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Successful Stories of Success: the Rhetorical (Re)Presentation of the Biomedical and Healthcare Policy within the Horizon 2020 Framework Program

verfasst von / submitted by

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The process of starting to study something completely different from my original background has been perhaps the most challenging project I have taken in my life so far. Many things have happened since I made this life-changing decision, and while this is not the place to elaborate about that, this work most definitely materializes and represents this process. Process which is, fortunately and after a long path, reaching a happy ending.

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1   Introduction

We could think that the European continental efforts for fostering research and innovation initiatives are a phenomena arisen only during the last few years, but it dates from a long time ago.

In 1951 the European Coal and Steel Community (ECSC) was established, providing funding for research for the coal and steel industries. More than just a mere idea about science and research, it had also a political background: it represented an effort after the devastation of World War II to start walking through a path of peace within the participating countries. That same year was launched the Joint Research Centre, responsible for giving independent scientific and technical advice to the ECSC. The next big step in this line occurred in 1981, when Étienne Davignon, the European Commissioner for Industrial Affairs and Energy, worked on channeling the research funding for different initiatives in industrial development topics under one single framework (EC, 2015).

In 1984 the first **Framework Programme (FP) for Research and Technological Development** within the European Community was launched. Its aim was "to bring together expertise from across the European Community, [...] and make Europe more competitive in key technologies" (EC, 2015, p. 1). It was designed to last three years, and had a budget of €3.3 million. In 1986, when the next FP version was being designed, the EC decided that the legal basis should be strengthened and its objectives refined and extended (ibid). Since then, the subsequent FPs have had better coordination, higher budget and an overall aim for fostering research, innovation and development. The eighth version of these FPs was called **Horizon 2020 Framework Programme**.

The EC has done a broad activity of spreading the need and benefits of these programs to society, especially Horizon 2020, through the issuance of public documents. But how are they doing so?

1.1   What is Horizon 2020?

Horizon 2020 is a program from the European Union (EU), run by the European Commission (EC), which aims to support and foster research and innovation within the countries of the bloc. Its website describes this program as follows (EC, 2016a):

Horizon 2020 is the biggest EU research and innovation programme ever. Almost €77 billion of funding is available over seven years (2014 to 2020) – in addition to the private and national public investment that this money will attract.

Horizon 2020 will help to achieve smart, sustainable and inclusive economic growth. The goal is to ensure Europe produces world-class science and technology, removes barriers to innovation and makes it easier for the public and private sectors to work together in delivering solutions to big challenges facing our society.

It clearly shows the promise of Europe as an area of economic, scientific and social progress. The research initiatives Horizon 2020 supports have been grouped within different *calls*, such as Clean Energy, Smart Transport, and **Health, Demographic Change and Wellbeing (HDCW)**. In particular, this last one comprises those research projects about biomedical and life sciences (which will be the focus of this thesis). For contextualizing the importance of this FP, we can note that the funds allocated for biomedical and healthcare research topics is 9.7% of the total budget, corresponding to €7.4B over a grand total of €77B (EC, 2013a).

Why biomedical? More funding for research and innovation seems inherently a positive policy. The same with the idea that biomedical and life sciences research should be translated into solving health issues. But how are the promised outcomes of this enormous investment created and communicated to society? Other topics, such as green transport or renewable energies, are also important for more sustainable futures, but my personal interest stems on the fact that biomedical and life science research promise to alleviate the very personal suffering of the people. Therefore, a particular rhetoric representation of success (such as the use of the language to persuade for the need of more research) can be expected, becoming an object of interest.

My thesis does not plan to judge Horizon 2020 (and its sponsored projects) as a good or bad policy. Instead, the goal is to understand how the institution promotes hope and validates itself (and the program), while proving its value upon the community, within the specific case of its biomedical research division under the HDCW call. The EC has released a wide range of public documents, in order to let the people know what they are working on, what the results have been, and why the policy is important, as well as other information. Among these documents, we can find the ***Success Stories***. They communicate the goals and the expected results and benefits of several on-going projects, and pose bright futures to the community, being a rhetoric object of success. Written in a formal but simple and straightforward style, they are, seemingly, understandable in general by the lay public (not necessarily tied to the scientific world). Therefore, the aim of this thesis is to analyze how hopes of better futures are enacted within these documents, as a mean for the EC to promote continental success through Horizon 2020, in light of the social value that these documents attribute to the EU science policy.

1.2   Innovation in scientific research and the bioeconomy: key drivers for the future

Innovation has been a key concept within European science and technology policy, and its entanglement with scientific research has been a resource used for building a European identity. The EC has constructed a whole narrative in this regard, so as to install this conception at the center of the policy (Marelli & Testa, 2017). This started back in 1957 with the Rome Treaty, envisioning a European integration concerning those matters, jointly articulating science and democracy as crucial means for progress. In the particular case of the biosciences, the EC started in the mid 1970s to establish continental research programs, strengthened during the 1980s with the launch of the 'Biomolecular Engineering Programme', and steadily toned up within the next decade. These programs were conceived as strategic sites for the construction of a unified European agenda for scientific policy, crucial for the conception of the EU as a political project (ibid).

In 2000 the Lisbon Agenda established a new mindset for European research and innovation policies, comprising several fields. One of them was biosciences, with an agenda coined as the Knowledge-based bioeconomy (KBBE)[1], which aimed to turn Europe into "the most competitive and dynamic knowledge-based economy in the world" (EU Council, 2000, p. 2). The use of the bioeconomy provided a political materialization of the relationship between knowledge and value (in the economic sense of the word). At the same time, portrayed it as the core of the European integration process, driven through the path of competitiveness and innovation (Marelli & Testa, 2017).

During the following years, subsequent efforts to consolidate this framing of the European future were taken. The EC's Life Sciences and Biotechnology strategy in 2002, a large-scale KBBE conference in 2005 (Brussels), the 2007's Cologne Paper (which traced a 20-year vision for bioeconomic development), and 2012's *Innovating for Sustainable Growth: A Bioeconomy for Europe Strategy* (also known as *Europe 2020 Strategy* presentation), are all examples of this framework of the new economic growth strategy (Marelli & Testa, 2017). The goal of this strategy was a more innovative economy, focusing on three key aspects (Schmid, Padel & Levidow, 2012):

- Developing new technologies and processes for the bioeconomy.

- Developing markets and competitiveness in bio-economy sectors.

- Pushing policymakers and stakeholders to work more closely together.

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[1] For the rest of the thesis, the terms *Knowledge-based Bioeconomy* and *Bioeconomy* will be used indistinctively.

The bioeconomy, then, is another central concept for my thesis. It has shaped the politics of European scientific research policy, and it has determined the nature of the promises and hopes of better futures. The *Innovating for Sustainable Growth* dossier explains it as encompassing the production and development of biotechnology through strong innovation in life sciences, enabling industrial technologies and knowledge (EC, 2012a). The use of the 'innovation' concept (now linked with the bioeconomy), then, became a political tool for defining what the future should look like, according to the EC. In 2010, regarding the relationship between innovation and the future, they declared:

"How will we tackle growing societal challenges like climate change, energy supply, the scarcity of resources and the impact of demographic changes? How will we improve health and security and sustainably provide water and high-quality, affordable food? The only answer is innovation, which is at the core of the Europe 2020 Strategy" (EC, 2010, p. 6).

This is, at the highest official levels, the EC has developed a solid policy of innovation. This enables several inquiries about what is conceived as innovation and its consequences: how should it be institutionalized, how it can be used to justify the expenditure on scientific research, and how should it be communicated to portray the benefits for society, among others.

The EC has also linked research and innovation (R&I) practices with its social benefits. In this matter, they have stated the following:

"In a global environment, Europe must also develop its own distinctive approach to innovation which builds on its strengths and capitalises on its values by focusing on innovations that address the major societal challenges identified in Europe 2020. [The EU should agree] to launch European innovation partnerships, the first on active and healthy ageing, to pool resources and expertise to find solutions to societal challenges and to build competitive advantage in key markets" (EC, 2010, pp. 7-8).

So far, it is clear how the EC has positioned innovation at the center of the discourse of development, being inherently positive for society. But they have left small chance (if any) to debate about the very nature of the term and its implications, and how has it been used for making futures.

In 2014, the European Economic and Social Committee (which represents civil society organizations upon the EC) suggested the "removal of administrative, economic and social obstacles to innovation and has objected to a concept of responsible conduct exclusively in relation to R&I" (de Saille, 2015, p. 158). This was acknowledged as a move to enhance the marketable outcomes of research programs, which need to focus on purposes emphasized on science for society, targeting at the 'right impacts'. In the particular case of Horizon 2020, R&I needs "to be responsive to society in terms of setting its direction" (Owen, Macnaghten & Stillgoe, 2012, p. 757). The EC has defined the right impacts of innovation as "a competitive

social market economy, sustainable development, and quality of life, [which should be met] in a way that is ethically acceptable, socially desirable, safe and sustainable" (Owen, Stilgoe, Macnaghten et al, 2013, p. 37, quoted from Von Schomberg, 2011). We can translate this as a framework for scrutinizing the compliance with the social contract between science and society.

But what can we understand as being considered (socially) important in R&I? In 2012 the EC defined six keys of Responsible Research and Innovation (RRI). Among those, we can find two of particular importance for this case: one is inclusive engagement, and the second is ethics, defined as shared values reflecting fundamental rights (EC, 2012b).

We can consider that the *Success Stories* are likely to make people think that success and development for society are a natural consequence of Horizon 2020. If so, that would be a case of Ezrahi's liberal democratic state (Jasanoff, 2004), in which science and technology policy is shown to the public in order to prove that the (global) state is pursuing collective social benefit. But the analysis of the *Stories* might enable a different situation: a case in which a political institution (the EC) is providing reassurance to citizens against uncertainties, instead of a socially constructed future.

All the previous apparently goes, theoretically, on the proper direction. But how is this represented within the *Success Stories*?

1.3   Narratives of better futures: values and hopes

For complying with the aim of this thesis, is necessary that we understand the way Horizon 2020 values and valorizes the EU's interests in biomedical and healthcare research policy. Moreover, we need to look at the ways in which those values are enacted (and how they prove the worth of their policies), showing how they are (re)presented within the *Success Stories*. Digging into this approach, and the very process of value-making, will help me to analyze how the rhetoric of success is used to valuate scientific research policy. Besides, to comprehend as well how the science communication process of a (so called) successful policy becomes a site of value making.

For this thesis, I will consider the EC as acting policy makers, based on their role as designers and implementers of Horizon 2020 (as a scientific research program). The EC has created this FP based on what they institutionally conceive as contributive (either for society, the markets, etc.). In turn, it has also been grounded on what interests the EC values and valorizes. These values are not self-existent, but rather have to be constructed, and represented within their public documents.

The intertwinement between the social, cultural and economic generate a value-making process, which produce the desired social benefits out of scientific policy making (Kearnes & Wienroth, 2011). But is not always clear how this process is done, since in general, what counts as ethical, matters for what counts as economic, and vice-versa. In the particular case of science policy, the value-making process is based on the *moral economy*, which determines the resources needed by the scientists. It encompasses moral values and guidelines about the scientific practice in general, defining what would be considered as an appropriate outcome of their work (Dussauge et al, 2015). Thus, it is a meeting point for values enacted by different stakeholders (e.g., scientists and the public). But since values are situated and constructed, the public can also determine what counts as important, valuable or desirable, based on their own economic and personal goals, which as well should be negotiated with the life-saving purposes of healthcare research.

The previous justifies my scrutiny of the narratives within the *Success Stories,* as a meaningful activity to show which values have determined Horizon 2020's success discourse, which in turn depict certain realities and futures. One of them is the sense of social ownership of science, which could increase the public engagement of science (making them feel that they are part of it, and that it can solve their problems), fostering their hopes about new technologies. This would be a case in which the policy makers lead society to feel that science should acknowledge and incorporate values held by a part of the public (Nowotny, 2014). But this does not necessary mean that those values have been collectively imagined, in the sense that they might not have been negotiated by the two parties, but rather imposed. This also helps us to understand the role of the *Success Stories* on divulgating the hopes of better futures (constructed based on these values, and being a medium where they are enacted). In particular, healthcare and life science policies depend on the values that the different actors involved negotiate, and how those values are enacted and/or displaced (Dussauge et al, 2015). Addressing contingency is a proper research strategy to understand how values are enacted (Dussauge, Helgesson & Lee, 2015), which also explains the overly usage of terms related to Responsible Research and Innovation (RRI) in the Horizon 2020 narrative. In such cases, we can consider those documents as value agents (Asdal, 2015).

1.4   Case Description. The *Success Stories*: what are they about?

I have conceived the case of this thesis, as a thematic overview of the meaning of European science funding, in the wider context of science/society relations in Europe. The aim is to analyze how the EC transmits to society the promises and hopes of better futures, expected out of Horizon 2020 scientific

research. In particular, my interest lies on the biomedical and life sciences, and how better healthcare futures are represented within the **Success Stories**.

Why the *Success Stories* and not any other from the available documents? They have been engineered as **"initiatives encouraging and facilitating the use of the EU research policy in support of public health, [...] to share good practice examples with and provide inspiration to other applicants"** (PHEIAC, 2011, p. 106)[2]. In other words, they aim to show society that the EC, thanks to their policies, is capable of delivering benefits to the citizens. Also, we can sustain the hypothesis that, considering that the *Success Stories* are called precisely that way, they have been deliberately created to transmit positive outcomes from the research policy, from their very title. They act as 'promise-carriers', were written by the Horizon 2020 personnel itself, and are publicly available.

The way in which the *Success Stories* legitimize the policy, makes them an 'STS-suitable' object for analysis. They do this legitimation through the rhetorical (re)presentation of promises for better healthcare, and the subsequent creation of hope, being an interesting science communication process. They can perhaps be performing a self-fulfilling prophecy (the constant risk that projections might act performatively on the object of study), recurring to the inherent self-fulfilling promise contained in the theoretical framing of innovation. This is, that "only innovation can provide us with a way to cope with innovation" (Nowotny, 2006, pp 14-15).

I expect that these documents to provide insights about how the EC constructs this validation process upon the public, though not necessarily upon the scientific community, governments or high-level officials (who might be interested in other kind of documents). In particular, we can appreciate that the *Success Stories* have not been conceived as a medium to foster the R&I discussion. Instead, they rather show how the EC seems to assume R&I as a taken for granted (which I could also notice in other of their already mentioned public documents). And to some extent, forcefully pushing their agenda: the so-called 'idea of Europe' based on a normative, self-generated imaginary of society (Marelli & Testa, 2017).

Key for understanding this will be my analysis of their narratives. Narrative plays a crucial part in the science communication process, in the sense that it "functions as a primary, universal, and probably vital means of structuring information. Stories and storytelling help us make sense of our individual and social existence" (Claisse & Delvenne, 2017, p. 255). Narratives can constitute a causal variable for policy outcomes (Shanahan, McBeth, & Hathaway, 2011), inevitably meaning that the way stories about policy-

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[2] While this report was issued in the context of displaying successful cases within the FP7 (the previous version of Horizon 2020), I will assume, for the purposes of this thesis, that this definition is extensible for Horizon 2020's *Success Stories*.

making are told to society shape possible controversies and, more in general, influence public opinion (Jones & McBeth, 2010).

What I will try to find within the texts is the rhetorical, argumentative and narrative means to transmit the information, using resources such as differentiated wording, specific actors speaking, or explanations about the commercial prospects. But are they really doing so? A brief look at some of their very titles sustains this idea:

- Improving heart health with a single pill
- Project to trial stem cell diabetes treatment
- Understanding cancer progression to improve treatment
- EU funds promising breast cancer risk research

Through the identification of patterns within the *Success Stories*, I expect to solve questions about institutional means to communicate the results of scientific research policy to society.

1.5   Research Questions

The interest of my thesis is driven towards how Horizon 2020 transmits to the public the expected results out of the research projects they sponsor. More in detail, I am interested in their promoted idea of their biomedical and healthcare R&I policy coming to solve society's problems, through narrations about promising futures. Then, my research question is the following one:

How biomedical research and healthcare futures are rhetorically (re)presented within the Horizon 2020's Health, Demographic Change and Wellbeing (HDCW) *Success Stories*?

As I wrote earlier, I will be analyzing some *Success Stories*, which tend to create hope within the population, based on their offerings of healthcare solutions. Answering this question will help me to understand how these documents have been used to legitimize this research policy. I will do this through a closer look at how promises of better futures are part of the discourse of success, and how the institution communicates the expected outcomes of their projects.

For helping to solve this question, I have considered the three sub research questions. Part of the theories and concepts that I will be using as tools to address my research, is values and valuations. Values are important in STS since they sustain what is politically defined as important, in particular for societal development. But values are not just naturally existing: they are constructed, and situated (Asdal, 2015). They are not only present in the discourses of success, but also within other documents or

political/institutional EC frameworks. One example is RRI, which has been constructed based on social values, and conceived by STS scholars as means of securing public support for scientific developments. It has gained as well a crucial role within the corresponding process of policy making (Owen, Stilgoe, Macnaghten et al, 2013). It is also the right approach to deliver social benefits as a result of publically funded research, responding to societal needs, and substantively improving research outcomes (Hartley et al., 2017). Besides, RRI could be used as a tool to favor what would sound more appealing to the public, thus framing their hopes. Therefore, if the *Success Stories* show projections of futures (based on what has been deemed as important), we can expect to find within these documents the values that sustain this. Then, the first sub research question is the following one:

How are the values and valuation practices that shape biomedical and healthcare futures transmitted to the public through the *Success Stories*?

