
Coordinator	THE UNIVERSITY OF NOTTINGHAM
Brief Description	The ARIA-VALUSPA project will create a ground-breaking new framework that will allow easy creation of Artificial Retrieval of Information Assistants (ARIAs) that are capable of holding multi-modal social interactions in challenging and unexpected situations. The system can generate search queries and return the information requested by interacting with humans through virtual characters. These virtual humans will be able to sustain an interaction with a user for some time, and react appropriately to the user's verbal and non-verbal behaviour when presenting the requested information and refining search results. Using audio and video signals as input, both verbal and non-verbal components of human communication are captured. Together with a rich and realistic emotive personality model, a sophisticated dialogue management system decides how to respond to a user's input, be it a spoken sentence, a head nod, or a smile. The ARIA uses special speech synthesisers to create emotionally coloured speech and a fully expressive 3D face to create the chosen response. Back-channelling, indicating that the ARIA understood what the user meant, or returning a smile are but a few of the many ways in which it can employ emotionally coloured social signals to improve communication. As part of the project, the consortium will develop two specific implementations of ARIAs for two different industrial applications. A 'speaking book' application will create an ARIA with a rich personality capturing the essence of a novel, whom users can ask novel-related questions. An 'artificial travel agent' web-based ARIA will be developed to help users find their perfect holiday – something that is difficult to do with existing web interfaces such as those created by booking.com or tripadvisor.

Kristina

Project title	Knowledge-Based Information Agent with Social Competence and Human Interaction Capabilities
Project acronym	**KRISTINA**
Project reference	645012
Funded under	H2020-ICT-2014-1
Project Duration	**From** 2015-03-01 **to** 2018-02-28
Total cost	3 633 801,25 €
EU contribution	3 633 801,25 €
Coordinator	UNIVERSIDAD POMPEU FABRA
Brief Description	In Europe, migration is tradition – and not only since the European legislation changed towards free migration of European citizens. This is not free of challenges. Especially in the case of care, migrants, often face a double challenge: (i) not to speak the language and not to be acquainted with the culture of the resident country, and (ii) be unfamiliar with the care and health administrations of the country. As a consequence, e.g., elderly migrants in care homes suffer from social exclusion, with their relatives also struggling with getting the right information and interacting with the administration, migrants at home are often reluctant to go to see the doctor in case of health issues, a tendency that is often further aggravated by cultural matters. Migrant temporary care workers, who in addition often do not have an adequate professional training, face the problem of isolation, lack of professional background information and deficient communication with both the cared and the supervision personnel. KRISTINA's overall objective is to research and develop technologies for a human-like socially competent and communicative agent that is run on mobile communication devices and that serves for migrants with language and cultural barriers in the host country as a trusted information provision party and mediator in questions related to basic care and healthcare. To develop such an agent, KRISTINA will advance the state of the art in dialogue management, multimodal (vocal, facial and gestural) communication analysis and multimodal communication. The technologies will be validated in two use cases, in which prolonged trials will be carried out for each prototype that marks the termination of a SW development cycle, with a representative number of migrants recruited as users from the migration circles identified as especially in need: elderly Turkish migrants and their relatives and short term Polish care giving personnel in Germany and North African migrants in Spain.

ProsocialLearn

Project title	ProsocialLearn - Gamification of Prosocial Learning for Increased Youth Inclusion and Academic Achievement
Project acronym	ProsocialLearn
Project reference	644204
Funded under	H2020-ICT-2014-1
Project Duration	**From** 2015-01-01 **to** 2017-12-31
Total cost	4 197 071,25 €
EU contribution	3 448 102,13 €
Coordinator	ATOS SPAIN SA
Brief Description	ProsocialLearn will establish a new market for digital games aiming at increasing social inclusion and academic performance. A ground-breaking digital gaming genre will be created that focuses on helping children to acquire prosocial skills necessary for positive relationships, team working, trustworthiness and emotional intelligence. ProsocialLearn will deliver a series of disruptive innovations building on a game development and distribution platform for the production of prosocial games that engages children and stimulates technology transfer from traditional game industry to the education sector. ProsocialLearn will offer games developers scientifically proven prosocial game elements for development digital games. An application programming interface (API), ProsocialAPI, will allow developers to integrate functions into games including visual sensing, identification of prosocial signals from in-game actions, personalised adaptation of game elements, player profiles, game mechanics and expressive virtual characters, and support for data collection with protection of personal data. SMEs from the traditional game industry will work together with serious games companies to produce a series of exciting digital games targeting European schools. Through a multi-disciplinary collaboration between industry, researchers, psychologists, pedagogists and teaching professionals, ProsocialLearn will address complex factors associated with child development and advanced ICT in school curricula. Two SMEs within the consortium will produce an initial set of games and additional SMEs will be incorporated in the third year of the project to foster market creation. Both short term and longitudinal studies (pilots) will be conducted at schools across Europe to build scientific evidence of the benefits of prosocial gaming in different cultural settings and scales, and to explore business models, business plans and verify financial viability of the ProsocialLearn platform.

Rife

Project title	architectuRe for an Internet For Everybody
Project acronym	**RIFE**
Project reference	644663
Funded under	H2020-ICT-2014-1
Project Duration	**From** 2015-02-01 **to** 2018-01-31
Total cost	3 185 001,25 €
EU contribution	2 930 626,25 €
Coordinator	MARTEL GMBH
Brief Description	RIFE addresses the major societal challenge of providing affordable Internet access to those who cannot afford it by solving the technological challenge to increase the efficiency of the underlying transport networks and the involved architectures and protocols. The RIFE solution will harness unused transmission capacity, combined with placing content caches and service functionality closer to the user and will use heterogeneous transmission opportunities that range from localized mesh and home networks over well-connected ISP backhauls to scarce satellite resources. RIFE will build upon recent advances on information-centric and delay-tolerant networking by developing optimized dissemination strategies for the involved transport networks, unified within a novel communication architecture that will provide clear abstractions to application developers. We will develop, deploy and showcase our solution in a real-life setting within a large-scale community network in Spain, demonstrating the technology and economic opportunities that the RIFE platform provides. We will complement our real-life testbeds with emulation scenarios to enable the evaluation of our novel resource management schemes at scale, while integrating with our prototype platform. On the economic side, we will develop business opportunities for local authorities as well as backhaul network providers to create a sustainable value chain by introducing virtual network operators that utilize the under-used capacity in a new business relationship with local customers, enabling novel and often socially-driven business models. The involvement of a technology, equipment, as well as satellite and community network provider will allow for maximizing the commercial exploitation of RIFE within real deployments and towards standard communities within the IETF/IRTF and beyond, placing RIFE in the centre of a growing community of practitioners that all share the same goal: making the Internet affordable to everybody!