These documents represent the social contribution of biomedical research policy, done through different ways. After a first scan, we can note that sometimes they mention the money involved, or the life-saving possibilities, for instance. The hypothesis is that these representations of future benefits rely also on the use of rhetoric means, as the ways to convince the reader about a given set of arguments. Therefore, this is the second sub research question:

How biomedical research is presented (and rhetorically justified) to the external world as interesting, contributive and beneficial to society by Horizon 2020 through its *Success Stories*?

The *Success Stories* are texts with a given narrative, and they have been created to transmit scientific work to society. An important aspect for us to understand how they enact their arguments, is addressing them as performing scientific storytelling. This enables the third sub research question:

How biomedical and healthcare innovation policy need is staged and how its success is being enacted through the narrative of the *Success Stories*?

These questions are expected to contribute to my analysis of the discourses present in the *Success Stories*, which show the EC as tackling down societal issues, as well as addressing the adequate biomedical and healthcare needs within. In shorter words, demonstrating their ability as policy makers, as well as how the imagined future in the biomedical field has been drawn by the EC itself.

1.6 Thesis structure

This thesis is organized in six chapters. The State of the art corresponds to chapter 2, and it positions this work within the current debates in academia and the relevant literature. This section is elaborated in three parts. The first one, based on the generation of hope and promises, and the social value and benefit of science (with a brief subsection of science communication and scientific storytelling). The second one talks about RRI within biomedical research. The third one is about a more specific concept: the *bioeconomy*, and how it has shaped the politics of scientific research policy.

Chapter 3 includes the theories and concepts I considered to approach this case. These were two: first, *sociotechnical imaginaries*, including sociology of hope and future making. This will help me to tie the offering of better futures by Horizon 2020, with the political visions of future-nationhood. The second theoretical concept is *values and valuations*, which will be contributive to specify the value-making process used by Horizon 2020 to pose their work as beneficial for society.

As for the material and methods, coming in chapter 4, I will explain the process for selecting the subset of the *Success Stories* I used. The EC has issued more than 400 of them so far (for the *Health and life sciences* section), but not all of them are likely to answer my questions. After applying a 3-point criteria workflow (based on the related diseases, the dating of the documents, and the offering of promises within the title), I found 23 *Success Stories* which complied with the rationale, being the documents I will use. The method of analysis used, was Critical Discourse Analysis. Using Discourse Analysis strategy (Wodak & Meyer, 2009) to observe the structure of discourse (Jäger & Maier, 2009), rendered a code set of 12 different categories, or discourse strands. I grouped these categories within 3 discursive knots, based on the different argumentation aspects I found.

Chapter 5 consists of the empirical data analysis, which I split according to the aforementioned knots (layers), for a more detailed observation of the different strategies used to represent the success of Horizon 2020. The first one is focused on the layout, writing and argumentation style, in terms of linguistic means and wording. Within this layer, I grouped these categories: sense of a problem/need, promises of better futures, use of conditionals, colloquial wording, and complex wording. The second layer elaborates on the rhetorical structure and the content of argumentation of the Stories. Here, I incorporated these categories: sense of life-saving, use of personal stories, and scientists speaking. The third and last layer was about the technical infrastructure of the research projects, and the way in which they have been conducted. The categories mingled here are sense of innovation, business opportunities, sense of economization, internationality of the projects, people (patients) involved and the monetary resources invested.

Chapter 6 shows the conclusions. I understood how the *Success Stories* construct futures of better healthcare for society, based on these rhetorical means and narrative strategies. Through this discourse, the EC attempts to prove the worth of their policies. This was achieved through several means: the wording (colloquially over-simplified so as to reach the public, or complexly over-explained so as to reinforce the knowledge-authoritative role of science), the nature of the promises (life-saving solutions, even when still being under development and not close to be deployed), the 'humanization' of the narrative through personal stories of the patients involved, the innovativeness of the solutions and the business opportunities that they will mean so as to generate economic boost, are the main ones.

2   State of the Art

This section is split into three different (but inherently related) topics. The first one is based on **social value and benefit of science**, and how the outcome of the scientific research, in general, positively impacts the society (or should do). In particular, the scientific knowledge produced and promoted by Horizon 2020. The second one digs into a more specific item: **Responsible Research and Innovation**. Again, starting from the in-general discussion and how it shapes institutional aims for scientific research, and then driven towards the specific case of the EC and Horizon 2020, framing biomedical and life sciences research policy. The third and last concept is the ***Bioeconomy***, and how the politics of scientific research are determined by the commodification of healthcare and life sciences (a dominant neoliberal conception, according to some STS scholars). Inquiring about this concept will allow me to scrutinize how the *Success Stories* portray the research policy of Horizon 2020 as a case which fits within the modern bioeconomy.

Despite the existence of other topics related to this debate (e.g. public engagement, governance of the policy institutions), the aforementioned three are expected to sufficiently frame my case, according to the aim of this thesis.

2.1   Hope, social value and benefit of science

Nowadays society is presented with an immense set of new technologies that promise to alleviate suffering and enhance health. These offer new imperatives and possibilities for healthier living, and therefore a better future, giving individuals a more active role in the consumption of technology, in order to optimize their health. As positive as this can sound, there is a potential problem: there is no guarantee that these new technologies will deliver what they promise. This possible gap between what they promise and what they truly provide to the citizens, can have different origins. In particular, following the aim of this thesis, we can look at two specific causes: first, the manipulation of emotions (Petersen, 2015), and second, the indiscriminate use of the mass media (Turow, 2011). These constitute two forms of casting hope in the pursuit of desirable futures.

The discussion can be tracked one step back to question what is understood as 'desirable futures' when thinking of the outcomes of scientific research policy. Kearnes & Wienroth (2011) give a simple and useful definition: the tendency to maximize the economic and social benefits produced by scientific research as the final goal. Maximizing the benefits sounds intuitively reasonable and logical. When we break down those benefits specifically into the *economic* and the *social*, we can agree that the economic benefits can be quantified and measured through different mechanisms and standardized indicators. But what is

particularly interesting for this work is what is understood by those potential *social* benefits, as the desirable futures from biomedical research policy, and *how* they are shared with society.

When thinking about *who* is in charge of defining those desired goals, in general, the pressure to produce results out of scientific research programs, is mostly put onto the developers and policy makers. They need to address societal needs and to ensure public support for science (Hartley et al., 2017). This decision-making process for science policy cannot be objective and value-free, but rather has to involve political questions (Sarewitz, 2015). This procedure is also about making visible the role of values, which means that notions of public good should be incorporated in the discussion about policy-making, in particular when it involves future-making and research and innovation.

If we take those concepts to the particular case of Horizon 2020, we can see that the same institution (though not the same individuals) which act as policy makers, are also the ones showing the potential benefits to society. On the one hand, the EC designs, implements and manages the Framework Programmes (from which Horizon 2020 is part of), as well as most of the future of Europe's scientific research policy. On the other hand, it also plays a role as communicators of their policy to society, through a myriad of publicly accessible documents. As part of those documents, we can find the *Success Stories*. These show a subset of EC-funded projects, and the expected outcome of their scientific research. Then, the definition of what will be the *potential social benefits*, depends on the same actors who promote and fund scientific knowledge production (who elaborate 'desirable futures'). This contains an inherent tension. The policy makers might take advantage of the expected reaction of the public, when they communicate the (alleged) positive outcomes, since they (as the knowledge-production side) define what is important. But the social benefits that the public expect might be different, since both sides are not likely to have equal perceptions of what is important (and needs to be addressed). Given this situation, the question is how to perform the science communication process. This is what literature has called the 'anxiety about health': how to manage the hope generated by emerging technologies, addressing the problem of the divergent public/scientific value of science, and the necessity to prove the scientific research as worthy (Kearnes & Wienroth, 2011).

The portrayal of these potential results depends on the risk perceptions the public have. This relates to the referred anxiety, in a "heightened sensitivity to the prospect of the worst possible outcomes when medical testing reveals a positive diagnosis or a susceptibility to illness; in worry that is disproportionate to actual biophysical risk/s; in obsessive concern about undertaking preventive actions; and in an over eagerness to seek expert advice when things are perceived to be 'not quite right'" (Petersen, 2015, pp. 79-80). In practical terms, this means that the popular perception of the importance that a biomedical development has, is (partially) shaped by the people's perception of the risk associated to the

corresponding health condition. Especially when their perception differs from the actual probability of suffering it, this creates an artificial anxiety. This, in turn, shapes the way people receive the communication of these expected results, and their subsequent decision making (such as taking medicines or undergoing treatments).

One interesting example of this phenomenon in the literature, is the generation of hope and expectations in cancer patients[3], which has been proven profitable for the pharmaceutical industry (Petersen, 2015). Scholars have studied this case as a contributive and helpful way to assist society to transition from lay citizens (living on a 'blissful ignorance'), to informed, and even active consumers. But this can be perhaps a naïve conception, in the sense that the increase in the patient's knowledge, might not imply that the cancer-related deaths will be dropping down. This case illustrates how the imperative of the use of new tests and screenings (pushed by the pharmaceutical industry) has produced technological promises and subsequent hopes. This in turn has shaped the actions performed by the patients. Petersen cites on his work the example of prostatic cancer, in which patients have been taking medical tests (lucrative for the industry, but sometimes unneeded) to avoid the risk of being called irresponsible citizens.

What I have stated so far, does not mean that the pursuit of hope is intrinsically criticizable. All the opposite: seeking for hope is positively valued in modern societies, hence worthy of support and nurturance (Petersen, 2015). Petersen mentions that hope in healthcare needs to be contextualized within "a much wider effort to engender optimism and happiness in populations –to create citizens that are more entrepreneurial, 'resilient', and 'future-focused'. Optimism or hopefulness is seen as a valued attribute that can be acquired, mastered, and employed in education, in business, in the military, and in healthcare; that is, utilized in the present to shape future outcome" (2015, p. 46). While this is an acknowledgement of the implications of hope in biomedical promises, in turn, opens up the possibility of falling into the *optimism bias*. This is what occurs when individuals overestimate the probability of positive events, while underestimate the negative probabilities (Sharot, 2011). The *optimism bias* implicates that the people might make wrong choices, such as taking tests, drugs or treatments which are not necessary, and/or expecting unreal outcomes (such as in the prostatic cancer case). In this situation, we can talk about a phenomenon which scholars have coined as the *false hope*. They have defined it as "an unrealistic set of expectations, encouraged through incomplete or faulty information or by a patient's willingness to acknowledge the limits of medicine" (Rettig et al, 2007, p. 286). In shorter words, the *false hope* can lead the patients to acquire an unquestioned faith in the irrefutable proof. Though I will not be discussing the veracity of the information presented in the *Success Stories*, the *false hope* and the *optimism bias* are useful conceptions to consider, since the analyzed documents present promises through a given narrative,

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[3] Considering that 13 out of the 23 documents analyzed for this thesis were about cancer, this is an interesting case.

which in turn produce hope from the developing technologies. And in particular, these hopes are being created by the policy makers who fund the knowledge production, though performing their role resembling Hilgartner's (2000) theatrical staging. Performers state a division between the *backstage* and the *front stage*. The former is not likely to be seen by the audience, while the latter is deliberately deployed. This separation is created by certain resources or machinery (such as lightning or costumes), controlling what the audience sees. Horizon 2020 and the *Success Stories* are at the front of the stage. This metaphor also allows to consider the ways the performers control the information provided to the audience.

In this line, it is useful to introduce the concept of the *hope management*. Petersen has defined it as "the task of acknowledging [medical] uncertainty while maintaining the legitimacy of a field that is based on claims to unique knowledge and expertise [through] the utilization of a particular construction and rhetorical use of 'evidence'" (2015, p. 50). The *hope management* frames the responsibility the policy makers have, when shaping the hopes they offer the people. In this case, it allows to study how Horizon 2020 balances the uncertainty and the rhetoric means within the hopes offered through the *Success Stories*.

If we switch back to the other end of this science communication process, we find the public as the receptors of the information. Hope is generated on their side, as a result of the promised benefits of scientific research. This is based on people's belief in the ability of technological developments to relieve their health problems. This is not grounded solely on the health perspectives, but is also part of a broader societal dimension. The power of biomedical technology to overcome health issues has determined modern narratives of socioeconomic progress, promising to manage all aspects of life. Promises establish public and policy support for science, and for translating in-lab knowledge into palpable technologies such as new tests and drugs (Petersen, 2015). This means that the health benefits that scientific research can offer the population, depend on the actors (besides the policy makers) who create the embedded hopes. Actors such as scientists who build their careers from new breakthroughs, clinicians who seek to improve the quality of healthcare, and patients who expect treatments for their conditions. All of them have one thing as a common focus of hope: new, emergent and envisaged technologies (ibid).

We can summarize the previous in the concept of the *economy of hope*. It has been defined as the "intermingling of the hopes of individual patients with the promises of new biomedical technologies" (Petersen, 2015, p. 10). The *economy of hope* also is nurtured by the belief that biotechnologies, "if democratic, open-ended, and made capable of realizing their experimental potential, rather than closed, proprietary and subjected to the dictates of hegemonic state and corporate power structures, can in fact make the world a better place" (Sunder Rajan, 2012b, p. 448). This becomes a common focus the different

actors might have (in particular scientists and the people), which could provide a framework to shape the earlier mentioned *potential social benefits*, as desired outcomes of scientific research policy.

The *economy of hope* also has an embedded political aspect. Novas conceives it as a framework to deal with the "political-economic dimensions of the hopes that patients' associations invest in the possibilities of biomedical research to develop cures or therapies" (Novas, 2006, p. 290). This allows us to better understand the translation of biomedical research into its capitalizations. The *economy of hope* also elaborates norms related to the conduct of medical research, instead of considering *hope* as a mere act of imagination (ibid). Therefore it enables the idea that the process of hope generation needs to be 'marketed', so as to reach its destination (the patients). How to do this? The 'marketing' within the economy of hopes, when promissory and successful, is characterized by the use of "rhetorical devices that enhance the persuasiveness of claims, including 'advertorial' material (e.g. stories of purported individual successes with treatments), reference to purported experts or scientific evidence, user testimonial, […] attention-grabbing phrases or banners, […] broad descriptive terms, of ambiguous meaning, that allow audiences to read messages in multiple ways. While promissory claims are integral to all marketing, they would appear to be especially strong in matters of health, illness, and the body" (Petersen, 2015, p. 128). Therefore we can concretize the *economy of hope* as a medium through which the scientific research policy makers construct hope, and show it to society. This elaboration demands the study of the 'marketing of the economy of hopes' as a science communication case.

In an effort from the authorities for supporting the people to make healthier decisions, the former provide the latter expert advice, helping the people getting educated in this matter. This opens up the door to the possible paternalism of the authorities, namely the policy makers, to legitimately influence people's behavior so they can live longer, better and healthier (Thaler & Sunstein, 2009; Petersen, 2015). While this might sound logic, in many cases the embedded life-improvement promises are accompanied with commercial imperatives. In other words, the rhetoric of offering better healthcare choices, is used as a strategy to commercialize promising technologies. A particular example have been those cases in which testimonials of other patients are shown as "heroic efforts to overcome adversity" (Petersen, 2015, p. 90), used to transmit hope and success through the power of words.

If the expectations of the public (as the hope receptors) are not met, the floor could be opened to scrutinize whether the policy makers are complying with the social contract. This revision process is also given by the public's ability to speak back to science, thanks to this new forms of dual-channeling, back-and-forth science communication scheme. Here, knowledge not only flows from science to society, but also vice versa (Gibbons, 1999). This can be done through the accomplishment (or not) of the 'right

impacts' of scientific research and innovation. In particular, studying if they are ethically acceptable and socially desirable (Von Schomberg, 2011; Owen, Stilgoe, Macnaghten et al, 2013).

2.1.1 Storytelling in scientific research policy

The effective transmission of the hope generated by the policy makers to society, deserves to be treated as a science communication phenomenon. Therefore this subsection will elaborate some notions of science communication, popularization of science and public understanding of science.

The promises of biomedical technologies not only embed long-term national/continental social benefits. They are also about "short-to-medium term 'consumer' benefits –particularly offering individuals greater choice in the healthcare marketplace and the prospect of a more 'personalized' form of care" (Petersen, 2015, p. 14). This opens up a whole new field of personalized medicines. Processes of innovation, and the increase of public participation, imply the distinction between two castes, which will engage with the involved knowledge produced: the producers and the users. And when the political gets more strongly entrenched, this could mean the issue of choice becoming neglected to the users (Felt, 2015a), even though the same users tend to perceive otherwise.