Acanto

Project title	**A CyberphysicAl social NeTwOrk using robot friends**
Project acronym	**ACANTO**
Project reference	643644
Funded under	H2020-PHC-2014-single-stage
Project Duration	**From** 2015-02-01 **to** 2018-07-31, ongoing project
Total cost	EUR 4 295 755 €
EU contribution	EUR 4 295 755 €
Coordinator	UNIVERSITA DEGLI STUDI DI TRENTO
Brief Description	Despite its recognised benefits, most older adults do not engage in a regular physical activity. The ACANTO project proposes a friendly robot walker (the FriWalk) that will abate a some of the most important barriers to this healthy behaviour. The FriWalk revisits the notion of robotic walking assistants and evolves it towards an activity vehicle. The execution of a programme of physical training is embedded within familiar and compelling every-day activities. The FriWalk operates as a personal trainer triggering the user actions and monitoring their impact on the physical and mental well-being. It offers cognitive and emotional support for navigation pinpointing risk situations in the environment and understanding the social context. It supports coordinated motion with other FriWalks for group activities. The FriWalk combines low cost and advanced features, thanks to its reliance on a cloud of services that increase its computing power and interconnect it to other assisted living devices. Very innovative is its ability to collect observations on the user preferred behaviours, which are consolidated in a user profile and used for recommendation of future activities. In this way, the FriWalk operates as a gateway toward a CyberPhysical Social Network (CPSN), which is an important contribution of the project. The CPSN is at the basis of a recommendation system in which users' profiles are created, combined into "circles" and matched with the opportunity offered by the environment to generate recommendations for activities to be executed with the FriWalk support. The permanent connection between users and CPSN is secured by the FriPad, a tablet with a specifically designed user interface. The CPSN creates a community of users, relatives and therapists, who can enter prescriptions on the user and receive information on her/his state. Users are involved in a large number in all the phases of the system development and an extensive validation is carried out at the end."

Advocate

Project title	**Added Value for Oral Care**
Project acronym	**ADVOCATE**
Project reference	**635183**
Funded under	H2020-PHC-2014-two-stage
Project Duration	**From** 2015-05-01 **to** 2019-04-30, ongoing project
Total cost	5 993 032,75 €
EU contribution	5 993 032,5 €
Coordinator	University of Leeds
Brief Description	ADVOCATE brings together top principal investigators from prestigious universities, the public sector, and the private sector to address the most common diseases affecting humanity, as measured by the recent Global Burden of Disease Study. ADVOCATE strives to optimise delivery of oral health and wellbeing to the population in EU Member States. This requires a change in oral health care delivery towards prevention. The change will be achieved by developing a model that promotes a preventive rather than restorative oral health care system: The oral health care model 2020. As the oral health care delivery system is not as overly complex as other health care systems, the oral health care model 2020 may serve as a blueprint for other health care system reforms. The development of this model requires intensive information exchange and engagement of stakeholders to establish a set of key-indicators. These indicators will be used to benchmark health care performance on practice as well as system level. Two types of evidence-based indicators will be selected: Quantitative and qualitative indicators that allow measuring and influencing of either intrinsic motivation or extrinsic motivation incentives towards a patient centred, resilient and prevention oriented oral health care system. ADVOCATE will test this model in a natural environment, and provide evidence-informed policy measures towards its implementation, both for oral health care systems as well as other health care systems. Given the comprehensiveness of the topic, ADVOCATE uses a targeted approach that is entirely focused on the five major root-causes underlying the current suboptimal performance of oral health care systems. Moreover, ADVOCATE has confirmed access to data of eight European oral health care databases; it is well connected to existing initiatives and networks, and has ample support from preventive oriented industry, as exemplified by the financial support provided for the final conference

Ageing with elegance

Project title	**Validating C. elegans healthspan model for better understanding factors causing health and disease, to develop evidence based prevention, diagnostic, therapeutic and other strategies.**
Project acronym	**Ageing with elegance**
Project reference	**633589**
Funded under	H2020-PHC-2014-two-stage
Project Duration	**From** 2015-05-01 **to** 2020-04-30, ongoing project
Total cost	7 305 146 €
EU contribution	6 573 680,5 €
Coordinator	KATHOLIEKE UNIVERSITEIT LEUVEN
Brief Description	Healthspan (the life period when one is generally healthy and free from serious disease) depends on nature (genetic make-up) and nurture (environmental influences, from the earliest stages of development throughout life). Genetic studies increasingly reveal mutations and polymorphisms that may affect healthspan. Similarly, claims abound about lifestyle modifications or treatments improving healthspan. In both cases, rigorous testing is hampered by the long lifespan of model organisms like mice (let alone humans) and the difficulty of introducing genetic changes to examine the phenotype of the altered genome. We will develop C. elegans as a healthspan model. Already validated extensively as an ageing model, this organism can be readily modified genetically, and effects of environmental manipulations on healthspan can be measured in days or weeks. Once validated as a healthspan model, it can be used for an initial assessment of preventive and therapeutic measures for humans, as well as for risk identification and the initial evaluation of potential biomarkers. It will also prove useful to study interactions between genetic and various environmental factors.

BEenerGI

Project title	**Bundling sustainable energy investments for GIrona´s municipalities**
Project acronym	**BEenerGI**
Project reference	**649789**
Funded under	H2020-EE-2014-4-PDA
Project Duration	**From** 2015-04-01 **to** 2018-03-31, ongoing project
Total cost	1 024 887,5 €
EU contribution	922 398,75 €
Coordinator	DIPUTACION DE GERONA
Brief Description	Girona's municipalities are mainly small so lack the technical or financial capacity to carry out ISE on their own. BEenerGI will support these municipalities from technical, legal and financial points of view. So in the next three years 6.48 MEUR of investments will be mobilized to increase energy efficiency in street lighting in 65 municipalities and 9.40 MEUR will be mobilized in energy efficiency investments in 85 public buildings. BEenerGI specific objectives are: launching sustainable energy investments to strengthen innovative organisational models, establishing and promoting a new funding scheme, capacity building among all key actors involved and final beneficiaries, opening access to energy consumption data and communication of results across Europe. BEenerGI is innovative both for the organisation of project development assistance (PDA) and for its proposed financial engineering. Regarding PDA innovation, the project will join investments in at least 15 packages in order to make them bankable. Regarding the innovation of the proposed financing engineering, BEenerGI will encourage contracts between municipalities and ESCOs or Small and Medium Enterprises-Micro-ESCOs Local energy sector SMEs (local maintainers, local energy suppliers,..). In some cases, Ddgi will give a subsidy of 2 MEUR to municipalities (during the whole period) to make the planned investments in public buildings bankable and to decrease the payback of these investments. BEenerGI foresees using the monitoring system for energetic consumption already installed in Covenant municipalities as a monitoring tool to evaluate the impact and results of the project. BEenerGI will disseminate its results among Covenant Coordinators or other local authorities that want to replicate these innovative organizational models to mobilize bankable bundled IES.