Scrutinizing the storytelling in science, is more than simply giving a certain account of a research project to convince someone. It is about choosing which stories are being told (and which are not), as well as the type of science framed for society (Felt & Fochler, 2013). Some scholars have argued that the ideal situation for policy makers, is when citizens do not question the impact of transformations on their value systems, since scientific advancements are inherently positive, and decreed as public goods. Therefore, what would be needed, is an "intensification of science communication, not for the sake of opening up technoscientific developments to public scrutiny, but rather convincing citizens to accept them" (Felt, 2015b, p. 116).

STS scholars have agreed the existence of a dominant model of science popularization, in which science produces legitimate knowledge, but not necessarily understandable by the lay people. This means that there is a mediator role to be assumed and bridge this gap, so as to translate a simplified version of this knowledge for the general consumption (Felt & Fochler, 2013). Seen from the side of the scientists (as knowledge producers), this simplification is, indeed, important as an ideological resource for science to exert its authority (instead of a mere tool for individual scientists). But it has a drawback: it may distort the message transmitted. Therefore, this makes it a 'necessary evil' (Sismondo, 2010). The in-lab scientists

might not be the ones taking this mediators role, but other actors instead, since popularization "pollutes the sphere of research" (ibid, p, 170).

If we look at how the involved actors enforce their positions, it is clear that scientists must convince the public that their knowledge is truthful and objective, for which rhetorical tools are crucial (Sismondo, 2010). In science communication, the scientific publications use this rhetoric, since they exert a persuasive power when they attempt to convince a given audience of their scientific facts (ibid).

The previous lead us to note that the rhetorical choices made by the authors, determine the style and content of scientific writing. For instance, arguments and their construction, language, key terms, etc., which are not innocuous, but specifically selected for their desired effects. This means that scientific writing is dynamic, situated and is shaped by particular needs (Sismondo, 2010). But why a scientific article would need to recur to rhetoric, when scientific knowledge can be deemed, by default, legitimate and objective? Because when sufficiently rhetorical, receives the highest appraisal: it is logic, therefore, its public acceptance is strengthened (Latour, 1987).

Historically, the diffusion of scientific knowledge has been dominated by the 'deficit model' of the public understanding of science (Wynne, 1992). This model sustains that "scientific and technical literacy is a good in short supply outside the ranks of scientists and engineers. The public is thus characterized as deficient in knowledge" (Sismondo, 2010, p. 174). This deficiency implies a two-dimension problem. The first is a moral one: if the public remains unable to understand science, they will not be likely to make right choices. The second is political: the public will be less keen on supporting the public expenditure on scientific research. This can be corrected by more didactic education, and, in general, by improving and enhancing the knowledge transfer from science to society (ibid). Representing scientific practice as successful, implies that science will be able to tackle down and solve societal issues, creating social expectations. Despite that, there can still be public opposition of science. This situation is not necessarily the result of a misunderstanding. It also depends on making the knowledge available by trustworthy actors or institutions, so as to diminish the possibilities of public rejection (Sismondo, 2010).

This shows yet another issue: granting that the science communicators comply with this 'trustworthy' status. This is reflected in the anxiety over the problem of control of emerging technologies, and how to deal with the management of the production and communication of new technology. Besides, concerns have arisen about the public value of science and the necessity to prove the research work as worthy (Kearnes & Wienroth, 2011). This is translated into a responsibility to drive knowledge and technology transfer and communication, through a scientific authoritative figure.

Stories about science constitute part of the broader societal imaginaries of research in contemporary societies (Felt & Fochler, 2013). Outreach requirements push scientists to present and re-present their work to different audiences, being active storytellers of science. In that terms, the way science is promoted is important. In many cases the science communication exercise is developed as "a process of imagination, invention, and development that actively seeks novelty, with a creation of value as its goal" (Owen, Stilgoe, Macnaghten et al, 2013, p. 32). This way it becomes appealing to the public. This is also known as the 'press-packaged science'. Felt & Fochler have defined this as a form of science communication in which the story is told by scientists, to a specific audience, in a brief, concise and entertaining way, "while simultaneously and convincingly conveying relevance" (2013, p. 80). But this phenomenon is not isolated. When it comes to science communication, researchers use the social contribution of science as an argumentative resource itself. This can be the case, generally, when they are both the producers and the subjects (storytellers) of science stories (ibid).

Press-packaged science does not only apply to 'standard' science storytelling, but also to a specific area: science funding. There, it is critical to construct grandiose societal narratives (Felt & Fochler, 2013). This concept is closely tied to the *economy of promises*. This has been defined as what happens when "the promise of future contributions to societal issues becomes a central medium for attaining reputation and resources within science" (ibid, p. 81). The *press-packaged science* and the *economy of promises* do not depend only on the knowledge being transferred, but also on the societal context in which science stories are shared. It can happen that society does not consider all forms of knowledge as equally promising (ibid). The 'right' kind of story has to be told, if knowledge needs (or is willing) to be converted into other forms of capital in this economy of promises.

Some research institutions might face the public questioning of the hope and expectations their research policy produces. In such cases, in general, it becomes important that these institutions invest in outreach and communication activities, since an intensification of science communication activities stimulates implementation and support. Also, success strongly depends on the applicability of the research outcome, as well as on its faculty of solving societal problems. These science communication activities can come through different formats: TV shows, blogs, public documents, and so on (Felt & Fochler, 2013). The coverage of science in the media has been called the 'medialization of research', in which scientists present and represent their work to the people. This activity has been fostered by policy makers, for several reasons. One of them, has been to communicate the aims and outputs of scientific research projects. Researchers have been invited to participate in such activities, becoming active storytellers of science, so as to add more 'authenticity' to the science stories they can share. This move enables three positive results which imply a more innovation-friendly climate: science stories become more attractive

to the public; the possibility of scientific mistrust on science gets diminished; and the public gets, in general, more educated in science, therefore they get more rationally engaged with scientific research (ibid). These consequences would be in line with the aforementioned social value and benefit of science, tying it with the proclaimed need of better science communication activities.

All this frames the issue of how the hopes generated by scientific research shapes the public expectations about the healthcare and biomedical developments. The *Success Stories* comply with the characteristics displayed previously, as being rhetorical devices, this means that they are part of a science communication enhancement, stimulating support and 'compliance' of the EC (through Horizon 2020) of the social contract. The way they perform this process, then, makes this set of documents an interesting objects of analysis.

2.2   Responsible (biomedical) research and innovation

This subsection develops the role of innovation within scientific research policy. It is important that I include this concept within this literature review, since it is permanently used and recalled, not only within Horizon 2020, but also within other EC public documents. When we look at the EC public documents, in particular the *Success Stories*, the broad use of innovation invites us to question how are they portraying their innovative practices, and whether could this be such a case whether responsibility is addressed or not.

Innovation has become a key part of industrial policy in the most developed economies, considered as a crucial stimulator of economic growth due to its role on creation of job and wealth (Von Schomberg, 2011; Owen, Stilgoe, Macnaghten et al., 2013; de Saille, 2015). This idea also applies to the particular case of biomedical and healthcare areas, which are seen as leading the path for meeting clinical needs, as well as contributive to the economic growth (Gardner et al., 2017). States, among other nation/continental-wide institutions, have strived for incorporating the innovation concept within biomedical research policy. This does not necessarily mean that the state picks certain projects and funds them, but it can also provide a facilitating framework for this to happen. This means that there is a shift from a popular conception of the state as a bureaucracy-generator, to a *mobilizator* of resources and knowledge, for the sake of producing advancements on given areas (Mazzucato, 2015).

This is known as the *entrepreneurial state*, defined as "a particular mode of biomedical innovation that entails commercialization. This is reflected in the establishment of commercialization-oriented accelerator agencies" (Gardner et al., 2017, p. 41). This concept explains the use of the expertise from

industry to prioritize commercialization practices as (marketable) outcomes of biomedical research. This, in turn, considers the novel healthcare access as a result of this nation-building mantra, driven by promissory visions of health and wealth. This implies the use of public funds for innovation entrepreneurships, which consecutively would generate wealth markets. The state then, becomes a broker between the public and the private good, socializing the risks and privatizing the revenues (ibid). But this situation engenders a problem: an exacerbation of inequality (Mazzucato, 2015), therefore allowing to question how responsible is innovation. The pursuit of 'health and wealth', through the facilitation of innovation, could be delegated to particular communities of expertise. If this happens, it would mean that more values would be enacted in this *new health bioeconomy ecology* (Mittra, 2016).

But this possible shift in the role of the state does not imply a detachment of its responsibility (understood as offering realistic promises, and eventually delivering them). As an example, we can see past cases of design and re-design of biomedical governance and regulatory frameworks, where incentives have been placed stimulating mostly the producers. Here I recall the case of fast-track drug approval processes, where incentives have been put in the manufacturers' side to innovate in areas of considerable unmet clinical need (Gardner et al., 2017). More generally, Gardner et al. state that it is possible that when regulatory bodies (or policy makers) perform their institutional roles, they might not be necessarily protecting society. Instead, they might be mostly fostering market activities, yet sustained by an institutionalized discourse of being innovation facilitators (as a naturally positive feature).

Within the biomedical and healthcare domain, scholars have noticed a growing emphasis on measuring and assessing the impacts of the global burden of the loss of healthy life. This has as a driving force the optimization of global health, which in turn would implicate subsequent economic benefits. This conception demands, or stimulates, the consideration of health as a form of human capital (Kenny, 2015). This implies not only the public and private investment (as providers of biomedical services), but also self-investment by individuals, either in form of money, time or health education. Sunder Rajan (2012a) also addresses this, assuring that life sciences converge with systems and regimes of capital. Specifically, he sustains that life sciences are increasingly incorporated into market regimes, in what he considers an institutional movement into the market (to the detriment of the academia). This has facilitated the 'utilization' of the university as a more entrepreneurial site (in terms of the resources it can provide for research), envisioning commercialization goals out of its research activities. In this regard, he uses the term "corporatization of life sciences" (ibid, p. 2), explained as the emergence of the 'entrepreneurial university'. While not intrinsically negative, from its beginnings the institutionalized collaboration between universities and the private innovation enterprises, has had different consequences. Within those, we can find collaborative research or professors commercializing their research (and even starting

their own companies). This has provoked that universities (and research centers in general) modified their stakeholders role within the R&I process, possibly deviating from seeking the public good. The main observation is that commercialization practices out of academic research, are consequence of the commodification of healthcare.

This is also explained by the fact that different actors tend to have different understandings of what innovation means, and what it implies. Policy makers consider, in general, innovation as the key to a better future, promising economic growth and competitiveness. Not only that, but also as a bearer of solutions to persistent social challenges such as energy, health or ageing (Pfotenhauer & Jasanoff, 2017), and has purposely stalked the claims for a new disciplinary tribe (Godin, 2014). If we ask what its social significances are, we can bring in the idea of Responsible Innovation (RI), as a form in which innovation needs to be performed, aiming to socially focused innovation policy (Owen, Stilgoe, Macnaghten et al, 2013). RI is tacitly the right way to orientate scientific research through, feels implicitly right and tends to have positive and constructive overtones. It aims towards "socially desirable and socially acceptable ends, with connotations of trust and integrity" (ibid, p. 27).

Responsible research and innovation (RRI) emerges as a concept within this fabric, providing a framework to understand what does RI involve, and who is involved, ultimately shaping the path technoscientific developments should go. Macro-level, multinational scientific research programs tend to follow this direction of promises, instead of defying it. This implies the inclusion of questions of power relations (both political and economic) among people and institutions (policy-making actors in general). This contributes to new forms of social, political, and technical order. RRI should also collectively commit to care for the future, ask what are futures envisioned by society for science and innovation, and which values they will be based on (Owen, Stilgoe, Macnaghten et al, 2013). Policy making framings which consider RI, aim at innovation-developing processes with increased responsiveness to societal challenges, in particular, regarding uncertainties and potential risks that the outcomes of innovation can have. This would help researchers to anticipate possible future impacts and implications (Macnaghten et al, 2014), factors which also shape the hope these new technologies create on society. This means that the way RRI is performed, impacts downstream on the production and transmission of hopes. In broader political terms, we can say there is a notion that, if not innovative enough, it becomes difficult to prove research as economically defensible, politically legitimate and suited to contemporary times (ibid).

RRI is not a static concept, but it has evolved throughout time. From simple and mere non-bonding discourses of socio-technical integration, to stronger political commitments which recognize the limitations of "extant policy approaches to managing ethically-problematic areas of science and innovation" (Owen, Macnaghten & Stilgoe, 2012, p. 751-752). At the same time, this has been

accompanied by growing concerns about global impacts of innovations in contemporary society. This has meant a revision of linear models of science communication, and in particular, the social contract of science (ibid). We can tie this with the expected social benefits of science, or the 'socially desired' outcomes of scientific research. RRI then becomes a piece on the generation of hope by the scientific research policy, adding a precautionary sense.

If we want to study how RRI has specifically been present within Horizon 2020, it becomes important to recall how the EC has defined this concept. In 2012, the EC's *Science in Society Work Program* defined RRI as "a transparent, interactive process in which societal actors and innovators become mutually responsive to each other with a view on the ethical acceptability, sustainability and societal desirability of the innovation process and its marketable products" (de Saille, 2015, p. 158). In 2013, they redefined RRI as a process by which societal actors "work together during the whole research and innovation process in order to better align the process and the results with the expectations of society" (ibid, p. 158). This constituted a clear expression of the entanglement between technoscience and society, portraying their institutional concern. Also the societal dimension of innovation seems addressed, as well as the political economy of hope.

Hartley et. al (2017) provide a clearer understanding of the relationship between RRI and the economy of hope (and consequently with the social value of science), when they address the emergence of RRI as a "policy tool to shape the direction and nature of science, technology and innovation for the benefit of society" (p. 362). This enables to politicize scientific research through the pluralization of expertise, at the same time it can be opened to a broader range of actors, meaning that different values will also be incorporated (especially the social). RRI therefore plans to repoliticize scientific research policy making, as an attempt to rebalance the power relations within policy making on R&I practices, building trust between the policy makers and society.

RRI is also involved within science communication practices, acknowledging scientists' responsibility about making available the benefits of science to the public, leading to greater public trust and acceptance of science (Hartley et al., 2017). This means, RRI should also shape the storytelling activities surrounding scientific research policy. Not only that, but also when conceptualizing the role of technoscientific developments, Macnaghten et al. have said that "innovations and technologies are or should be primarily framed as instruments for bringing about future effects or 'impacts'. […] Technologies should be treated, instead, as elements of practices of care that both serve intended ends and that mediate our changing conceptions of these ends" (2014, p. 196).

The subsequent challenge with RRI then, is how to negotiate the stimuli for the private investors to address social (biomedical) needs, using innovation practices responsibly. Undoubtedly, innovation should be pursued, but it has been noticed that it can constitute a government-supported mechanism. In that regard, it needs to be designed within a formal framework in order to provide better healthcare access (Gardner et al., 2017). States and political institutions have already made efforts to re-shape biomedical innovations governance, in order to re-balance the risk embedded in those developments, so as to ensure that the outcomes are materialized in better healthcare solutions (Mazzucato, 2015). Mittra has described this as the aforementioned *new health bioeconomy*: the instrumentalization of biomedical RI practices, in the name of 'health and wealth'. This also requires the proper adjustment of governance frameworks, so as to reposition healthcare providers as innovators. This would be possible thanks to the work of heterogeneous actors and interests, which in the end should all aim to a wealth-generative bioeconomy[4] (Mittra, 2016).

Looking at how knowledge claims are constructed and spread within those instances, allows us to analyze how the previous statements have been translated into reality. This can be an example of an effort for over-pushing the introduction of new technologies as a mere way to prepare "the product for the market and the market for the product" (Thorpe & Gregory, 2010, p. 273). The *Success Stories* pose an arena in which the publics might be on an unprivileged site (compared to the policy makers), since they tend to be neglected to express their concerns to their counterparts (investors, policy makers and scientists). But the preferable situation is that one in which notions of risk are openly and democratically debated for the good of science and innovation (Sarewitz, 2015), in a context in which the difference between production and consumption falls into a grey, undefined zone.

Though is not the aim of this thesis to dig into the deliberative process of public engagement of Horizon 2020, the previous observation can be summarized as the existence of a possible gap between 'theoretical' and 'practical' RRI. This can lead RRI practitioners (researchers or policy makers) to interpret and apply RRI on their own behalf. Subsequently, this can shape discourses in which their work is praised as innovative and, consequently, necessary and contributive to society. It can also be conceived as an *egg-or-chicken* problem: the market is invoked to substantiate the premise that innovation is intrinsically valuable (if there is a market, innovation is by definition responding to people's needs). But for this to happen, is an imperative that innovation has first to exist, in order to engender that market (Doezema & Hurlbut, 2017). Then the logic behind the need of (more) innovation might be falling into the trap of circular justification.

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[4] This concept is broader elaborated and discussed within the next subsection.

2.3 Bioeconomy: the politics of scientific research policy

For a long while, science has tried to be constructed as inherently nonpolitical (Brown, 2015), but since the second half of the 20th century, it has been agreed within STS that technoscience is political. Consequently, this implies that scientific research policy, as well as its sociotechnical practices (including science production), are also political (Jasanoff, 2004; Felt & Stöckelová, 2009). Sheila Jasanoff summarizes this idea asserting that "there cannot be a proper history of scientific things independent of power and culture" (2004, p. 21). From that point on, STS scholars have elaborated several conceptions about the relationship between politics, science and society. In this subsection, I will develop some notions of politics and democracy in scientific policy making.