BioEnergyTrain

Project title	**BioEnergyTrain**
Project acronym	**BioEnergyTrain**
Project reference	656760
Funded under	H2020-LCE-2014-2
Project Duration	**From** 2015-05-01 **to** 2019-04-30, ongoing project
Total cost	3 697 580 €
EU contribution	3 697 578 €
Coordinator	European Sustainable Energy Innovation Alliance - Eseia, Verein Fur Forderung Der Europaieschen Innovation Fur Erneuerbare Energien
Brief Description	The development and adoption of renewable and sustainable energy has become a top priority in Europe, and is Horizon 2020's most prominent theme. Research into new energy methods required to reduce humanity's carbon footprint is an urgent and critical need, and is reliant upon a flow of newly qualified persons in areas as diverse as renewable energy infrastructure management, new energy materials and methods, and smart buildings and transport. Bioenergy is a particularly important field in this respect as it is at the cross-roads of several important European policies, from the Strategic Energy Technology Plan Roadmap on Education and Training (SET-Plan) to the European Bioeconomy Strategy to European Food Safety and Nutrition Policy. European development in this prioritised field is stalled due to a lack of qualified personnel, a lack of cohesion and integration among stakeholders, and poor linkage between professional training and industry needs. To address these problems, BioEnergyTrain brings together fifteen partners from six EU countries to create new post-graduate level curricula in key bioenergy disciplines, and a network of tertiary education institutions, research centres, professional associations, and industry stakeholders encompassing the whole value chain of bioenergy from field/forest to integration into the sustainable energy systems of buildings, settlements and regions. The project will foster European cooperation to provide a highly skilled and innovative workforce across the whole bioenergy value chain, closely following the recommendations of the SET-Plan Education Roadmap.

Briskee

Project title	Behavioural Response to Investment Risks in Energy Efficiency
Project acronym	**Briskee**
Project reference	649875
Funded under	H2020-EE-2014-2-RIA
Project Duration	**From** 2015-03-01 **to** 2017-08-31, ongoing project
Total cost	1 029 133,25 €
EU contribution	1 029 133,25 €
Coordinator	FRAUNHOFER-GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V
Brief Description	Investments in energy efficiency in the residential sector (27% of EU final energy demand) may also provide economic benefits at different levels of the economy. These benefits may not be realized because of barriers, which are typically reflected in implied discount rates. BRISKEE (Behavioural Response to Investment Risks in Energy Efficiency) provides evidence-based input to energy efficiency policy design and evaluation, thereby supporting the market uptake of energy efficiency technologies in the EU residential sector. It contributes to the work programme by addressing the interrelations between microeconomic factors, sectoral energy demand and macroeconomic effects, relying on a consistent methodological framework implemented in 5 work packages: • Provide empirical evidence for the magnitudes of discount rates accounting for differences across households, technologies and countries, and assess their effects on the diffusion of efficiency technologies in the EU (micro-level). A multi-country survey (1000 interviews per country) will be carried out and analyzed econometrically. • Explore the impact of time discounting and risk preferences (and of policies affecting those factors) on the diffusion of energy efficient technology and energy demand in the EU residential sector until 2030 (meso-level). Established bottom-up vintage stock models will be employed for appliances (FORECAST-Residential) and for buildings (Invert/EE-Lab). • Explore the macro-level impacts of changes in microeconomic decision-making and of energy efficiency policy on employment, GDP and exports in the EU until 2030. This involves simulations with an established macro-economic model for the EU (ASTRA). • Provide evidence-based recommendations for key energy efficiency policies and input for impact assessments and policy analysis at the three levels of analysis. • Communicate and disseminate empirical findings to policy makers, national experts, the research community and the general public.

CITYnvest

Project title	**Increasing Capacities in Cities for Innovative Financing in Energy Efficiency**
Project acronym	**CITYnvest**
Project reference	649730
Funded under	H2020-EE-2014-3-MarketUptake
Project Duration	**From** 2015-02-01 **to** 2018-01-31
Total cost	1 512 938,75 €
EU contribution	1 512 937 €
Coordinator	CLIMATE ALLIANCE
Brief Description	CITYnvest strives to introduce innovative financing models (revolving funds, EPC,TPF, cooperative models, etc.) in 3 Pilot Regions (partners Liège (BE), Rhodope (BG) and Murcia (ES)) and conduct a wide-scale capacity building programme in 10 focus countries concerning specific financial instruments/business models. The assessment of innovative financial models is integral to discovering opportunities and identifying and overcoming barriers that specifically local and regional levels face. The project aims to develop a web-based portal that provides diverse practical guidance and match-makes experienced forerunners with less-experienced first-timer authorities. CITYnvest will spread the under-utilized financing models that enable project bundling and aggregation by mobilising the entire value chain at the regional/local level towards Horizon 2020's energy efficiency goals. To succeed, the project will first tackle public authorities' lack of understanding and knowledge on innovative financing models for sustainable energy services, especially retrofitting the building stock. Second, CITYnvest's concrete guidance will ensure in-depth capacity building and training. Third, close collaboration with authorities will trigger innovative financing schemes implementation and mobilise finance for energy efficiency services. Organization of consistent follow-up will monitor progress towards the objective of 37,5 GWh savings/year and other commitments. Finally, the national structures (of CEMR and CA) and invited experts will liaise with the participating public authorities in the capacity building programs to achieve CITYnvest's goal of ensuring long-term engagement. CITYnvest partners liaise with an Advisory Expert Group and pool of experts to provide the expertise and guidance/training. CITYnvest will further create synergies with other wide-spread initiatives, such as the Covenant of Mayors, linking SEAPS to innovative financing models for energy efficiency.

Greenplay

Project title	Game to promote energy efficiency actions
Project acronym	**Greenplay**
Project reference	649621
Funded under	H2020-EE-2014-2-RIA
Project Duration	**From** 2015-03-01 **to** 2018-02-28, ongoing project
Total cost	1 705 500 €
EU contribution	1 705 500 €
Coordinator	CHAMBRE DE COMMERCE ET D'INDUSTRIE DE BAYONNE PAYS BASQUE
Brief Description	The GreenPlay project consists in raising awareness among citizens through the implementation of a real time monitoring energy consumption platform and the development of a serious game. This system will consist of four key elements: • A monitoring energy consumption in real time • A web-based platform to monitor its consumption • Advice and challenges available for users on the platform to reduce consumption • A serious game to raise awareness of users The demonstration of this project will take place in three European cities and reach at least 200 homes. These targeted homes, located in public owned buildings, will have to fulfil two conditions: i. Being heated with electricity ii. Having an internet access The expected impact of the solution is to decrease by 30% the energy consumption of the testing homes.

Heron

Project title	**Forward-looking socio-economic research on Energy Efficiency in EU countries.**
Project acronym	**HERON**
Project reference	649690
Funded under	H2020-EE-2014-2-RIA
Project Duration	**From** 2015-05-01 **to** 2017-06-30
Total cost	958 750 €
EU contribution	958 750 €
Coordinator	ETHNIKO KAI KAPODISTRIAKO PANEPISTIMIO ATHINON
Brief Description	HERON aims at facilitating policy makers of multi-level governance in EU, to develop and monitor energy efficiency policies in building and transport sectors, through forward-looking socio-economic research in seven EU and one candidate countries. The objectives are: i. the impact of socio-economic and institutional factors on implementing energy efficiency policies and measures, ii. the development of energy-efficient pathways to the horizon 2030 and beyond taking into account the socio-economic drivers and the updated energy efficiency measures, iii. the contribution to improving energy modeling by incorporating social, educational and cultural factors so as to reflect the end-user behavior, iv. the establishment of communication channels between researchers, decision makers of different governance levels and social and market stakeholders. These objectives will be achieved through: (1) Mapping of energy efficiency policy instruments, available technologies and social, economic, cultural and educational barriers in transport and buildings, (2) Assessment of the evidenced barriers and the main driving factors, in order to define their weight/importance for the implementation of energy efficiency policies, (3) Determination of linkages between the factors and the energy efficiency, (4) Forward-looking scenario analysis, focusing on macro- and micro-economic impacts of energy efficiency policy options, (5) Policy recommendations through multi-criteria evaluation and feedback mechanisms with policy makers and market stakeholders from EU (member states, Covenant of Mayors) and neighboring countries (Business Council of BSEC). HERON will develop an innovative decision support tool to incorporate non-economic and non-market elements, such as social, educational and cultural, into scenario analysis.

Urban Learning

Project title	Integrative energy planning of urban areas: collective learning for improved governance
Project acronym	**URBAN LEARNING**
Project reference	649883
Funded under	H2020-EE-2014-3-MarketUptake
Project Duration	**From** 2015-03-01 **to** 2017-08-31
Total cost	1 850 062,5 €
EU contribution	1 850 062,5 €
Coordinator	TINA VIENNA GMBH
Brief Description	URBAN LEARNING gathers capitals and other large cities across Europe facing the common challenge of considerable population growth while being committed to significantly reduce fossil energy consumption and CO2 emissions. E.g. Stockholm grew by more than 12.000 people / a (1.5%); in the next 10 years Vienna has to build for 200.000 new people. Efficient and effective planning processes will be crucial for climbing this mountain. Vienna, Berlin, Paris, Stockholm, Amsterdam/Zaanstad, Warsaw and Zagreb aim to enhance the capacity of their local authorities on integrative urban energy planning, as response to new challenges from EU EPBD and RES directives as well as to changes of technologies and market conditions and the pressure to provide sufficient, affordable homes. The focus is put on the governance processes related to the (re-)development of concrete sites. While some cities already started ambitious urban development projects, the institutionalisation of these experiences is missing - despite awareness and willingness, due to lack of knowledge, lack of time and the need for collaboration across departments, which is not a common practice in many administrations in Europe. External stimulus is needed to overcome these barriers, and to address these issues collectively with external key stakeholders, such as DNOs and energy suppliers, and across cities. Focus will be on multi-disciplinary learning – concentrating on innovative technological solutions, instruments and tools as well as on innovative governance elements - and to capitalise this learning to institutionalise integrative urban energy planning. Improving the governance processes is expected to have significant energy impacts on homes and workplaces to be built and refurbished for over 3 million more people in the participating cities in the next 20 years: more than 1.700 GWh/a of energy savings and over 2.000 GWh/a renewable energy produced. Special emphasis is put on knowledge transfer to 150 more cities.

Ciptec

Project title	Collective Innovation for Public Transport in European Cities
Project acronym	**CIPTEC**
Project reference	636412
Funded under	H2020-MG-2014_TwoStages
Project Duration	**From** 2015-05-01 **to** 2018-04-30
Total cost	3 498 350 €
EU contribution	3 498 350 €
Coordinator	ARISTOTELIO PANEPISTIMIO THESSALONIKIS
Brief Description	CIPTEC introduces an integrated approach which draws on the best ideas deriving from marketing (i.e. customer orientation, marketing research, consumer intelligence), consumer behaviour (i.e. advanced motivational research, behavioural experimentation), innovation (i.e. crowd sourcing, collective intelligence, co-creation and co-design of new ideas, fusion of business concepts with social innovation), evaluation (i.e. socioeconomic, technological and ethical) and co-exploitation within a wider than usual stakeholder platform attacking the challenges that hinder the public transport "environment" transition and re-orientation towards increasing PT market shares, thus substantially contributing to urban road congestion reduction in a sustainable manner. In the frame of CIPTEC, we study the demand side and how its needs are affected by the continuous storm of change but we take a close look to the supply in an attempt to demystify the needs and understand the distinct challenges PT providers face in tackling the same changes. We dig out and map promising existing innovation from PT and adjacent fields but we also put forth a collective intelligence subprogram to crowd-source and co-produce novel approaches to tackle underserved needs. We survey public transport users to appreciate the finer differences in preferences for the promising innovations but we dig deeper looking for motivation triggers able to achieve natural behaviour change – not only in the lab but in real life. We provide a translation-in-a-box of our results but we don't wait for stakeholders to use them; we work with them to motivate and apply these insights into concrete street-action. We invite the broader community to cooperate along the value chain but we bring along an unexpected ally – social entrepreneurs - to build and apply disruptive models of sustainable and replicable value. Our team is set to provide evidence and innovative tools for achieving growth in European public transport

Silver stream

Project title	Social innovation and light electric vehicle revolution on streets and ambient
Project acronym	**SILVER STREAM**
Project reference	653861
Funded under	H2020-GV-2014
Project Duration	**From** 2015-06-01 **to** 2018-05-31
Total cost	4 573 567,5 €
EU contribution	4 573 567,5 €
Coordinator	INFINEON TECHNOLOGIES AG
Brief Description	The SilverStream project addresses the challenges associated with sustainable and affordable personal mobility for the growing and ageing population in congested European cities. The project combines both ergonomic concepts conceived for elderly people and advanced automotive technologies that are quiet, clean, energy efficient and safe. The particular objectives of SilverStream are: i) specifications related to the needs of urban and ageing population; ii) enhanced vehicle manoeuvrability for urban context; iii) sustainable ergonomics, health monitoring and adaptive HMI for minimum-fatigue vehicle operation; iv) dual voltage 12/48 V power network for modular and scalable E/E architecture; v) hybrid energy storage system for extended operating life and increased efficiency; vi) compact in-wheel drive units for light urban mobility solutions; and vii) maximizing project impact for enhanced European competitiveness. To achieve these objectives, the SilverStream project brings together 10 committed and complementary European partners that cover the whole value chain, including SMEs, large industry, academia and research institutes. The developed technologies will be driven by a team of expert in the field of medical and cognitive science domain through a top/down approach, and will be demonstrated with a vehicle prototype running in a realistic test environment. In conclusion, SilverStream will develop and demonstrate a radically new light and affordable vehicle concept (L-category). In doing so, SilverStream provides one possible mobility solution to address the tough challenges faced by Europe in relation to the field of air quality, noise and environmental protection, traffic congestion, competiveness and jobs preservation, as outlined in the specific challenge of the work programme.