I will start with the repoliticization of science. While we can commonly see advocators for this in the academia, there might be opponents in other sectors. The public can be prone to think that science should be 'protected' from politics (especially in times of rising popular distrust on politics and politicians), but this does not mean that politics *will* be actually kept off science (Hartley et al., 2017). There are two major risks of pushing politicization on the 'output site' of scientific policy (rather than on the 'input site'): the lack of the policy debate, and public resistance to emerging technologies (ibid). This phenomenon could be counter-balanced through the promotion of hope on these novel technologies to increase public support. An interesting approach is given by Brown (2015). He describes five conceptions of politics in science, and the implications that this relationship has. In that matter, he writes that "sociotechnical practices and institutions may have political origins, implications, or effects, and thus be political, without necessarily being a mode, site or object of politics" (p. 6). This idea conceptualizes democracy as a way of getting collective self-governance, which can shape the policy-making for supporting one or another field. This can be useful to challenge pre-established power relations between science institutions, politics and the public, in order to diminish the potential public resistance towards new technologies.

The relationship between (biomedical) science and society (both in discourses and practices) is therefore a political event. It is also not unidirectional, in the sense that technoscience and the social "are simultaneous, historically constituted events" (Sunder Rajan, 2012a, p. 1), instead of 'living' apart and independently one from another. This political connection has been used to promote the urgency of translating biomedical innovation into better life perspectives for the people, as a necessary response for healthcare demands. Since this relates to what I previously elaborated about RRI, and how policy makers generate hope, we can now say that the performance of RRI is itself a political process. This political responsibility can be summarized in the idea that, if not because of the innovation brought by biomedical research, human needs are at risk of being unmet (Doezema & Hurlbut, 2017). But the act of requesting more reflection and deliberation on innovation futures, might be seen by others as a threat to efficiency,

with the potential risk of falling behind (Felt, 2015b). This perceived risk is tied to the so called *translational gap,* and the rush to commercialize scientific developments.

The *bioeconomy* emerges here as a concept which binds these topics and concretizing some ideas. It has been defined as "the growing entanglement of capital with the biological sciences and technologies" (Petersen, 2015, p. 13). Another definition, complementing Petersen's, is the one found in Pavone & Goven (2017). These two authors treat the *bioeconomy* as the economy generated and developed by the biotechnological innovation. They have also related it to governmental promotions and claims of promises about the tremendous promises of biotechnologies. These promises claim to be able to create large-scale economic growth, as well as a myriad of global/national challenges. Besides, Pavone & Goven conceive that the threat of medical conditions "can be addressed, through biotechnology, in a way that simultaneously also boosts national competitiveness and rates of return to capital" (ibid, p. 3). This approach exposes two aspects:

1. The bioeconomy becomes associated with the problem of treating the biotechnological developments in a purely economic way (neoliberal, in the sense that markets, and the policies which sustain ways for markets are valorized). At the same time, ethical issues are swept aside, and socio-political problems are undermined (as if technology would solve them unquestionably).

2. It shows the potential problems of the creation of hope, as a consequence of technological developments (e.g., the earlier elaborated *false hope* and *optimism bias*).

The previous demand the consideration of further ideas about the politics of the bioeconomy. Science has a political dimension, which means that technoscience is not only produced within the strict limits of the laboratory (or 'in-lab work'). It is also shaped by the work of others, such as policy makers, market actors, or patients, meaning that it is, likewise, determined by social structures, practices and ideologies (Sunder Rajan, 2012a; Felt, 2015b). This implicates that the production of technoscience and its subsequent translation (in particular within those cases falling into the commodification of healthcare and biomedical sciences) become objects of study in the context of the bioeconomy. Why? Because it is needed to understand the "political strategies deployed to moderate debate and construct authoritative governance regimes" (Sunder Rajan, 2012a, p. 17). In this circumstance, then, the economic dimension of the bioeconomy does not only relate to quantitative measurements of costs and profits, but also regimes of value, which in turn are politically articulated. This means that the bioeconomy has an intrinsic political dimension.

Bioeconomy strategies imply multiple policy-making activities, such as increased public investment in science (and the promotion of its commercialization), public support for private commercial actors, and

active government stimulation of public acceptance of bioeconomic activities. Therefore, we can consider the bioeconomy as an object for governmental strategy (Pavone & Goven, 2017). This means, it is a political project (instead of a mere technoscientific one), in which political institutions (e.g., the EC) are subordinated to the need of innovation regimes, positioning bioeconomy as key to global competitiveness (Goven & Pavone, 2015). In fact, we can appreciate this within the EC's discourse about the need of innovation to tackle down European global competitiveness problem (Geoghegan-Quinn, 2012). On the other hand, the management of knowledge is also political, especially when shared with society (or introduced intro *complex sociotechnical systems*, in Sarewitz's terms). This is enforced when we consider the associated risks, which will shape the acceptance (or rejection) of the involved technologies, mainly due to the information gap that can exist if the publics are ill-informed about those risks (Sarewitz, 2015). This is connected to the hope and social value of science: earning the public's acceptance by the policy makers, is critical to achieve success. It is a barrier to innovation which needs to be overcome (Goven & Pavone, 2015).

How can we reflect this entanglement between RRI and politics in more concrete terms? In the previous subsection I said that the 'theoretical' RRI has been dynamic and has evolved throughout time. This also applies to 'practical' RRI, since there has been an effort to channel it "away from its original goal of creating a mutually responsive society, and more towards the imperative of speeding up innovation to produce immediate economic growth" (de Saille, 2015, p. 159). This transformation shows that there is an inherent tension within the process of shaping RRI as an institutional policy. Both interests (social and economical) have to be safeguarded, otherwise, this would broaden the gap between the aforementioned 'theoretical' and 'practical' RRI. In the context of this thesis, we can observe this in the *Success Stories*, which enhance public support, portraying innovation through technologies which will (allegedly) create social benefit. This includes the stimulation of marketable technological developments, in order to avoid losing 'economic momentum'.

This channeling of RRI towards more economic growth, makes the concept of innovation fit within the *entrepreneurial state*, or the pure neoliberal bioeconomy. This, in turn, clashes with the framing of technological innovation as "much more than the production of new tools to solve particular problems: it is a framing of problems to suit particular technological responses in a process that coproduces (reshaping and preserving) social order" (Goven & Pavone, 2015, p. 325). This is, addressing societal concerns.

Considering the social implications that the bioeconomy can have, we can note that the incorporation of the bioeconomy into policy-making activities constitutes a form of governance. Doezema & Hurlbut (2017) have said that "visions of the bioeconomy are (also) visions of governance: of the responsibilities of the state to manage the conditions of possibility for achieving a better future, where 'better' is imagined in

terms of the fruits of innovation. This task of diagnosing barriers and mitigating market failures is grounded in the notion that, together, state, and science are in a position to *know* the future in a way that citizens and markets are not" (pp. 64-65). This is a summary of how the political dimension of the bioeconomy can shape the future, and how can it be used to construct a sociotechnical imaginary (to be developed in chapter 3). Incorporating the bioeconomy, then, could improve the decision-making in healthcare practices, in particular in biomedical R&I.

If we take into account the previous discussion, understanding Horizon 2020 as a case of scientific research policy shaped by the bioeconomy is not a random idea. In fact, the concept of bioeconomy has been formally and officially coined by the EC as a strategy to follow, so as to accomplish certain global goals, in particular within Horizon 2020 (Goven & Pavone, 2015).

The EC first materialized this discussion in 2012, in the Bioeconomy Newsletter (a bioeconomy policy document). They acknowledged the bioeconomy in the form of an economy using biological resources from the land and sea (including waste) as inputs to industry and energy production. It also included the use of bio-based processes to green industries (EC, 2012c). They updated this definition later, addressing the production of renewable biological resources, and their conversion into vital products and bio-energy (EC, 2018). But there is a broader, more general political idea underneath. During 2018, the EC's bioeconomy policy had an important update, in which it was defined that bioeconomy should respond "to new European policy priorities, in particular the renewed Industrial Policy Strategy" (ibid). They also incorporated a 3-point action plan. The first one of those points promises to "strengthen and scale up the bio-based sectors, unlock investments and markets" (ibid). It can be related to my thesis in the sense that products of biomedical research can, and should be more intensely marketed.

In general, the diversity of policy steps taken by the EC, is reflected in the broad range of official documents issued, in which bioeconomy and innovation are praised as imperative drivers for a better continental future (EC, 2012a; 2012b; 2018). These documents naturalize some ideas. One of them is the need to accelerate the commercialization (and clinical implementation) of scientific developments, so as to avoid a potential lag (Marelli & Testa, 2017). This phenomenon, also called *translational gap* (Aarden et al., 2015), or the *European paradox*, describes the possibility of failing to turn the technoscientific developments into "tangible wealth-generating innovations" (Marelli & Testa, 2017, p. 80). More than just an ethereal idea, the EC has concretely addressed this within Horizon 2020. They have declared the explicit aim of "taking great ideas from the lab to the market" (EC, 2013b). They have also considered this as key for leveraging and sustaining the competitiveness of the European biotech sector for smart, sustainable and inclusive growth and innovate the continent out of the crisis (EC, 2012a; 2012d; Marelli & Testa, 2017), constituting this a political definition for scientific R&I.

This *translational gap*, or risk of lagging behind, is rooted on an embedded promise of the bioeconomy. This promise is that the basic needs of global society "will be met and desires satisfied without cost or sacrifice: a world reengineered to make overconsumption into 'sustainable' consumption while maintaining or increasing consumption. […] The bioeconomy is assimilated into the economy" (Doezema & Hurlbut, 2017, p. 66). This definition means that there is room for accommodating new biomedical practices into neoliberal regimes, without challenging assumptions about sustainable futures (but rather accepting them).

The European scientific policy has actually represented this situation with some sense of urgency. The EC has officially declared that there is a need to act as soon as possible so as to grasp the full benefits of the opportunities, upon the risk of falling behind other economies (EU Council, 2000). This leads us to the alleged necessity of increasing the speed and spreading of innovation practices, also found on the bioeconomy agenda. This agenda calls for better alignment of R&I funding, according to the established policies (Marelli & Testa, 2017), which also contributes to shape the political dimension of RRI. This represents an opposed framing of R&I than the previously elaborated, in which the need of more deliberation was addressed, and the fear that it would hamper the efficiency of R&I (Felt, 2015b).

The previous leads the discussion, again, towards what is understood for the 'societal problems' which drive these needs. If we analyze the corresponding discourses and how Horizon 2020 portrays the problems, we can assert whether this is an effect of epistemic ways of risk assessment, or instead a political (normative) imagination of authority-making to govern research policy. And it has already been discussed that expert knowledge can become, in fact, "a locus of political authority" (Doezema & Hurlbut, 2017, p. 64).

In order to portray the wider and more global role bioeconomy has had within scientific policy making, we can recall other cases, such as how the OECD has incorporated it[5]. They have defined that bioeconomy implies a set of policy frameworks in order to achieve a form of policy making "that allow[s] the opportunities offered through biotechnology, genetics, genomics and the biosciences more generally to be delivered" (OECD, 2006, p. 5). Derived from this, a concise but useful definition of bioeconomy can be called in: a master narrative which conflates "technological advance with societal progress" (Delvenne & Hendrickx, 2013, p. 75). This means that it englobes research practices which acknowledge that those

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[5] Though is not the aim here to analyze or compare the whole set of available definitions of bioeconomy, quoting the official information from the OECD is used to point out that bioeconomy has not only been addressed by the EC. Instead, that the literature shows that it has been further incorporated and used by other international institutions, which have also acted as scientific research policy makers.

narratives constitute power relations, analyzing the bioeconomy as a site of struggle between different actors involved (ibid). Therefore, it shapes policy making process.

Pondering these definitions of bioeconomy, and its implications in policy making, we can expect that it shapes the interests that the different actors involved have in the results of the scientific research. Governments tend to consider "the national economic potential of new treatments in the longer term, patients and their carers often hope for at least some health improvement in the not-too-distant future [while] private providers hope to profit from the provision of treatments" which in some cases might be still clinically unproven (Petersen, 2015, p. 65). This depicts a scenario in which the future (and its accessibility) is differently understood by the patients and by the policy makers. In some cases, the expected (social) benefits of scientific research might differ from the actual ones. This can happen, in particular, as a result of the earlier mentioned corporatization of the life sciences. A case in which the benefits for the industry are mostly economic, in detriment of social.

But we can find cases where governments assess the need for the social focus of science, such as The White House's 2012 National Bioeconomy Blueprint. It describes five strategic objectives for a bioeconomy, with the potential to generate economic growth and address societal needs. This document says that "externalities and social attitudes influence market opportunities in the bioeconomy as they do in other economic arenas, a clear understanding of the benefits and risks of bioproducts is critical to the future bioeconomy" (White House, 2012, p. 29). Several more official governmental declarations like this can be quoted, but this one seems enough to show that a precedent is set. The government of the USA (the richest country in the world) illustrates at which level this topic has been addressed.

So far I have shown how the bioeconomy concept has shaped the healthcare and biomedical research from Horizon 2020 as a mechanism for solving 'societal problems'. The media and regulatory agencies have participated within the discussion of public health policy, naturalizing 'inevitable' market opportunities, which occurs through both the very performance of policy-making activities, and also discursive practices (Sunder Rajan, 2012a; Dumit, 2012). Therefore is expected to find interesting projections of the bioeconomy within the *Success Stories*. The next chapter elaborates the theories which will allow me to do so.

3 Theories and Concepts

3.1 Sociotechnical Imaginaries and Sociology of Hope

The *Success Stories* contain, among other information, a substantial assortment of promises of better societal futures, to be potentially achieved as a consequence of Horizon 2020's research policy. For understanding how this futures are depicted and (re)presented through these documents, some concepts within sociology of the future are needed to frame the case. They will explain how the policy makers mobilize their visions of both the possible and the necessary (Irwin & Soneryd, 2016). If the agenda the EC is translating and pushing has been built based on its own imaginaries (as should be reflected in the *Success Stories*), then it has been constructed over its own values. This situation has been already addressed by some scholars, which have described the risk of a potential lack of 'imagined community', in terms of democratic legitimacy for the European technocratic institutions (Anderson, 1991). This has been reflected in how common European discourses, publics and values have been articulated through political imaginaries, which foresee Europe as a unified political space (Jasanoff, 2005).

In general, future making depends on imaginaries and values (Adam & Groves, 2011; Irwin & Soneryd, 2016). This means that the futures created or ideated by those who control the technology (political institutions such as the EC), might not be the same as those that other actors imagine (such as the public). Adam & Groves sustain this idea, since intellectual currents that support legal and political institutions, also "support and ratify the exploitation of the future" (2011, p. 21). In turn, public tend to be kept away from the political framing of the futures (Groves, 2006). If this happens, it contravenes the idea that future making "cannot be seen purely as a technoscientific challenge, but is also a societal, and above all a democratic challenge, raising the questions of societal participation and responsibility" (Felt, 2015b, p. 114).

Is not always clear how *far* lies the future depicted by the promises of new technologies, and more in general, where the line between the *present* and the *past* is drawn (Nowotny, 2015). New knowledge and novel technologies help bringing the future into the present. This is the point where scientific storytelling, as a science communication activity, becomes critical to address this issue. STS scholars have described the responsibility that storytelling has in scientific policy communication, needing a "more heroic plot, in which science contributes to shaping societal futures, to realizing societal values and to solving societal problems. […] This ties the stories told into broader accounts about progress and innovation, about how more knowledge will necessarily lead to better lives" (Felt & Fochler, 2013, p. 81). This explanation allows us to envisage the *Success Stories* as mechanisms of scientific storytelling, containing promises which create futures, and also, as a rhetorical device with a persuasion and hope-construction goal.

Regarding the relationship between science and future making, some scholars have conceived 'science' in the past as a part of the imaginary of innovation-as-governance. Sometimes called the 'republic of science', producing only knowledge and progress, therefore generating an imaginary which has allocated authority and governance, full of legitimacy on its own (Doezema & Hurlbut, 2017). But envisioning science as such an institution requires to scrutinize its compliance with the social expectations its developments might generate. Otherwise, technoscience will hold the ability and the authority to declare, on its own, what the best possible/desirable forms of innovation are (perhaps not meeting society's needs). In concrete terms, this can be reflected in the possibility that the aims of scientific research can differ from those considered by society (earlier discussed as addressing the potential social benefits). The definition of those social benefits is not necessarily to be performed by the market (driven mostly by pure economic criteria), but by technoscience (if its social values are addressed). This is, "by those who are in a position to see ahead into a future where particular technological potentials are realized and specific urgent needs are thereby met" (ibid, p. 60). In other words, we might not be in front of an epistemic problem (in the sense of wrong or false information), but political (in the sense of how those imagined futures are constructed, and what are the aims). This problem can have two implications. First, the lack of a proper understanding of both present assumptions and knowledge practices, in order to address the social inquiry (Adam, 2010). Second, a good example of the extreme difficultness of achieving absolute certainty (Nowotny, 2015). In that regard, it can exist a gap between "the temporal perspectives of the modes of inquiry and those of the knowledge practices under investigation. [A] mismatch between social life and the study of that life" (Adam, 2010, p. 362). This again can be appreciated within the *Success Stories*, and how this has been considered by the EC as authorities in charge of framing the future of scientific research for Europe.