SocialCar

Project title	Open social transport network for urban approach to carpooling
Project acronym	**SocialCar**
Project reference	636427
Funded under	H2020-MG-2014_TwoStages
Project Duration	**From** 2015-06-01 **to** 2018-05-31
Total cost	5 953 083 €
EU contribution	5 953 083 €
Coordinator	FIT CONSULTING SRL
Brief Description	SocialCar is an Intelligent Transport System based on an innovative approach to transport demand management, and more specifically to carpooling in urban and peri-urban areas. SocialCar's main objective is devopping a new communication network for intelligent mobility, sharing information of car-pooling integrated with existing transport and mobility systems. It will be achieved by means of powerful planning algorithms and integration in a liveable environment of big data related to public transport, carpooling and crowdsourcing in order to provide the final user with a simplified travel experience allowing comparison and choice between multiple options/services.SocialCar will take advantage Social Media to communicate, share information and provide the best just-in-time notifications to the travellers. SocialCar will take advantage of the ever growing connectivity of people and objects and the propagation of Internet services, the potential of Future Internet and the availability of GNSS based location and social media to create an integrated mobility service with the potential to sensibly reduce mobility problems of European citizens. SocialCar will capitalise on a strong pan European team with a solid background in social, psychological and economic sciences, the involvement of 10 European urban sites will prove the concepts' validity and business case. SocialCar General Objectives are to: • contribute to the EU2020 targets on energy efficiency and renewable energy sources reducing congestion by improving and maximising connectivity and information in real-time • overcoming the limitations of current carpooling practices moving from long trips to effective urban and peri-urban use • validate green driving support systems, active management based on European GNSS • identify a suitable big data management architecture for integrating mobility data • produce a city-based open integrated mobility repository of public transport and traffic city-based data

Carismand

Project title	Culture And RISkmanagement in Man-made And Natural Disasters
Project acronym	**CARISMAND**
Project reference	653748
Funded under	H2020-DRS-2014
Project Duration	**From** 2015-10-01 **to** 2018-09-30
Total cost	3 788 526,25 €
EU contribution	3 788 526,25 €
Coordinator	RIJKSUNIVERSITEIT GRONINGEN
Brief Description	As risks are not "objective" but socially and culturally constructed, disaster management which is aware, respects, and makes use of local cultural aspects will be not only more effective but, at the same time, also improve the community's disaster coping capacities. CARISMAND is setting out to identify these factors, to explore existing gaps and opportunities for improvement of disaster policies and procedures, and to develop a comprehensive toolkit which will allow professional as well as voluntary disaster managers to adopt culturally-aware everyday practices. This goal will be achieved by approaching the links, and gaps, between disaster management, culture and risk perception from the broadest possible multi-disciplinary perspective and, simultaneously, developing a feedback-loop between disaster management stakeholders and citizens to establish, test, and refine proposed solutions for culturally-informed best practices in disaster management. Whilst experts from a variety of fields (in particular legal, IT, cognitive science, anthropology, psychology, sociology) will undertake a comprehensive collation of existing knowledge and structures, a number of Citizen Summits and Stakeholder Assemblies will be organised. Systematically, CARISMAND will use an approach that examines natural, man-made and technical disasters, placing at the centre of attention specific aspects that affect culturally informed risk perceptions, eg whether disasters are caused intentionally or not, the different "visibility" of hazards, and various time scales of disasters such as slow/fast onset and short- and long-term effects. By organising six Citizen Summits (two per disaster category per year in two separate locations) where such disaster risks are prevalent , and three Stakeholder Assemblies (one per year) where the results are discussed through a wide cross-sectional knowledge transfer between disaster managers from different locations as well as from different cultural backgrounds.

Impact-EV

Project title	**Evaluating the impact and outcomes of European SSH research**
Project acronym	**IMPACT - EV**
Project reference	**613202**
Funded under	FP7-SSH-2013-2
Project Duration	**From** 2014-01-01 **to** 2017-12-31
Total cost	2 989 054,8 €
EU contribution	2 271 709 €
Coordinator	UNIVERSITAT DE BARCELONA
Brief Description	The main objective of IMPACT-EV is to develop a permanent system of selection, monitoring, evaluation and comparison of the impact and outcomes from European SSH research, taking into account the latest quantitative and qualitative evaluation tools, identifying new ways of implementing them and exploring new standards and indicators that complement existing impact assessment processes. IMPACT-EV will contribute to developing a permanent system of selection, monitoring and evaluation of EU funded SSH research, therefore able to provide insights for the ex-ante, in-itinere and ex-post evaluation concerning assessment of the scientific, policy and social impact of SSH research project outcomes. Scientific impact involves quality of publications, training of young researchers, forms of interdisciplinarity and the constitution of European scientific excellence networks; in policy impact we will focus on EU directives or recommendations, national, regional and local policies; by social impact we understand results of the policies and citizens' actions based on research evidence in relation to the five EU 2020 targets (i.e. increased employment among 20-64 years old, increased investment in R&D/I, increase in energy efficiency and renewables, reducing dropout rates and increasing third level education, and reducing poverty and social exclusion). In addition, the impacts of SSH research projects on the development of the European Research Area in SSH (e.g. ERA-Nets and of art. 185 initiatives in the domain of SSH, the mobility of researchers and the circulation of concepts across national and disciplinary borders) will be also analysed."

3.6. A survey on SSH embedding in Horizon 2020

Reading papers and reports of insiders or looking at statistics elaborated by the European Commission is not sufficient to understand the real dimension of an issue such as the SSH embedding in Horizon 2020.

Surveying experts working daily on the design and management of European proposals linked to the social sciences and humanities is an experiment to provide a concrete view from insiders. A very short questionnaire was elaborated to intercept those opinions, as easily as possible. The survey was realized with Google Forms and distributed in September 2016 by e-mail to obtain a statistical evaluation of the final results, which facilitates easier interpretation and communication of the answers. The

The questionnaire was elaborated in four short questions to encourage and stimulate wider participation of the selected recipients as well as to test the effectiveness of the questionnaire. The formulation of the questions aimed to capture the different aspects composing the SSH dimension in Horizon 2020, thus showing the general picture of the SSH's role in Horizon 2020. The questions are in Table 10. Each question ad multiple-choice answers, to facilitate the interpretation and communication of the results. The possibility to select "other" as an answer and then write a free-text answer was also provided. In this way each queried participant had the chance to add some lines freely.

Table 10 below shows the answers received to each question.

Table 10 – Multiple-choice answers

Questions	Answers
1) In your opinion, is the level of embedding of the SSH into Horizon 2020 satisfactory?	a) Yes b) It can be improved c) No d) Other
2) In your opinion, what benefits can be generated by the application of the SSH to research?	a) More inclusive and comprehensive research b) It won't generate remarkable benefits c) Other
3) In your opinion, what are the current issues related to the embedding of the SSH in Horizon 2020?	a) The SSH are not well highlighted b) Most of the participants are not aware about the SSH potentialities c) Other
4) Do you have any suggestions to enhance the embedding of the SSH into Horizon 2020 and, more generally, into the European funding programs?	a) No b) Other

The target group selected to be questioned consisted of people who work day-by-day in the field of the European funding programs, analyzing calls for proposals as well as managing and designing projects. Moreover, the target group contained people from different countries in Europe according to the different perceptions of the issue.