According to Jasanoff and Kim (2009), it has been paid little attention to the entanglement with science and technology by actors and institutions outside the scientific world. The consequence has been the formation of a gap between science and technology, on one side, and the politics of policy making, on the other side. *Sociotechnical imaginaries* emerges as a concept to fulfill this vacancy.

Sociotechnical imaginaries are defined as "collectively held, institutionally stabilized, and publicly performed visions of desirable futures, animated by shared understandings of forms of social life and social order attainable through, and supportive of, advances in science and technology. This definition privileges the word 'desirable' because efforts to build new sociotechnical futures are typically grounded in positive visions of social progress" (Jasanoff, 2015, p. 4). Why does this concept apply in this case? The *Success Stories* elaborate promises about better biomedical and healthcare futures for society, which, at some extent, correspond to a 'form of social life' (national and/or continental), while all the analyzed

documents are about technoscientific developments. The 'collectively' part is what would be at stake. This helps us to understand the future-making and the promises embedded in the *Success Stories,* as a way to communicate the EC's policy outcomes. They possess a given imagined future in mind: in particular, that one of the EU in which biomedical research policy is the path to success.

A brief example which shows how biomedical research shapes the behavior of the public, is, again, Petersen's (2015). He explains how cancer patients have increased their knowledge about the disease, thus changing their roles (from lay to active citizens). This implied that they started to make different decisions, such as taking more tests, which increased the profits of the industry.

In that sense, imaginaries about biomedical research policy are a case which describe "attainable futures and prescribe futures that states believe ought to be attained. […] These visions, and the policies built upon them, have the power to influence technological design, channel public expenditures, and justify the inclusion or exclusion of citizens with respect to the benefits of technological progress" (Jasanoff & Kim, 2009, p. 120). Sociotechnical imaginaries need to be constructed with public acceptance, and in that terms, the analysis of what the *Success Stories* promote, form a part of the future-making process (enacting hope and success). Horizon 2020, therefore, fits into this conception of sociotechnical imaginaries of a common Europe, since it encodes and articulates technoscientific projects, in order to attain a shared idea of a socio-political order (Felt, 2015b).

Sociotechnical imaginaries occupy "the theoretically undeveloped space between the idealistic collective imaginations identified by social and political theorists and the hybrid but politically neutered networks or assemblages with which STS scholars often describe reality" (Jasanoff, 2015, p. 19). This imaginations, then, are both products of and instruments of the coproduction of science, technology and society. Consequently, sociotechnical imaginaries are performative: they are an instrument of political action, applicable to policy making. This enables a master narrative to offer a rationale "for a society's long evolutionary course while also committing that society to keep performing the imagined lines of the story" (ibid, p. 20), implying a monolithic and strict vision of social future.

We can appreciate an example of those 'monolithic' futures for Europe in the way the EC justifies their FPs, posing the need of more investment in R&I as urgent (EC, 2013b). In the specific case of Horizon 2020, the concept of sociotechnical imaginaries helps to frame the nature of the discourse spread by the *Success Stories*. The potential lack of a collective, publicly valid sociotechnical imaginary, can mean that the necessities of society are imagined and translated (by the policy makers) based on the necessities of others (e.g., partner companies or research centers).

The idealization of a given imagined better future, implicitly presupposes that the present is imperfect or needs to be changed (Pfotenhauer & Jasanoff, 2017). But if this 'crisis' situation truly exists (as depicted within the Innovation Union initiative), then what would be the imagined opposite, ideal non-crisis situation, and how would it be reached? After scanning some of the EC's public documents (Innovation Union, Success Stories, the Bioeconomy Strategy, to name a few), the solution that seems most promoted is through more innovation as the key to secure Europe's global competitiveness to overcome the economic crisis (Geoghegan-Quinn, 2012). This could also be found within the *Success Stories* as a part of their future-making process.

This type of policy analysis allows a balancing exercise, weighting "visions of desirable futures driven by science and technology" on the one side, against "fears of either not realizing those futures" on the other (Jasanoff & Kim, 2009, p. 121). This in the context of thinking what is exactly that of national/continental interest, and why and how becomes an important issue. It is also needed to consider imaginations of "risk and benefit, public good, and nationhood" (ibid, p. 122) while analyzing the life trajectories of healthcare futures. We can argue that Horizon 2020 has tried to create this future on their own, not necessarily with the collaboration of the public, translating it into a continental-wide sociotechnical imaginary in a forcedly way. Different imaginaries depict different visions of the future. Some of those visions might become more 'durable' or longstanding, depending on the political instruments of meaning-making and goal-selecting. In turn, those are dominated by the actors holding control of nation states, being this a tool of nation-building policies (Jasanoff, 1995; 2005). In these terms, the future is constructed as an object of knowledge, of action and of ethical concern. This enables the discussion about what counts as responsible actions, and how the interests of the present can put at risk the interests of the future (Adam & Groves, 2011). In this regard, Horizon 2020 might be giving an overarching importance to the present values of innovation in science and technology. The analysis of the innovation discourse embedded in the *Success Stories* might allow to interpret the future-making procedure as part of the continental policy.

The wording (and discursive practices in general) used in the transmission of those issues, is also important to reinforce the promises and futures while defining these imaginaries (Jasanoff & Kim, 2009). They can enable "new forms of life by projecting positive goals and seeking to attain them, [producing] systems of meaning that enable collective interpretations of social reality" (ibid, p. 122). This forms the basis for a shared sense of belonging and attachment to an organized political or social community, making social order. The final goal of this process would be to construct sociotechnical imaginaries, "associated with active exercises of state power, such as the selection of development priorities, the allocation of funds, the investment in material infrastructures, and the acceptance or suppression of

political dissent" (ibid, p. 123). This is, they do not only remain on the sites of imagination, but also action: they are not only discursive, but also performative.

In her 2015's revision of this theoretical approach, Sheila Jasanoff connects discourses with imaginaries. She mentions that both are collective and systemic, though sometimes focusing too much on language, in detriment of performance or materialization (through technology). In the case of policy, she refers to it as "formal or tacit programs of action, not to the underlying rationale or justification that may be provided by sociotechnical imaginaries" (p. 20). This means that policy can convey the intentionality of sociotechnical imaginaries, but aiming to shorter-term futures with specific goals. Thus, being normally an outcome of institutional policy, instead of a cultural construction. She also recalls cancer research as an example of projects which animates sociotechnical imaginaries. The fact that the *Success Stories* share publicly the expected results of their projects (including 13 cancer projects within this thesis) opens up the floor to understanding how this concept is useful to analyze the case presented on my thesis.

This is stated as a way to operationalize sociotechnical imaginaries, asking how they can be identified on a given case. Sociotechnical imaginaries help to deal with the corresponding political problem in both structure and agency, studying policy styles, political cultures, among other aspects. This study is better done using "interpretive research and analysis that probe the nature of structure-agency relationships through inquiries into meaning making, […] attending to the means by which imaginaries frame and represent alternative futures, link past and future times, enable or restrict actions in space, and naturalize ways of thinking about possible worlds" (Jasanoff, 2015, p. 24). One of the mechanisms is the analysis of languages of power, in particular official state policy discourses. They frame an agenda designed by actors with the authority to shape the public imagination, and construct stories of progress in their programmatic statements, blending into them the expectations that scientific research policy create (ibid). In shorter words, narratives define the public good or manage risk, while sociotechnical imaginaries "configure shared understandings of space and time" (ibid, p. 26). This permits the study of references of past achievements, in promises of future developments, based in policy discourse.

Pfotenhauer & Jasanoff sustain that policy making guides "activities, provide structure and legitimation, attract interest and foster investments, and therefore may become wishful enactments of a desired future that may lead to certain material and social path dependencies […] becoming the basis for future envisioning" (2017, pp. 787-788). Horizon 2020 is a case in which this sense of belonging is being promoted by the EC through the *Success Stories*. This implies that we can conceive imaginaries of innovation "as epistemic and political resources for defining a community that shares a common (and hopefully better) sociotechnical future. Imaginaries provide a thread of continuity and stability […] into the future, thus mitigating the unknown through what is known and taming the disruptive quality of

innovation through what is imaginable and permissible" (ibid, p. 788).This also enforces the understanding of the nature of the *Success Stories* as a political instrument for science and technology policy making.

As I said before, the aim of this thesis is not to judge the EC's policy as good or bad. This complies with the idea that collective imaginaries should not be deemed as either right or wrong (Nowotny, 2014). Instead, they gain power when they manage to shape individual and collective minds in the public sphere, translating their agency into institutions and policy making processes. As citizens are given choices, the technologies offered to them will be better received if better promoted. And the promises that come with innovation, and the anticipation of an even brighter future, is a manner of bridge the gap between science and society (ibid).

Those promises of better futures imply the creation of hope within those who will (or should) be benefited by public policies. Then, hope also deserves some analysis within the context of future making. Hope is a major motivator of action, in particular within context of physical constraint representing the options of brighter futures (Petersen, 2015), therefore is expected the use of hope to pursue a certain political action. This means that hopes are performative and also situated (Brown & Michael, 2003; Petersen, 2015), and are crucial for policy making (Eggerman & Panter-Brick, 2010). When we analyze in which ways this performativity of hope can be reflected in the case of this thesis, we can consider the therapeutic value of hope, meaning that we have to make a distinction. There are different types of hopes, mostly due to the fact that the people can get unrealistic expectations out of biomedical research, shaping their decision making (Petersen, 2015). As I mentioned in the State of the Art, in particular we find the 'false hopes', which refer to an unrealistic set of expectations (Rettig et al., 2007). In turn, they can shape the patients' decision-making (here is where we can see the performativity).

Regarding how hope is constructed, scholars affirm that it tends to be articulated "in situations of despair, where there are perceived limited options. In such situations, there is often an absence of experiential knowledge that may be drawn upon to construct an optimistic future. Such situations tend to be defined by uncertainty or doubt rather than certainty or confidence. It arises in contexts involving a sense of futility or foreboding –articulated as 'hopelessness'- as in poor prognosis, a terminal illness" (Petersen, 2015, p. 15). But this does not guarantee that the policy needs will be met. In some cases the hopes created can fall into the trap of the 'hope-generating machine', which would, allegedly, produce the right knowledge eventually (Nuijten, 2004). This can also lead to the commodification of life (Petersen & Krisjansen, 2015). Hope motivates and guides present action, and also the future, though not necessarily in a linear way (Brown 2003, 2005). When studying where the driving force of this hope is, we find that the industry plays a role, in particular, generating interest in the population. This could be a case of

'hyping' science through the media, in an attempt to gain public acceptance and trust. The glorification of some of the technological advancements within the *Success Stories* can also fit in the case of the new 'hopeful citizenship', which places an important truth in newly developed technologies (Petersen, 2015). This might be identified within the *Stories* in the form of certain patterns, such as the appraisal of new business opportunities, and the incorporation of patients within the developmental stages.

Though we can expect that the public will remain hopeful upon new technologies in biomedical sciences, this must be reinforced through the promotion of promises. Hope in science policy realms has been conceived as some sort of a religious idea of a better society in the distant future:

> "as in science-based, materialist conceptions involving belief in the prospects for social change, achieved through rational and technological means, or to a healthier or longer life in the future, for those suffering illness or disability or facing death. Different conceptions of hope have different consequences, for those who are the recipients of hopeful endeavors and for those who create, promise, and promote 'hope', and indeed for society more generally. 'Hope', in short, has undeniable *socio-political* significance and, therefore, *should* be of concern to sociologists and other social scientists" (Petersen, 2015, p. 141).

In this regard, the consumption of technology has been considered "as providing the path to salvation" (ibid, p. 142). The characterization of the 'hopeful' has been done, in the particular case of health sciences and biomedicine, through the "embracement of the language of hope and their generally optimistic stance towards the future, namely in regard to the prospect of healing […] and improving care" (ibid, p. 143). Petersen shows the consensus on the idea that patients' suffering will be treated and minimized through the use of more and better technology, and that the patients should also believe and share this hope.

The hopes embedded in the dominant discourses of the policy makers, are not isolated from the politico-economic and socio-cultural (as explained before, they are situated). This shapes how implicit efforts to engender favorable possibilities are spread to citizens (for instance, through the *Success Stories*). In the light of the free-market based healthcare, the promotion of hope involves "emotional manipulation [and] the promised path to salvation being through the consumption of technologies that are in many cases expensive and unnecessary" (Petersen, 2015, p. 145). This takes us back to the risk of falling into the *paradox of hope,* this means, being potentially 'realistic' and 'false' at the same time. This depends on how patients increase their hope, based on how they perceive the information, and how it is provided by the scientists or policy makers.

In the specific case of biomedical futures, the bond between hopes, policy making and future making has been made quite clear. Hopkins et al. sustain that biotechnology will have 'revolutionary' impacts across

a range of domains (2007). Scholars of the sociology of expectations discuss the performativity of such promises and the expectations they generate. They act to build consensus around a technological project; mobilize investment; enroll scientific, social, and economic actors; and construct a case for facilitative and supportive legislation (Brown, 2003; Goven & Pavone, 2015). These promissory claims, in general, are thus not merely predictive statements about the future. They generate change in the present, regardless of whether or not they are ever fulfilled.

The performativity of the expectations is based on their ability to generate a new social order. This order is based on collective projections of the future, also related to failed past projects, and how past unmatched expectations shape those new which will come in the future. Expectations help to create a storyline of the future, structuring the action before it happens, and then articulating the new patterns, institutions or policies, making structure and agency work altogether for developing the promises (Van Lente & Rip, 1998).

The bioeconomy shapes scientific policy making, with its embedded values and assumptions. Moreover, it also mobilizes an imaginary of "innovation-as-governance that figures science and state as cooperative prime movers in the making of desirable futures, and the market as *consequence,* not cause, of progress" (Doezema & Hurlbut, 2017, p. 53). And according to Jasanoff, policy documents "can be mined for insights into the framing of desirable futures […] as well as for specific verbal tropes and analogies that help identify the elements of the imaginary" (2015, p. 27).

Sociotechnical imaginaries do not remain under the exclusive property of state actors (policy makers). They are translated and spread to society, communicating technological progress (Jasanoff, 2015), which can be made using different resources. One of them is the media, thus conceptualizing the *Success Stories* as mobilizators of the imaginaries produced by the EC. For performing this analysis in search for social meaning, the "languages, metaphors and symbols of official political talk can be mined for framings of risk and benefit, attitudes toward regulation and the market, and visions of technologically mediated progress or failure and backsliding" (ibid, p. 28). We can summarize this on the expected idea of identifying sociotechnical imaginaries, as knotting different strands of the discourse of brighter futures within the *Success Stories*.

3.2   Values and Valuations

Horizon 2020 has been a scientific research policy created by the EC, based on institutionally-conceived interests and European values. These values have to be enacted, and we can expect to find them represented within their public documents.

Values and valuations become important for this case, since they explain why people, institutions or different social groups valorize or care about things in different ways (Dewey, 1939). The aim of this thesis is to understand over what pillars the EC builds the rhetoric of success for Horizon 2020's biomedical research policy. For that, it is required to identify what they have determined as valuable.

Going one step back, first we need to recall a core definition: values are conceived, in a sociological sense, as "shared standards or assumptions about what is important" (Gardner et al., 2017, p. 28). Values are neither 'naturally' existing nor are stable or predefined. STS scholars have agreed that they are actively done and constructed, based on concrete practices, and they are worth to be explained and understood, rather than assumed as objects with self-explanatory power (Asdal, 2015; Dussauge et al., 2015). In simple words, we need to ask how values *are made* rather than what values *are*. Especially considering that they tend to be created out of personal choices, hierarchizations and practices, based on what is considered as good, desirable or proper (Lynch, 1993; Graeber, 2001; Muniesa, 2012).

Earlier I said that values are situated, therefore depend on the actors (institutions) who produce them. This means that, in particular, values might differ between the public and policy makers, depending basically on what each one of them consider as important. Based on that, we can expect that the public tend to be more precautionary than policy makers to consider what is important or valuable. This, since the former weight their decisions and appreciations according to personal values and valuations, political ideology, personal interests and preferences (Sturgis & Allum, 2004), regardless the low risk a given technology can have. This can imply that the values underpinning scientific research policy making, can favor a downstream focus on the outcomes of the policy (which is what is more tangible to the public). But this would happen only once these results have already been deployed (or when they are about to, such as the case of the *Success Stories*, since those technologies have not been made available yet).

Within the previous chapter I also commented that scientific knowledge cannot solve societal problems on its own, needing a proper entanglement with society. Thus, the value-making discussions need to be incorporated within the scientific research decision making process. If not, RRI is at risk of being a case in which policy makers base their decisions valuing science as a competition between national economies, instead of a collective and public good (Nowotny, 2014). The analysis of the *Success Stories* will allow me to describe how success is enacted, on which values it is based, and how those values can be identified within the discourse.