These insiders have considerable experience in the identification and realization of SSH proposals to be submitted under the main European funding programs such as Horizon 2020, Erasmus +, and others. The process leading to the identification of the most suitable recipients for the survey began with the EARMA,[147] which was crucial in supplying information and suggestions on the best targets to be involved.

Therefore, the choice was made of the universities' international offices, as they act daily as the first representative in front of the European institutions, promoting the needs coming from the universities. The universities involved in the survey come from different European countries, as: Italy, Portugal, Belgium.

Moreover, the people questioned by the survey are currently enrolled in a decision-making body of their university. This gives great relevance to the responses received, which are based on substantial experience. The table below shows the universities involved and the role of the surveyed people:

Table 11 – Institutions and people involved in the survey

Name of the university	Role of the surveyed person
University of Macerata	Head of International Research Office
Instituto de Ciências Sociais da Universidade de Lisboa	International Funding Officer
University of Bologna	Research Advisor and Project Manager for the SSH Area
Università Politecnica delle Marche	Research Support Officer
KU Leuven	SSH Research and Funding Advisor
Università Politecnica delle Marche	Research Division Officer

[147] EARMA represents the community of research managers and administrators (RM&As) in Europe. The members work in industry, academia, and the public and private sectors.
EARMA works mainly with the EU Commission and national and international funding agencies and provides a networking forum, a learning platform, and a place to share experiences and best practice among RM&As throughout EARMA and the wider RM&A community. Moreover, EARMA is an active member of the wider international RM&A community and is a founding member of the International Network of Research Management Societies (INORMS). The members work at the forefront of building the European Research Area and form the interface between research funding organizations and the scientific community, bridging cultural and legal differences between countries and between academia and industry, contributing to policy consultations, and managing the smooth running of research projects.

The individual answers of each surveyed person are reported in the following paragraph, to understand perception about the issue proposed in the questionnaire and to make a final comparison. Moreover, at the end of the individual answers, statistics tables summarizin all the results collectively will be presented to provide a general overview.

3.7 The results of the survey: individual responses

This paragraph provides the answers of each person surveyed as well as information on the role of the person within home institution.

University of Macerata[148] – Head of the International Research Office

Questions	Answers
1) In your opinion, is the level of embedding of the SSH into Horizon 2020 satisfactory?	b) It can be improved
2) In your opinion, what benefits can be generated by the application of the SSH to research?	c) Other "Effective products and services"
3) In your opinion, what are the current issues related to the embedding of the SSH into Horizon 2020?	c) Other "Incentives to insert SSH partners into STEAM projects"
4) Do you have any suggestion to enhance the embedding of the SSH into Horizon 2020 and, more generally, into the European funding programs?	b) Other "Incentives for putting SSH partners in consortia"

Instituto de Ciências Sociais da Universidade de Lisboa – International Funding Officer

Questions	Answers
1) In your opinion, is the level of embedding of the SSH into Horizon 2020 satisfactory?	b) It can be improved
2) In your opinion, what benefits can be generated by the application of the SSH to research?	a) More inclusive and comprehensive research
3) In your opinion, what are the current issues related to the embedding of the SSH into Horizon 2020?	b) Most of the participants are not aware about the SSH potentialities
4) Do you have any suggestions to enhance the embedding of the SSH into Horizon 2020 and, more generally, into the European funding programs?	b) Other "Give the SSH an identity again"

[148] The responses provided by University of Macerata have particular relevance based on the nature of its faculties, which provide only social science and humanities subjects. http://www.unimc.it

University of Bologna – Research Advisor and Project Manager for the SSH Area

Questions	Answers
1) In your opinion, is the level of embedding of the SSH into Horizon 2020 satisfactory?	b) It can be improved
2) In your opinion, what benefits can be generated by the application of the SSH to research?	a) More inclusive and comprehensive research
3) In your opinion, what are the current issues related to the embedding of the SSH into Horizon 2020?	c) Other "The two previous points are both true and interrelated. Moreover, the STEAM and SSH communities should have more opportunities of dialogue and knowledge exchange"
4) Do you have any suggestions to enhance the embedding of the SSH into Horizon 2020 and, more generally, into the European funding programs?	b) Other "An improved phrasing of topics would contribute to increase the interest of potential SSH researchers when approaching a topic and would also determine the positive attitude of STEM proponents when considering a possible contribution from social sciences and humanities disciplines. For SSH-flagged topics, relevant SSH expertise should be included in the evaluation panels"

Università Politecnica delle Marche – Research Support Officer

Questions	Person n.1 - answers	Person n. 2 - answers
1) In your opinion, is the level of embedding of the SSH into Horizon 2020 satisfactory?	b) It can be improved	b) It can be improved
2) In your opinion, what benefits can be generated by the application of the SSH to research?	a) More inclusive and comprehensive research	a) More inclusive and comprehensive research
3) In your opinion, what are the current issues related to the embedding of the SSH into Horizon 2020?	b) Most of the participants are not aware about the SSH potentialities	b) Most of the participants are not aware about the SSH potentialities
4) Do you have any suggestions to	a) No	a) No

enhance the embedding of the SSH into Horizon 2020 and, more generally, into the European funding programs?		

KU Leuven – SSH Research and Funding Advisor

Questions	**Answers**
1) In your opinion, is the level of embedding of the SSH into Horizon 2020 satisfactory?	b) It can be improved
2) In your opinion, what benefits can be generated by the application of the SSH to research?	a) More inclusive and comprehensive research
3) In your opinion, what are the current issues related to the embedding of the SSH into Horizon 2020?	c) Other "In a lot of topics, there is no true embedding. Adding the words 'input from the Humanities and Social Sciences is necessary' does not stimulate researchers to truly work together. Non-SSH researchers do not see potential and SSH researchers feel offended"
4) Do you have any suggestions to enhance the embedding of the SSH into Horizon 2020 and, more generally, into the European funding programs?	a) Other "Be more strict in the evaluation, be more concrete about the kind of SSH research you would like to see in each topic"

In many cases, the option "other" was chosen by participants to express their own opinion in more detail. Table 12 presents the open answers given by the participants, offering a clearer overview.

Table 12 – Open answers

Question	Answer
2) In your opinion, what benefits can be generated by the application of the SSH to research?	• "Effective products and services" – **University of Macerata**
3) In your opinion, what are the current issues related to the embedding of the SSH into Horizon 2020?	• "Incentives to insert SSH partners into STEAM projects" – **University of Macerata** • "The two previous points are both true and interrelated. Moreover, the STEAM and SSH communities should have more opportunities of dialogue and knowledge exchange" – **University of Bologna** • "In a lot of topics, there is no true embedding. Adding the words 'input from the Humanities and Social Sciences is necessary' does not stimulate researchers to truly work together. Non-SSH researchers do not see potential and SSH researchers feel offended" – **KU Leuven**
4) Do you have any suggestions to enhance the embedding of the SSH into Horizon 2020 and, more generally, into the European funding programs?	• "Incentives for putting SSH partners in consortia" – **University of Macerata** • "Give the SSH an identity again" – **Instituto de Ciências Sociais da Universidade de Lisboa** • "An improved phrasing of topics would contribute to increase the interest of potential SSH researchers when approaching a topic and would also determine the positive attitude of STEM proponents when considering a possible contribution from social sciences and humanities disciplines. For SSH-flagged topics, relevant SSH expertise should be included in the evaluation panels" – **University of Bologna** • "Be more strict in the evaluation, be more concrete about the kind of SSH research you would like to see in each topic" – **KU Leuven**

The responses listed above show some points that need to be discussed, in particular at the policy level. From questions 3 and 4, it is clear that there is a need for better integration among STEAM and SSH subjects. Also, respondents highlight the need to strengthen the topic's formulation to provide a better definition of the role of the SSH in the research activities of Horizon 2020. Moreover, there is a necessity to provide tools enabling stronger communication between experts belonging to different scientific fields as well as ex ante involvement of SSH experts in the formulation of the calls flagged as being related to the SSH.

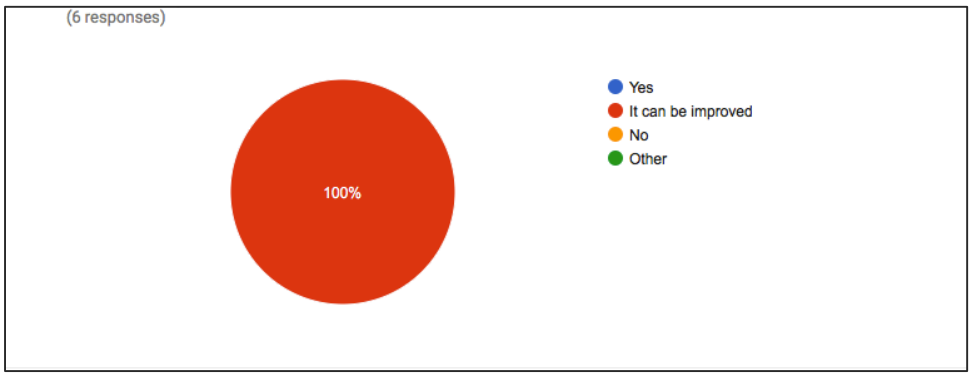
Those concerns were confirmed by the suggestions included in the monitoring report released by DG Research and Innovation – *Report on the integration of SSH into Horizon2020: Participants,*

*budget, disciplin*es – analyzed in the previous chapter.[149] As a matter of fact, in paragraph 6 – *Conclusion and a way forward* – the report stated the following four points for improvement:[150]improving the quality of topics; improving the quality of evaluation; improving the quality of feedback; improving the quality of communication

3.8 A broad picture

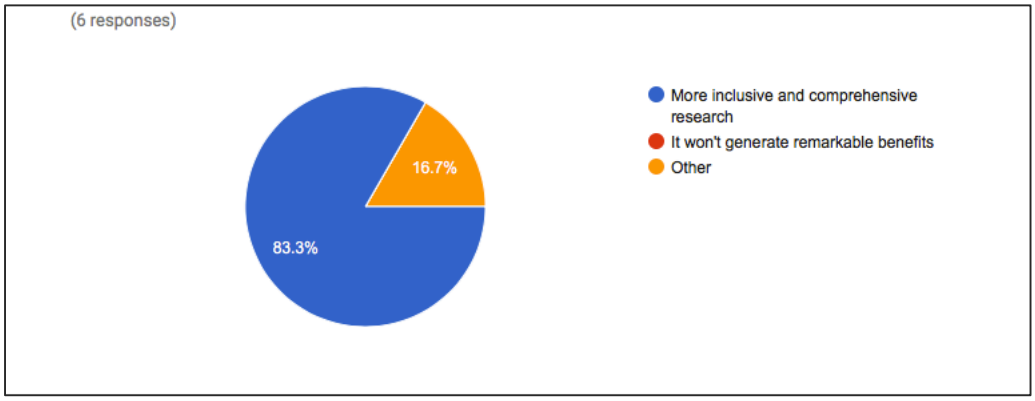
The pictures below show the global results of the questionnaire. The aim is to provide a comprehensive overview of the findings, thus offering the perspective in a more readable way.

In your opinion, is the level of embedding of the SSH into Horizon 2020 satisfactory?



The results from the first question are clearly homogeneous. The six persons interviewed all gave the same answer: "It can be improved." Therefore, it seems that the level of SSH embedding in Horizon 2020 is perceived as unsatisfactory.

In your opinion, what benefits can be generated by the application of the SSH to research?

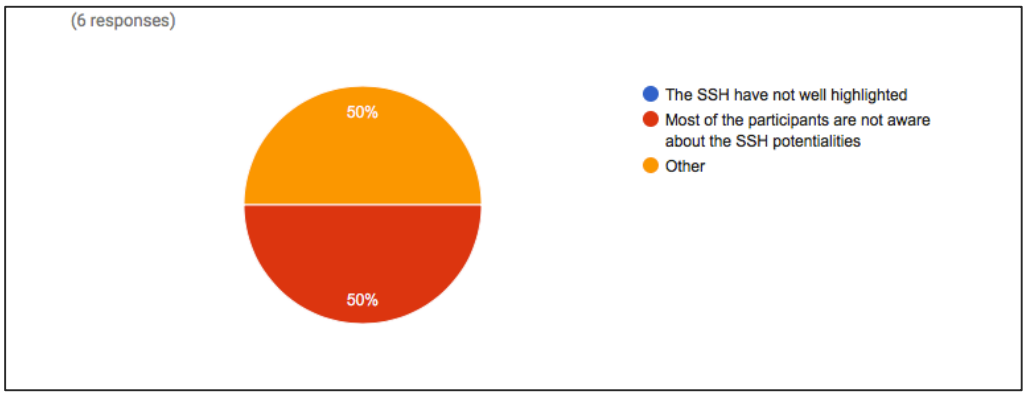


[149] The report has been introduced in its main parts in Chapter III, "The role of the social sciences and humanities in Horizon 2020," on p. 117.
[150] The complete explanation can be found in paragraph 6, "Conclusion and a way forward," on p. 43. It gives the chance to see more details for each point mentioned.

The results of question 2 recognize the benefits coming from the implementation of the SSH, which for its peculiarities can provide more dimensions of an issue and catches several different aspects. Question 2 concerns one of the hottest issues linked to the application of the SSH: the impact. In this regard, the European-funded project IMPACT-EV,[151] which aims to evaluate the social impact arising from the implementation of social science and humanities research is one of the most relevant project to be taken into account.