As commented within the introduction, RRI is intensely mentioned within several EC's policy documents, shaping discourses of success. This allows us to acknowledge the bond between RRI and the EC's value-making process. This is reinforced in the reflection about "what sort of future(s) we want science and

technology to bring into the world, what futures we care about, what challenges we want these to meet, what values these are anchored in, and whether the negotiations of such technologically-enabled futures are democratic" (Owen, Stilgoe, Macnaghten et al, 2013, pp. 34-35). Besides, the primary purpose of RRI is to inclusively and democratically define and realize new areas of public value for innovation (Wilsdon, Stilgoe and Wynne, 2005).

As I elaborated in the State of the Art, the production of scientific knowledge not only is political and value-laden, but also needs to differentiate values from facts. Especially considering that values are the impetus shaping knowledge, and in turn, new knowledge and technologies might inspire efforts to articulate and enact certain values, and to displace others (Dussauge, Helgesson & Lee, 2015). When studying *what* is at stake in the value-making process, it has to be considered that society is the object of these policies. Therefore, if values will be enacted, they also have to be communicated and proposed to society, preferably in a more engaging tone. This makes the analysis of the discourses which surround policy making a contributive activity for understanding how the incorporated values are constructed.

In general, the R&I strategies seek to produce value for both consumers and policy makers. When innovation gains a central role within scientific research policy, valuation processes involve appraisal, the construction of kinship value, and ways of linking new objects to valued versions of the past. In this regard, narration processes also participate: they are important valuation strategies (Asdal, 2015). These values, and the corresponding valuation activities, should be reflected within the narrative of the documents which constitute these narration processes, and could be identified when breaking down their discourse.

In general terms, values play a nuclear part of human conduct and behavior. They depend on human action, and are "closely associated with the problem of the structure of the sciences of human activities and human relations" (Dewey, 1939, p. 3). Besides the rational, values also have an emotional component, since they define the *desirable*. This is crucial for the value-making practices, which in turn is vital for generating matters of care and concern (Dussauge et al, 2015). The settling of matters of concern in policy making, between different stakeholders, is critical for them to be participants on the consensual definition of a sociotechnical imaginary. For healthcare research policy, we can identify different values which shape the activity, such as risk, health, economic and life quality. The production of these values around efforts to make markets produce stakes, which define what is worthy and what is not (Dussauge et al, 2015). The economic perspectives that we can find within the discourses of success are an example of that. Then, is important to analyze the translation of these values into the narrative of the *Success Stories*, and how they become worthy and are interesting to the public they aim to. The making of different sets of values, is the outcome of a process in which the life sciences are at constant tension between different performances of values. But this needs a medium to happen, which turn out to be, in the case of the EC,

the different policy documents (e.g., the *Innovating for Sustainable Growth* bioeconomy blueprint, or the *Success Stories*), which act as valuation devices guiding innovation (Asdal, 2015).

The concept of values leads to valuations. Things increase their *valuable* condition once human activities have defined them as 'worthy'. This derives in the difference Dewey poses between prizing (holding particular personal value) and appraising (assigning value to something). This definition is useful to understand why in this case of healthcare research policy, the values of the society (e.g., a healthy life) might be different than those of the policy makers (e.g., producing a marketable device). Then we could think that what governs the different agendas that the different stakeholders will have, is basically a "difference between processes of assessment (in which things undergo judgements of value) and processes of production (in which things are produced so as to be of value)" (Vatin, 2013, p. 31). In turn, this is mainly shaped by valuations made by evaluation and valorization (ibid). How is this done? Since different agendas promote different interests, biomedical and healthcare related valuations shape the enactment of promises of better futures, further translated into the *Success Stories*, offering the public a better future sponsored by Horizon 2020.

Now, we can think this does not necessarily operate the same way in each and every scientific area. Healthcare and biomedical sciences tend to offer promises of improving the life quality, therefore, value and valuations of life, health and wellbeing become matters of concern. This enables a promissory rhetoric of science and technology, which performs certain worths, and participates of the process of creating these (or other) matters of concern. Valuation practices can determine, according to the knowledge and expertise of the different actors, who is able to produce stakes. In turn, this determines what is important and what is not. In the case of healthcare, the well-regulated mingling between the economic and the social values, ensures that the products of knowledge production can become more available to more citizens (Dussauge et al., 2015). This process is basically generated through four steps: (1) understanding how are knowledge and life transformed, when they become described and treated as subjects to economic goals and constrains; (2) how and with what means are economic values made in practice; (3) how are boundaries and links made between notions of economic, epistemic and cultural values; and (4) how are different values (economic, cultural, social) performed as distinct, intertwined, homogeneous, or heterogeneous (Brown, 2013).

So far within this section I have developed several ideas about future and value making. But how are those two processes connected? If the purpose of future studies is to reach better social futures, then the definition of what counts as 'better' for future-shaping, is value-laden (Andersson, 2015). Collective imaginaries influence future developments, but the future, more than an extrapolation of current trends, is an active human construct, based on "normative desires and values" (ibid, p. 19). The performativity of

political imagination transforms these desires into effective and powerful imaginaries, which in turn are fed by either metaphorical, cognitive or emotional components (Ezrahi, 2012; Nowotny, 2014). Also values are shaped by the cognitive and the emotional, while the metaphors can politically justify the development of certain technologies through public funding (Sismondo, 2010). The shaping of values which determine this future making is not "an outcome of the sociotechnical processes of modernization, but an undetermined, conscientious and fundamentally social process" (Andersson, 2015, p. 21). Assuming that technological developments have been planned (or funded) based on a given desired future, then Andersson's stances tie technological developments and social values. If future-making has values embedded, then, the technoscientific developments which were a product of that envisioned future, also share and hold those values (directly or indirectly). In simpler words, values shape the solution (improved healthcare possibilities) to the problem (lack of treatments, life-threatening diseases). As I wrote earlier, the EC acts as providers of these solutions. This means they enact values, link them to their own imagined futures, and spread them through their public documents.

Imagined futures are envisioned and enacted based on the hopes and fears of different actors. They must fill a canvas "with imaginings, with wishes and goals and novel alternative configurations that somehow possess reality and present shared, or at least shareable, values" (Andersson, 2015, p. 29). This explains the performativity of the discourses of success within Horizon 2020, promoting futures through 'shareable' values. They are represented within the *Success Stories* in the forms of projections of a better life quality, in terms of promises of new biomedical technologies. Some of them are life-saving, others innovative, others more economic, and so on. Futures are not rigid, but malleable (they can be modified according to the context), and can be shaped "through the mobilization of social science, values, and positive images of tomorrow" (ibid, p. 30). Socially agreed values are useful for decision making processes, enforcing the democratic deliberation, and are helpful on building of communities and promising stability.

Finally, we can close this chapter with the politics of value making. As a strategy, the bioeconomy negotiates the problem of treating the biotechnological developments in both a marketable (economically valorized) and social way, thus being politically shaped. Therefore, we can bond the concept of values with the politics of the bioeconomy. Values operate in several dimensions: the local/global, the historical context, the geographical location, and so on. In the specific case of the bioeconomy, value is constituted primarily by the social practices of the political-economic actors, who configure the financial value and valuation of firms, which is the biomedical work that produces economic value (Pavone & Goven, 2017). The case reviewed within my thesis, shows that, observing the business opportunities the *Success Stories* explain, we can identify the generation of 'health and wealth' through the delegation of the innovation practices from the state to third-party, private initiatives. These ventures will enact and articulate new

and different values, closely related to commercialization and global competitiveness, as well as increased safety (in healthcare terms), innovation (as a value on its own), and patient-centeredness (Mittra, 2016). This is a way of pursuing support and legitimacy for Horizon 2020 as a political project. We can identify this within the *Success Stories* as EC discourses (about the importance of the partnership with the private sector on bolstering innovation practices). Their promises of better futures rely, for instance, on the innovative nature of several of their projects, or on the potential revenue that new technologies can have. In the end, as forms of valorizing the better healthcare access the population should get.

4 Materials and Methods

4.1 The *Success Stories* as a policy discourse site

As I discussed in the previous sections, science and technology, as well as RI, are not politically neutral. In the case of Horizon 2020, we should not consider the public documents which transmit its benefits as mere brochures or informative leaflets, but rather as documents with an embedded political dimension, and as such, with agency. A central aspect of my thesis is how the promises they offer are communicated, and the hope they produce in society. But what happens when the communication of these promises is not a one-time, spot activity, but instead an institutional, systematical practice? The long-term effects of relations of promise-offering, and the political context of science and technology, include the ability to occlude efforts to tackle down sociopolitical causes of the problems they intend to address. This happens through the strengthening of dominant sociotechnical imaginaries, shaping sociopolitical mobilizations and debates (Goven & Pavone, 2015). The relationship between RRI and policy making support that the *Success Stories* enact hope while communicating science, therefore they perform a political act itself.

Narratives are not only objects of knowledge, cognitive instruments or strategic resources. They are also located at the heart of power and its distribution. They are not only about semantic units unrelated to the context of what they intend to communicate, but also need to be mediated through discursiveness (conceived as a particular ordering of words). This discursiveness is also needed in order to perform the transmission of knowledge itself (Claisse & Delvenne, 2017).

Policy stories do not emerge in a cultural void. As narrative pieces in general, they are inserted in the past, and aim towards a certain future. In the specific case of the open-ended stories, such as the *Success Stories*, individuals have to articulate necessity and possibility, synthesizing and forecasting, as the sequence of action unfolds. These cognitive activities also show up when a story is read. Even in case the end is unknown, strategies can be developed to interpret and clarify the possible worlds the narrative provides (Claisse & Delvenne, 2017). This implies that any story can contain a set of endogenous futures (Rip & Te Kulve, 2008), in the sense that the present situation determines the future. But not all possible futures are equally portrayed. Some of them can be shown as more probable to happen than others (which depends on the description of the current scenario, and how the future is envisioned). Choices, contingencies, and irreversibilities are path-dependent but opened, as part of the potential directions of the story. This can mean that readers can be persuaded to imagine pessimistic scenarios (instead of more realistic/optimistic ones), which should be deemed as avoidable by them. This allows to conceive the *Success Stories* as potentially shaping the opinion of the people through their discourse.

4.2   Defining the documents to be used. A workflow selection

As of February 2018, when I did the material selection process, there were 338 *Success Stories* published under the *Health & Life Sciences* subsection[6]. There we can find projects sponsored not only by Horizon 2020, but also from previous FPs. The list of sub-themes within this subsection is the following (EC, 2017a), and clarifies what these documents are focused on:

Allergy & asthma	Health & ageing	Molecular biology
Biotechnology	Health & poverty	Neuroscience
Communicable diseases	Health & special needs	Public health
Drugs & drug processes	Health systems & management	Rare & orphan diseases
Genetic engineering	Major diseases	Other
Genomics	Medical research	

Table 1: themes within the Health & Life Sciences subsection

As we can see, the list of areas of interest is quite broad. It was unpractical to search separately through each sub-theme, and the idea was to avoid scrolling through each and every published document to check their usefulness for my thesis. So for narrowing down the material, I established a **3-point selection criteria**, aiming to determine the universe of stories suitable for my analysis.

4.2.1   First criteria: timeframe

The first criteria I employed for the selection process, was the **issue date of the documents**. For this, there were three filters considered. The first one, *Stories* corresponding only to Horizon 2020-funded projects. The second one, that the documents were issued from 2016 onwards. This allowed me to select the documents which reflected the more up-to-date directions and goals that the EC has defined for elaborating the *Success Stories*, as well as filtering material from previous FPs (not under the scope of my thesis). The third and last one, that it was compulsory that the projects were **still at work** at the moment the corresponding *Success Story* was published. This, in order to discard the documents issued for already-finished projects (with an already concrete outcome).

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[6] The full list of the *Success Stories* on health science topics can be found here:
http://ec.europa.eu/research/infocentre/success_stories_en.cfm?item=Health%20%26%20life%20sciences

4.2.2   Second criteria: promises of a better future

The second criteria was about identifying the *Stories* which **emphasized promises**. I searched for the following keywords (and related) **in the title** of each document: 'Help', 'possible', 'possibility', 'save', 'hope', 'promise' and 'improvement'. If those words were not explicitly in the headline, I also checked whether the title itself was explicitly promissory (e.g., "developing tools for better diagnosis", "saving lives with a new device", "a new model for predicting deadly diseases", etc.).

For better explaining the idea behind this criteria, these were some discarded *Success Stories* which did not offer explicit promises: "One small step for a protein…", "Supporting family practice in Africa" and "How the brain manipulates time to give us our sense of now".

4.2.3   Third criteria: importance of the diseases or treatments

The third and last criteria consisted of selecting only documents about **wide public-interest diseases or treatments**. I defined that a given *Story* became interesting for my research, when it promoted an idea that 'society is threatened, but this can save us' type, which as well enhances the promise of better futures.

For this purposes, I drew upon the main causes of death from the Eurostat, which indicates that for the EU-28, circulatory system diseases and cancer (in diverse forms) are the leading two. The following table summarizes this information as of 2014 (sorted by death rate), which includes diverse types of cancer[7]:

1. Ischaemic heart diseases	7. Pneumonia	13. Malignant neoplasm of stomach
2. Cerebrovascular diseases	8. Diabetes mellitus	14. Intentional self-harm
3. Malignant neoplasm of trachea, bronchus and lung	9. Malignant neoplasm of pancreas	15. Alcohol abuse
4. Chronic lower respiratory diseases	10. Malignant neoplasm of breast	16. AIDS (HIV)
5. Malignant neoplasm of colon	11. Chronic liver disease	17. Drug dependence
6. Accidents	12. Diseases of kidney and ureter	

Table 2: most important causes of death within the EU28 as of 2014 (EC, 2017b).

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[7] In order to contextualize the information, according to the same source, the death rate for the most important one (ischaemic heart diseases) is 132,3 per 100.000 inhabitants, while for the last on the list (drug dependence) is 0,3 per 100.000 inhabitants. Both causes are the top and the bottom of the list for both male and female.

This criteria discarded documents about social or professional-formation related activities, such as the following: "Training surgeons of the African future", "Achieving sharper optical tools with plasma and metamaterials" and "Making society more active through government policy".

This 3-point workflow provided a **final universe of 23 *Success Stories*[8]**, which will be the documents that I analyzed for this thesis.

4.3   General layout of the *Success Stories*

The 23 documents tend to possess a similar overall structure:

- They all have a single-lined title, presenting the documents in a direct and simple way.
- Right below the title, they have a 3-6 line subtitle, where they briefly depict what the *Story* is about.
- Next, an image or a video embedded[9].
- The body of the document, which is 1-2 pages long (and which constitutes the nuclear part of the analysis). Within some of the documents, the body is split in different subsections (properly named).
- In the end, there is an additional information box showing the project details: official name, total cost, EU funds contributed, participating countries, duration, and contact information[10].

The authors of the *Stories* have not been individualized, so it was not possible for me to know how many different people wrote the documents. Therefore, I will assume that all of them follow the same writing instructions, aims, etc.

4.4   Coding the information: the categories

I performed the document analysis in order to search for patterns within the different *Success Stories*, which could help explain how the different ideas were transmitted. I Followed the Discourse Analysis strategy (Wodak & Meyer, 2009), which allowed me to establish:

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[8] For the forthcoming parts of the thesis, when quoting any of the *Success Stories*, they will be recalled with the 'SSxx' form, where xx is the number of the *Story*, ranging from 01 to 23. For instance, if written "the SS06 says…", it means that the *Success Story* #06 (*Breaking down barriers to develop new anticancer drugs*) is being quoted. The full list of the *Stories* can be found in the Appendix.

[9] Neither the images nor the videos were analyzed, in spite of focusing completely on the texts.

[10] Since information in these boxes is just standard technical details, and not part of the narrative of the documents itself, it was kept off the analysis.

1. The contents/topics of a given discourse: success of a scientific research policy.

2. The discursive and argumentation strategies: posing of problems, needs and promises.

3. The linguistic means: wording, tenses.

4. The contextual linguistic realization and stereotypes: continental efforts, complex current situation, innovation as the solution for society's problems.

I used Jäger & Maier's (2009) structure of discourse. They define the discourse strands as "flows of discourse that centre on a common topic" (p. 46), located at the level of utterances or performances at the surface of texts. Then, they determined a 'toolbox' for performing a detailed analysis of discourse fragments, which should follow these aspects[11]:

1. Context
   a. Why was the article selected? Why is it typical?
2. Surface of the text
   a. How is the article structured into units of meaning?
   b. What topics are touched upon in the article, or what discourse strands is the article a fragment of?
   c. How do these topics relate to each other and overlap (entanglement of discourse strands)
3. Rhetorical means – observing the available means of persuasion
   a. What kind and form of argumentation does the article follow? What argumentation strategy is used?
   b. What logic underlies the composition of the article?
   c. What implications and allusions does the article contain? (problems – hopes)
   d. What collective symbolism is used (statistics, figures)
   e. What sayings and clichés are used?
   f. What are the vocabulary and style?
   g. What actors are mentioned, and how are they portrayed?
   h. What references are made (e.g. references to science, information about the sources of knowledge used)
4. Content and ideological statements
   a. What concept of humankind, society and technology does the article presuppose and convey?
   b. What perspective regarding the future does the article give?
5. Other peculiarities of the article
   a. What do these peculiarities mean? What do they imply? What effect does it create? E.g., a particular statistic, or statement
6. Discourse position and overall message of the article

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[11] This list is an excerpt of the actual 'toolbox'. Those steps which did not apply to my case (e.g., differentiating articles by authorship and media source) were discarded in order to simplify the information here posted. The complete 'toolbox' can be found on the page 55 of the cited text.