IMPACT – EV provides a definition of "social impact" that is worth sharing: "social impact are the social improvements achieved as a consequence of implementing the results of a particular research project or study. Our societies have already defined societal challenges and goals (such as EU2020 targets, UN Millennium Goals, etc.) and need research developments and innovations to address them" (http://impact-ev.eu/about/).

In your opinion, what are the current issues related to the embedding of the SSH into Horizon2020?

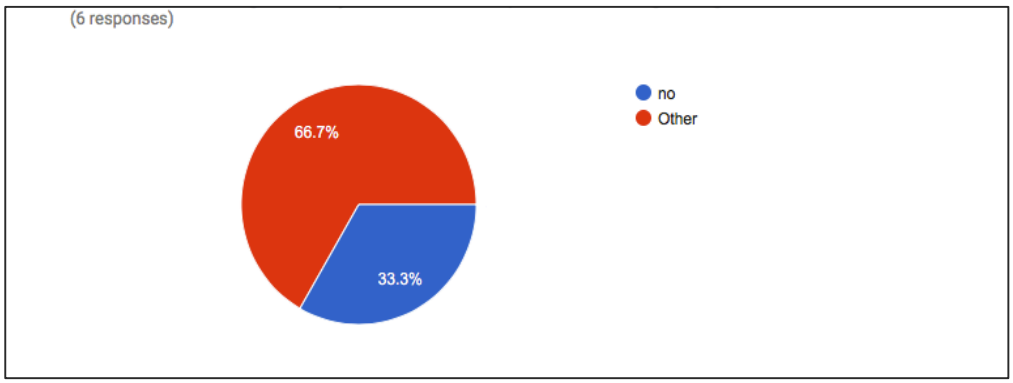


The outcome from question 3 expresses a balance in the identification of the current issues linked to the embedding of the SSH into Horizon 2020.

On one hand, half of the respondent underlined the lack of awareness of the potentialities of SSH; on the other hand, free-text answers were provided, which identified both the lack of communication among the STEAM and SSH communities and the lack of proper formulation of SSH topics as major issues (see Table 12 – Open answers).

[151] The main objective of IMPACT-EV is to develop a permanent system of selection, monitoring, and evaluation of the various impacts of social sciences and humanities research. IMPACT-EV will develop indicators and standards not only for evaluating the scientific impact of SSH research but especially for evaluating their political and social impact. This project started in January 2014 and will be finished in December 2017 (48 months). Project reference – 613202.

Do you have any suggestions to enhance the embedding of the SSH into Horizon 2020 and, more generally, into the European Funding Programmes?



The findings from question 4 have been already described in Table n. 12 – Open answers. This question was designed to give the chance to express some suggestions or improvements that could be taken into account at the policy level. Some key recommendations emerge from the results of the questionnaire:

- improving the quality of topics flagged as SSH

- improving the quality of communication among SSH experts and others

- improve the dissemination of SSH research projects and results

They are aligned to those identified in the already mentioned Monitoring Report on the integration of social sciences and humanities in Horizon 2020 released by the European Commission. In particular, what is crucial is a better involvement of SSH experts in the development process of topics, thus providing a stronger and integrated SSH dimension into the next research questions.

Conclusions

The thesis explains the current context of the funding programs in Europe and how they relate to the promotion of innovation and the increasing involvement of social sciences and humanities within the European Framework Programmes.

The analysis highlights the crucial role played by EU funding tools in the research area, to promote technological, economic, and social development. In particular, since 1984 the framework program has been recognized as one of the most effective tools in promoting and spreading growth among the Member States.

As a matter of fact, the budget allocated to FPs in their eight editions has increased constantly over decades along with the involvement of industry, academia, and society at large. Particularly, the collaboration between industry and academia has been analyzed as an innovation driver, in line with the guidelines provided by the European Union on the relevance of this cooperation.

The starting point of this work was the explanation and investigation of the concept of innovation, which is nowadays at the center of the political, economic, and social debate.

The approach followed was to gather the most recognized definitions of innovation provided by several authors from different scientific fields as well as to compare their findings and underline both differences and commonalities. Chapter I provided a multidisciplinary definition of innovation. Then, the collaboration between industry and universities (I-U) was taken as an example of an innovation driver. The approach followed was based on the crucial role given to collaboration between universities and industry by the European Commission in several official documents (see Chapter I Paragraph 2). This enabled them to be framed as the main actors in the innovation process. At the end of Chapter I, the role of universities in our era and some of the most recognized theories of knowledge production were described.

Chapter II introduced the European Framework Programmes and their evolution throughout history. The main purpose was to offer an overview of the FPs' structure and how they have changed over the years, as well as how those changes were related to some crucial historical events. The latter topic was difficult to investigate, as there is no sure evidence able to prove it. Thus, the connections described are logical deductions that need to be investigated and confirmed further.

The *fil rouge* adopted in the investigation and description of the framework programs was the social dimension.

The objective was to design the path that the social dimension followed to research the meaning of such substantial inclusion in Horizon 2020 (third pillar – societal challenges) and the opposing absence of a social dimension within the first three framework programs.

The investigation of the social dimension in the framework programs evolved to research on the role that the social sciences and humanities played in the framework programs, in Chapter 3. In particular, attention was paid to the role of the SSH in Horizon 2020. This is currently a central debate at the European level. The issue of the SSH embedding in Horizon 2020 was deeply analyzed based on the findings already provided by the European Commission and other relevant actors (Net4society).

The approach followed aimed to provide a pragmatic overview of this relevant issue through the description of concrete projects flagged as involving the SSH as well as through a questionnaire to be completed by people working in this field daily.

In conclusion, the investigation led to the recognition of the crucial role that the framework programs, but more in general the European Union, played in the economic and social development of our societies.

The FPs are tools that need to be improved even more, especially in terms of wider participation of the society at large and better integration among different scientific fields.

The economic crisis has changed our societal paradigm, showing the major needs and the societal challenges to be faced. This context gives even more relevance to tools enabling economic growth and social welfare, such the European funding programs, and to those scientific fields able to understand the major societal issues and to provide innovative solutions. In this way, the social sciences and humanities are essential to gain a better understanding of the social needs and to pave the way to innovation. The SSH should be better integrated into research, in particular technological research.

The aim should be to provide multidisciplinary solutions to be applied to new and emerging issues. Therefore, technological research and innovation should involve the social dimension to offer a comprehensive perspective, which takes into account a wider range of questions than those belonging just to one scientific field.

There are several possible solutions; here just a proposal is offered that is aligned with the ones suggested by the European Commission and SSH experts. It is the involvement ex ante of SSH experts in the formulation of SSH-flagged topics and, moreover, in the formulation of non-SSH flagged topics.

This could guarantee better integration of SSH into future calls for proposals. The aim should be to supply genetic imprinting composed of technological, economic, and social factors.

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