After analyzing the *Success Stories* using the previous toolbox, I identified the discourse strands (from now on, to be indistinctively called *Categories*) which allowed me to code the different information extracted. The corresponding number of documents in which they were found were the following:

Category	Number of documents
Use of conditionals	18
Scientists speaking	13
Number of countries (internationality of the projects)	12
Industrial opportunity/Commercial development	11
Sense of economization	10
Colloquial wording	9
Life-saving promises	8
Sense of innovation	8
Number of people (patients) involved	7
Complex wording	4
Money involved	3
Personal stories (patients speaking)	3

Table 3: categories coded for the Success Stories

To clarify the codes generated we can see some examples. For instance, this sentence complied with the 'use of conditionals' category:

"Cancer test would pinpoint high-risk women".

This sentence was coded as 'industrial opportunity':

"The ALIVER project is conducting clinical trials of Dialive, a dialysis device designed to help tackle acute-on-chronic liver failure. […] *The partners involved in this endeavor plan to obtain approval for commercialization of the device in the EU before the project ends in September 2020".*

This one was coded as 'sense of innovation':

"Though leukaemia treatments have advanced rapidly in recent years, the development of new therapeutic strategies and innovative drug delivery devices is considered essential to increasing long-term survival rates and reducing the debilitating side effects of chemotherapy".

The following quote was coded as 'colloquial wording':

"Proteoglycans (PGs) and glycosaminoglycans (GAGs) are structurally diverse carbohydrates within the extracellular matrix and cell surface".

The categories I defined might work independently or not. In some cases, they can get entangled with each other, since the texts analyzed refer to various topics, and therefore to various discourse strands (for instance, a paragraph can talk about how innovative a technology is, and at the same time use that to praise its potential marketability; or scientists using complex wording while speaking). Therefore, instead of inquiring category by category, I did the analysis of the content of the documents observing three different layers. Each layer resembles what Jäger & Maier have defined as *discursive knots*: "a statement where several discourses are entangled" (2009, p. 47). This is, the 'site' where the different discourse strands (or categories) meet and mingle. The aforementioned categories were grouped within those knots or layers, according to how they portray the different ideas from the *Success Stories* (to be developed within the next chapter).

4.5   Sorting the *Success Stories* by development type and disease type

The next step in the analysis was the classification of the *Success Stories* by disease and development type. The goal of doing this was to gain the possibility to group the different documents, in order to find patterns, which would provide more information to the analysis. The following table shows how many documents corresponded to each disease or health condition:

Disease/health condition type	Number of documents
Cancer	13
Diabetes	2
Heart Conditions	2
Ageing	1
Bacterial infections	1
Car accidents	1
Down Syndrome (general health conditions)	1
HIV	1
Liver Conditions	1

Table 4: disease/health condition types

And this table shows the classifications by development type:

Development type	Number of documents
Research/Modeling/Test	11
Drugs	5
Medical equipment	4
Technological device	3

Table 5: development types

The **Research/Modeling/Test (RMT)** type involves all those projects mostly about in-lab work, not quite familiar to the people. Specifically, how a certain disease evolves in the human body; the development of new testing methods; the improvement of the predictability of a given disease, and so on. The projects considered within this type are the new treatment for melanoma (SS04), the TRANSCAN-2 translational cancer research boosting (SS05), the test for detecting women's cancer risk (SS07), the blood test for diagnosing hypertension (SS08), the breast cancer research for subtype prediction (SS09), research on Down syndrome (SS10), the cancer detection on DNA molecules (SS17), the new blood test for earlier pancreatic cancer detection (SS18), the research for better bowel cancer treatment (SS19), the new tools for modelling and predicting cancer progress (SS21) and the better understanding of cancer progression through new biomarkers (SS22).

The **Drugs** type is about the development of new drugs, antibiotics, vaccines, and medications in general. Unlike the RMT type, the *drugs*-type documents promote results which can be more tangible and visible for the patients. The projects comprised here are the new anti-bacterial film for prostheses (SS03), new anticancer drugs (SS06), HIV vaccine (SS11), the polypill for heart conditions (SS13) and the stem cell diabetes treatment (SS14).

The **Medical equipment (ME)** type considers those projects which aim at developing new devices, but meant to be used, strictly, by personnel working on medical centers. The developments included here are the new probe for cancer surgery (SS01), the new portable cancer prognosis device (SS02), the new liver dialysis device (SS16), and the microfluidic chip for leukaemia treatment (SS20).

Finally, the **Technological device (TD)** type comprises the development of apparatuses which have two important differences with those of the **Medical equipment** type. First, they aim to the public as final users (instead of strictly medical staff). And second, they can be used anywhere (instead of strictly within medical centers, which is the case of, for instance, a screening probe or a dialysis machine). Also, these devices are not meant for curing a given disease, but rather for helping people to better deal with certain issues or conditions. Within this type, we can find the following developments: robots for helping the elderly (SS12), robots for helping kids with diabetes (SS15), and the airbag bike helmet (SS23).

The following table shows the distribution of the categories among the different development types:

Category	Drugs	Medical equipment	Tech device	Research/ Modeling/Test	Total
Conditionals	3	4	1	10	**18**
Scientists speaking	2	2	3	6	**13**
Number of countries (internationality of the projects)	4	1	2	5	**12**

Industrial opp/Commercial dev	2	2	2	5	**11**
Sense of Economization	2	4	2	2	**10**
Colloquial wording	2	2	3	2	**9**
Life-saving	2	2	0	4	**8**
Sense of innovation	2	2	0	4	**8**
Number of people involved	2	1	0	4	**7**
Complex wording	1	1	0	2	**4**
Money involved	1	0	0	2	**3**
Personal stories	1	0	2	0	**3**

Table 6: distribution of categories by development type

4.6   Analysis method: Critical Discourse Analysis

The method used is **Critical Discourse Analysis**, since the idea is to deconstruct the messages embedded within the documents, so as to understand what is being told through written statements. This is, how they have built dominant discourses which govern the power relations that deem a given story as 'successful'. This method also helps to identify what is trying to be legitimized, what is enforced as the 'sayable' and what is being inhibited (Jäger & Maier, 2009). In other words, having a closer look at the discursive nature of the presentation of the official support to this program, in order to maintain or gain power from those who will be at the head of the initiatives promoted by Horizon 2020. This method will also contribute to "de-mystifying ideologies and power through the systematic and *retroductable* investigation of [written] semiotic data" (Wodak & Meyer, 2009, p.3). CDA can integrate linguistic categories into their analyses, allowing also an analysis on the social actors embedded within the construction of the discourses.

More in detail, the Discourse-Historical Approach (DHA) is as an adequate perspective to perform the analysis. It links the discourse and the fields of action, and is particularly useful when those discourses are politically related (Wodak & Meyer, 2009). This approach comprises a four-step strategy of analysis: (1) establishing contents/topics of a given discourse; (2) the discursive strategies; (3) the linguistic means, and; (4) the contextual linguistic realizations and stereotypes. It enables a closer look at the strategies of predication and perspectivization (ibid), having a more pragmatic, problem-oriented approach, with a given and well-identified social problem.

The *Success Stories* are suitable to be scrutinized with this methodology since they fit with the description of *discourse planes* as "social locations from which speaking takes place" (Jäger & Maier, 2009, p. 48). For these authors, the media is an example of *discourse planes*, where "discourse fragments from scientific specialist discourse or political discourse are taken up. The media also take up everyday discourse, bundle

it, bring it to the point, or […] spice it with sensational and populist claims" (ibid). In simpler words, discourse planes are the sites in which the topics within the discourse operate, and the *Success Stories*, as media, allow the EC discourse (or the knowledge produced by Horizon 2020) to be spread.

5 Data analysis: making sense of what is inside the *Stories*

For starting this section, I will recall what I intended to find within the *Success Stories.* This is, what pieces of text will provide information so as to answer the research questions. What I will keep in mind when finding interesting material then, is:

- **Values and valuations** transmitted from Horizon 2020 to the public
- Biomedical research presented as **interesting, contributive and beneficial**
- Staging of **innovation policy need** and enacting of **success**

5.1 First layer: layout, stylistic structure and argumentation

In this first layer I will talk about the linguistic and wording style of argumentation found within the *Stories*. In specific, I studied here how the problems and/or needs are presented, and how the promises to solve them are verbalized. In this layer the focus will not be on the technical topics underneath the research projects, but rather on discussing why things are said in one or another way. This is about the discursive reality, and the very words used to tell the stories.

5.1.1 The subtitle

Generally speaking, the subtitle should be the place where the process of justifying the research starts. Considering the syntactic importance it has, reading the sole subtitle could be enough for making a reader believe that a given project is necessary and will solve problems, therefore supported. In most of the cases the subtitle of the document states explicitly the aim of the project. The SS20 (personalized treatment for leukaemia) is an example of a straight-forward subtitle explicitly telling the aim:

"EU-funded researchers are developing a personalised dosing solution for chemotherapy targeting leukaemia using advanced microfluidic chips to meet the precise medical requirements of individual patients".

We can envision this as a scheme to pursue the reader to react positively upon what the documents propose, naturalizing a given language (finding a solution for a disease through technological development). It is also interesting the offering of the "personalized treatment", and that the requirements of "individual patients" will be met, therefore proposing the idea of "a person like you can be saved", portraying closeness between the researchers and the patients.

While a priori we can expect that the subtitle is the proper place to state the aim of the project, this is not always happening. In other cases, instead, they share a personal story, or post an actual problem about the implied disease/health condition. When that was the case, I had to find the aim of the corresponding project further in the body of the document. An example of the subtitle being used for other purposes is found in the SS05 (boosting translational cancer research), where we can find a 'mixture' of explicit/implicit depiction of the goal:

"Developing new anti-cancer treatments is expensive, and national, public funding organizations across Europe dedicate substantial resources to this task. Linking their research programmes helps to ensure these funds are used to best effect. The ERA-Net Transcan is now continuing as the ERA-Net Cofund Transcan-2 network, fostering long-term transnational research synergy".

Though the aim is partially there, I could properly understand it only after reading the full text. The subtitle was not enough to get the whole picture. We can assert that in the quoted paragraph the objective might be not clear if the reader is not (at least partially) familiar with biomedical research, in particular, with transnational research. The most concrete part within the quoted text seems to be the "funds are used to best effect". This transmits the idea of doing something positive about research policy, but avoiding to describe what those funds are actually used for.

At the other end of the spectrum, I found cases in which the goal of the project is written but only implicitly, or not even stated at all. The SS15 (using robots to help children with diabetes) is an example. This is interesting if we consider that this whole case revolves around the personal stories about kids with diabetes and their struggles, but this subtitle does not contain the aim of the project:

"Diabetes is a serious challenge for many children and teenagers. Their well-being depends on various decisions that they have to take throughout the day. Can electronic games be of any help?"

Alternatively, we can appreciate that they comment that diabetes means a "challenge" for children and teenagers (a milder word to describe what, in broader terms, is considered a massive biomedical issue). This quote mentions the importance of the decisions the kids make, and finally, asks whether electronic games could provide help. After reading the subtitle of this *Story*, is still unclear what the research project is exactly about. In fact, when I read further, I found that the whole text does not include neither the 'aim' nor 'goal' words, and I had to interpret the actual aim of the project from a paragraph in the middle of the document:

"Tatum and Arjan are taking part in a European research project using electronic games to help children with diabetes".

While the idea is not to be evaluative, we can note that the subtitle is used in different ways through the *Stories*, showing different kind of information. It does not always show, as one could expect, the actual aim of the projects, but is used to transmit other ideas instead.

5.1.2   The problems, needs and promises

The previous subsection allows us to notice that, in many cases, the whole idea of what the projects are about can be grasped just by reading the title, plus the subtitle of the *Story*, with no strict need to go further through the document. In those cases, the perception is that the rest of the text is doing a 'convincing work' through a more detailed process of justifying the existence of Horizon 2020. This is done through the use of facts, but also clichés.

The *Success Stories* raise awareness about biomedical concerns which have become (or are likely to be considered) a public health or societal issue. For instance, that a given disease affects or kills many people, that no effective treatment exists so far, or that much-too-complex and expensive equipment is required for diagnosis. For communicating this, they elaborate the **sense of a problem or a need**.

It is interesting to notice that the *Stories* are written in third person, so the problems are presented as being 'yours' and not 'ours'. This is not meant as a negative observation, especially if we note that the promises are also 'yours' and not 'ours'. Through the use of this wording, the EC seems to disentangle themselves from the society in this regard. This observation is also fueled by the use of an omniscient narrator. Here are a few examples which portray this, the first from the SS05 (boosting translational cancer research):

"*Developing new anti-cancer treatments is expensive, and national, public funding organizations across Europe dedicate substantial resources to this task*".

And one quote from the SS08 (diagnose of hypertension):

"*More than a third of the population in Europe is affected by high blood pressure, known as hypertension. It causes cardiovascular problems including stroke and heart disease, and is responsible for more than a million deaths every year*".

After inspecting the whole set of documents, we can appreciate that the sense of a problem, though always present, is differently depicted throughout the different *Stories*. This depends on several factors, such as the nature of the involved project, the type of development or the disease. This means that the enactment of success through the innovation policy need, does not necessarily follow one pattern, but

several. Therefore, the rhetorical means used for promoting success also vary (further elaborated within the next layer). For instance, the SS08 (diagnose of hypertension) includes six different problem-statements. One of them is the following:

"Many people suffering from curable secondary hypertension – high blood pressure that is the result of a condition – are incorrectly diagnosed, so they don't receive the treatment they need".

And the SS09 (breast cancer prevention) contributes with 4 problem-statements, such as this one:

"*Breast cancer is the most common type of cancer affecting women around the globe*".

While a priori one could tend to think that hypertension is not per se such a dramatic public health issue, it actually is. The table 2 shows that heart diseases and cardiovascular disease are the first and second most important causes of death in the EU-28, respectively (EC, 2017b). This extensive posing of problems may be a way to lead the reader to think that the hypertension problem is far worse than imagined, hence a strategy to promote a life-saving-style project, though not explicitly (constituting a valuation activity). The SS18 (new test for pancreatic cancer) also states a couple of problems in a straightforward way. One of them is the following:

"Pancreatic cancer is usually detected too late, leaving patients little hope of recovery".

The use of the "little hope" is an interesting, subtle way to suggest that patients with such a disease are, at this moment, condemned, therefore there is a biomedical need.

Within other *Stories*, the problems/needs are evoked in a different style, backed with statistical figures instead of more 'emotional' sayings or clichés. For instance we can recall, again, the SS09:

"In the European Union, breast cancer claimed 93.500 lives in 2013 and accounted for 16.2% of all cancer deaths among women".

"October marks Breast Cancer Awareness Month, highlighting the plight of patients and efforts to fight this potentially deadly disease that claims around 570.000 lives a year around the world".

"Breast cancer impacts over 1.5 million women around the world every year".

These three quotes, taken from a *Story* that elaborates breast cancer prevention strategies, rely on the use of numbers to alert the readers about the worrying situation. They use a simple but straight-forward style, which leaves not much room for interpretation or discussion whether is this situation truly a matter of concern or not. But within other cases the problems are shown differently. They use more 'emotional'

means of communication, sharing how a given disease or condition has meant a burden for a patient, therefore it is a latent problem. This is aligned with Petersen's 'emotional manipulation' found on free-market healthcare (2015). The SS12 (robots and the elderly) provides an interesting example:

"Ten years ago, Isabel suffered a stroke. She thinks the robot can eventually be useful for her".

This quote was the only problem-related one I found within that whole *Story* and, in fact, is not quite explicit. It shows a particular case (a woman thinking that a robot could be helpful due to her medical condition), rather than a general, societal problem affecting a large amount of people. This is aligned with how dramatic the case can be thought of. One will not necessarily think that the lack of robots at home will mean that people are dying. So portraying this situation as problematic, in this case, can be seen as an 'artificial' intensification of an issue. We can understand this as a strategy to avoid questioning whether we need or not such research projects. This also provides support to the enactment of success.

In general, considering that these documents are about socially concerning healthcare issues, we can think that these problems will be expressed in a straightforward and simple style. But this does not always happen, and other *Stories* use different phrasing, showing the problems in quite an implicit way (contrary to how explicit were some of the already quoted problems). This can be appreciated, specifically, within three *Stories*: the SS01 (a better probe for cancer surgery), SS04 (treatment for melanoma) and SS06 (development of new anti-cancer drugs). The interesting point is that these three cases have a common aspect: they are about new cancer treatments. A priori, one could think that when it is about cancer, it should be simple to transmit the sense of a problematic condition (considering how dramatic is to suffer from such a disease). But this is not the case. Instead, these three examples show no explicit problems, but only implicit needs. The narrative switches, and they put the effort on the **communication of needs**. For instance, the SS04 shows these promises of better treatment for melanomas or other forms of cancer (which is the closest to a problem that I found within the whole text):

"*Greater understanding could help to predict how individual tumours are likely to respond to various combinations of therapies*".

"While the research relates to melanoma, any insights it may generate might also be relevant to other types of tumour. Ultimately, the training MelGen is providing could help to refine the treatment of a variety of cancers".

All the documents include, additionally to the problems, the sense of a need. Some of them elaborate about a given situation which is painful, expensive or time-consuming, among other burdens, therefore there is a subsequent necessity which must be tackled down. The SS03 (development of bacteria-resistant

prosthesis) is interesting, since it overly uses a single personal account to sustain the case and the need. Approximately one third of the text is about the story of a patient who suffered of an infected knee prosthesis after a surgery. Within the subtitle, the aim of the story is not explicit:

"Implantation of a prosthesis involves complex surgery conducted in a sterile environment. Still, sometimes implants get infected with dangerous bacteria. The consequences can be very serious. Why does this happen and what can be done to prevent it?"

But I could only see it in the second page of the document:

"Scientists together with manufacturers of prosthetic devices are developing a set of necessary methods to produce and test infection-resistant implants".

The posting of current problems is not broadly elaborated across the text on that example. We can think that more problems are, in general, associated with bacterial infections in prosthetic surgeries, but it was not mentioned. The only two (partially) explicit problems/needs on this *Story*, are the following:

"The infection endangered the whole limb and could have become life-threatening".

"Infections can occur in 1-3% of surgery like this".

The first sentence tells the potential threat the bacterial infection within the associated surgeries may have, while the second one backs up that threat with some data. But this data does not seem assertive enough: we can think that the 'less than 3% probability' might not sound 'frightening' enough. This can explain that the authors decided to make use also of emotional, sensitizing personal accounts to prove the medical need to be addressed.

The portrayal of problems and needs leads to the **elaboration of promises** for solving them. These promises are not mere words or isolated pieces of information, but they rather construct futures and imaginaries. These promises represent a relevant object of analysis, since they are the main generators of hope within the population. They are not equally presented and emphasized across the different texts, in terms of the wording and their expected results.

If we look first at those stories with the 'less' emphasis on the promises, we can note that in some cases the solutions they offer do not lead to a full recovery of the patients, but to temporal relief or palliative procedures. More than discussing the nature of those health solutions, we can perceive that in such cases, the technologies tend to provide less hope, but still elaborate strategies to increase the public support. For instance, we can see the SS15 (robots and diabetic children):

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"Although the robot doesn't provide medication advice, it helps to understand symptoms of diabetes-related conditions".

"Tatum and Arjan are taking part in a European research project using electronic games to help children with diabetes. Special apps on their tablets train them to choose the right food, count carbohydrates and keep track of their activities – in more of a fun way than books can ever do".

We can observe something quite similar in the SS12 (robots and the elderly):

"*Our vision is that eventually the robot will be part of a kind of 'smart home' environment for the users*".

Here, the proposed solutions offer the aid of robots for the patients (children and elderly), to better deal with their health conditions. They promise to make their day-to-day routine friendlier or easier, based on a novel, futuristic technology which sounds quite appealing for the patients involved. The SS10 (people with Down syndrome) offers another set of promises, which do not offer life-saving solutions, but rather more procedural ones:

"Better understanding of Down syndrome and early interventions can greatly increase the quality of life of children and adults and help them live fulfilling lives".

"Public funding for poorly understood areas like the exact nature of language ability and development is critical because it can improve services provided to individuals with Down syndrome".

Again, they propose futures in which the patients will have better chances to deal with their conditions through palliative solutions, instead of those *Stories* which offer, explicitly, cures. These three *Stories* (SS10, 12 and 15) portray their promises in a weaker shape than those about developing life-saving technologies (which I will analyze in the next layer). We can appreciate this contrast against the SS02 (portable device for detecting cancer):

"A portable device to detect potential signs of cancer in a patient's urine is under development within the EU-funded research project GLAM. The project aims to speed up cancer diagnosis and monitoring, while making the process both less intrusive and less unpleasant".

In this case, the promises are explicit and straightforward: the patients will get better treatment and will suffer less pain. Moreover, this was the sole promise within the whole text (unlike other *Stories* which included as much as five promises). The aim of the project is also clearly transmitted, posting the current problem (within the subtitle, making it accessible for the reader), and offering hope for a new technology

(concisely described). It does not use any sensitizing personal accounts, or narrations about joint efforts of different countries (which I actually found within other *Stories*).

Other documents showed promises of better futures differently. The SS23 (airbag helmet for bikers) is an example. Its closing paragraph says the following:

"Hövding is giving back to communities across the world. In exchange for helping the company gather data, it is donating money to good causes on behalf of everyday biker. In Sweden, for example, funding goes towards cycling schemes for immigrants. Donations also support a project in Africa that helps children commute to school by providing them with bikes".

We can note that there is no enactment of success, in terms of providing better healthcare access or better health futures in general for society. We can rather appreciate the use of the "give back" to return something, after a private company has already increased their revenue. The donations to an African community is a form of creating value out of social practices (which we can understand as social innovation), but the promotion of bright futures is not clear (showing this development as charitable, instead of proposing broader long-term policies to tackle down economic or social inequality).

Now, if we switch to the analysis of the wording used to deploy the promises within the *Success Stories*, we can note a very recurrent characteristic: they are written using **conditionals**. Noticeably, several of the documents prepend conditionals to their corresponding promises, such as "would be", "could lead" or "potentially". They sustains the idea of a commitment 'on the way', but being aware of not offering something completely proven or guaranteed[12]. In general, the use of conditionals communicates the readers a promise about the potential positive outcome of a new technology. As auspicious as they sound, the use of the conditionals is a form of enacting success in a case which is still under development. These conditionals are not solely used within the body of the text, but can also be found within the titles and the subtitles. Such is the case of the SS07 (a test for detecting a woman's cancer risk), which starts including the word "would" in the title and subtitle:

"*Cancer test **would** pinpoint high-risk women*".

 "*An EU-funded project is developing a single genetic test that **would** indicate an individual woman's risk of developing breast, cervical, womb or ovarian cancer – potentially saving lives*".

And once again, within the body of the text, where I found conditionals three more times. The following quote is an example:

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[12] Bold highlighting within the quotes generated by the author.

*"FORECEE's test **would** screen for molecular changes in cervical cells that indicate a woman's individual risk of developing these cancers. Project researchers say women **would** not need to go for extra appointments to take advantage of the test".*

It is interesting, since they say the technology will help detect ovarian, cervical and breast cancer, which are indeed a problem for women (see table 2 with the causes of death). The hopes are high, and so are the promises. The broad use of the "would", makes the outcome not be taken for granted, yet the document still enacts success. In fact, it is included within the same sentence as the promises. Also the conditional is included both in the title and the subtitle, which seems a way to induce the reader think that this development is closer to a reality, than to a mere project.

The use of conditionals within the subtitle is not innocuous. In general terms, within a given document the subtitle is, structurally, more important than the body of the text. Such is the case of the SS01 (a better probe for cancer surgery): the document was issued on 2016, while the expected finishing date for this project is 2019, this means that the possibility of success is rather unknown (as of February 2018), so as to promote the idea of such a revolutionary treatment as a sure thing. This quote is the very subtitle of the document:

"EU-funded project PRISAR is developing a hybrid probe that doctors can use to more precisely target cancerous tumours in image-guided surgery and during post-operative radiotherapy treatment. The project aims to improve treatments for cancer patients and save more lives".

We can also find within the body of the document another promise with conditionals:

"*A more accurate probe **would** help doctors identify and completely remove primary and microscopic tumours, without the need for invasive surgery. Doctors **would** also be able to use the probe's molecular radiotherapy technology to provide targeted treatment after operations to remove cancerous tumours*".

In some cases, the conditionals are extendedly used. I spotted this in the SS04 (treatment for melanoma), which speaks about genetic changes in melanoma patients, and includes as much as three conditionals within the same sentence. This *Story* was issued 2.5 years before the completion date of the project, which means that success is not necessarily guaranteed:

*"While the research relates to melanoma, any insights it **may** generate **might** also be relevant to other types of tumour. Ultimately, the training MelGen is providing **could** help to refine the treatment of a variety of cancers".*

So far, I have recalled promises which attain mostly to what the medics would be able to better do. But I also found other promises directly targeted to the patients themselves, expressed in stronger means. The SS06 (development of new anti-cancer drugs) continues with this discourse strand. Coincidentally or not, is also about cancer:

*"**If** successful, INPACT will develop innovative drugs able to kill bacteria and tumour cells as well as break through the blood-brain barrier. This means they **could** be capable of directly targeting and treating brain tumours and brain-hidden pathogens. These revolutionary developments **could** lead to potentially life-changing new drugs for cancer patients, among others, improving and saving innumerable lives".*

Again we can observe conditionals ("if successful") sustaining the promises. In this case, these promises are shown in a quite strong shape ("could be life changing"). Three conditionals within the quote emphasize the possibilities. This enables a social reality in which success is directly tied with a better life expectancy for the population.

Within other documents, I found a particular, and somewhat different form of using the conditionals, where the *real*, or *safe*, is juxtaposed with the *possible*. We can perceive a good example in the SS08 (diagnose of hypertension):

*"By studying thousands of hypertensive patients across Europe, the EU-funded ENSAT-HT project is searching for molecules in the bloodstream – known as biomarkers – that can accurately and reliably identify people who **could** be cured".*

The wording in this promise is very interesting, since in the same sentence it combines the assured ("accurately and reliably") with the potential ("could be"). The SS09 (breast cancer prevention) also includes the use of conditionals within some of its promises, when talking about what the proposed development consists of, and then switching the language to something 'safer'. We can consider this transition to more granted affirmations (from the "could have" to the "will enable") as a strategy to promote a potentially helpful treatment, with the sensation of being a certain possibility, rising the hopes for the public:

*"This **could** have a significant impact since not only does the effectiveness of preventive and early detection vary by tumour subtype, so does the response to treatment. The results will enable healthcare providers to better tailor prevention and treatment strategies to a woman's specific situation and needs".*

I also noticed this wording contrast (using both conditionals and 'safer' affirmations) in the SS16 (new liver dialysis device) and the SS17 (detecting cancer on a DNA molecule), respectively:

*"New technology **could** soon revolutionise the treatment of liver failure: an innovative dialysis device is currently being trialled. It aims to greatly improve the outlook for patients, helping them to recover or supporting them while they wait for a transplant".*

*"A novel approach to analyzing DNA for signs of mutation and disease is leading to highly accurate tests for early-stage cancer, antibiotic resistance and genetic disorders, **potentially** revolutionizing diagnostic medicine and saving lives".*

Both quotes use conditionals ("could" and "potentially"). But what comes after is interesting: medical practice could be revolutionized (a strong statement, despite not explaining in what sense or how will it benefit the patients), and lives could be saved. They omit the fact that these are mere projects, and not already available developments. These two quotes, promising better futures, leave somewhat unnoticed that the outcome of the projects is still a mere possibility. A strategy to increase the hopes that those affirmations create.

On the opposite, other quotes have 'softer' tones, offering more moderate promises. A priori, one can think that this might be the case of less severe/dangerous diseases, but I found it in other cancer cases, such as the SS18 (new test for pancreatic cancer). Despite this quote uses a subtle conditional for posing a problem and a promise, it remains a promising declaration:

*"Pancreatic cancer is usually detected too late, leaving patients little hope of recovery. But this **may be about** to change. A Swedish SME has developed a blood test to help clinicians identify new cases earlier".*

It is not clear though what "may be about to change": the too-late detection of pancreatic cancer? Or the patients' "little hope of recovery" maybe? Even if certain, the first promise (earlier detection of cancer) does not necessarily assure the second one (increasing the hope of recovery). We can even say that the document acknowledges this, when mentioning the "hope of recovery". This, in turn, would implicitly increase the people's expectations and hopes. We can appreciate again these hopes presented through non-exact quantitative information within the SS20 (personalized treatment for leukaemia):

*"We firmly believe that more sophisticated therapy models based on the bio-physical parameters of each patient, combined with innovative electronic devices for drug administration, **can contribute** to significant progress in the treatment of malignant diseases".*

The conditional accompanies a promise which is offering a "contribution", though it does not specify how, concretely, it will improve the patients' treatments. Regarding the "significant progress", one can ask how

much is "significant", while "progress" is not clearly understood in terms of what. The conditionals here are used to support the enactment of success, but through unspecific and somewhat ethereal claims.

But some of the *Stories* do use figures to render the *possible* outcomes of the promises. We can interpret this as a form of providing more sustain and hard-facts to support them. We can notice a specific example in the SS19 (treatment for bowel cancer):

*"**If** the expected results are achieved, the project outcomes alone **could** benefit up to 30.000 CRC suffers in the EU today, not to mention those diagnosed in the future".*

The "if" at the beginning might lead the reader to dismiss the conditional nature of the promise, especially considering that it is followed by the 'achievement of results', which are only "expected", but not yet concrete. The sentence finishes remarking the positive future benefits, being this an angle to make the public to swipe aside from the realm of the possible, into an enactment of success based on an imaginary of a better future.

5.1.3   Colloquial wording

The *Success Stories* I analyzed tended to use similar vocabulary and expressions. But some of them used a language which seemed somewhat diverted from the 'normal', with particular terminology and wording. Within 9 *Stories,* I identified the use of colloquial language (instead of a more formal one), when describing medical procedures or biological phenomena. While we can debate what is considered as 'colloquial' and what not, the interesting object of analysis in this regard, are those text parts which tend to oversimplify statements. Though I already commented that the *Success Stories* aim to reach lay public with (presumably) no background in biomedical sciences, we can still analyze the complexity of the wording used within the science communication process[13].

As I discussed in the State of the Art, it is important to maintain the use of simple language within these kind of documents for a proper storytelling process (the press-packaged science). But in some cases, the EC might be working on portraying that the laboratory (as a knowledge production site) closer to the people, thus making the narration more alive and even more convincing. In general, makes sense to do an effort to use simpler terms to improve the efficiency of the knowledge transfer to society, but that does not mean that overly-simplified wording has to be used. Simplifications are acceptable by scientists

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[13] Within the quoted discourse fragments of this section, the specific expressions which have been considered as colloquial wording, have been highlighted by the author, to provide guidance to the reader.

as a way to universalize knowledge, but despite popularization cannot always be clearly distinguished from genuine knowledge, it remains a legit way of transferring knowledge into new domains (Sismondo, 2010).

The (potential) misunderstanding of scientific knowledge can lead patients to a case of 'false hope' (Sharot, 2011; Petersen, 2015). Consequently, they could tend to make misinformed healthcare choices (such as taking unnecessary tests). This, in the context in which producers and providers of technologies aim to increase their economic benefits from technological promises, for instance, through the promotion of marketable products (Petersen, 2015). This is particularly interesting when we notice that, within this subsection, all the 3 *technological devices* type documents use colloquial wording. These correspond to developments aiming, precisely, the people as the final users (instead of scientists or medical staff, for example). It seems as a way to ensure that general public is reached and no information is 'lost in translation'. In particular, projects which spread technological solutions for already-solved problems (e.g., the airbag-helmet), can be a case of the EC promoting the idea that stimulating the consumption of biomedical products and services is economically and socially desirable (as part of the discourse of hope). This is understood as the technology providers influencing the thinking and actions of the people, to the extent of making it "difficult to envisage alternative, non-technologically mediated futures" (ibid, p. 62), attaching hope to these specific future scenarios. In concrete terms, we can conceive this as a case in which the people are stimulated to purchase a given technology, despite it not being a strict necessity (we already have helmets for bicycles).

After reading the titles of the documents analyzed, we can appreciate that while the headlines tend to be very direct and self-explanatory, they can also state colloquial expressions. The SS03 (development of bacteria-resistant prosthesis) is an example:

*"A **surgical strike** against bacteria".*

The term 'surgical strike' is normally used to depict an extremely precise military attack to a specific objective. In popular culture, is used as a metaphor to carry out a very delicate and precise action. Within this *Story,* it is used as some sort of wordplay to explain that they aim to tackle down bacterial infections. Moreover, this project is not related to improvements for surgeries, but instead, about developing bacteria-resistant prostheses, so it could even be misleading. In fact, is the only document which features the use of a linguistic device such as a metaphor or a metonym in its title. All the rest mention there either the treatment or the disease involved. In general, the use of metaphors to describe technologies is considered within STS as a resource to do political work. This, in particular, when talking about

technologies to serve the public good and should require public investment, therefore shaping the present and the future of those technologies (Sismondo, 2010).

We can notice other colloquial forms of writing, in the way they describe what the projects are doing, and how the experimental procedures are working. The SS06 (development of new anticancer drugs) has two sentences which refer to the undergoing development, though the wording they use does not look strictly formal:

*"The exchange of knowledge between them will lead to new techniques for the trans-barrier delivery of drugs and **bacterial destruction**".*

*"If successful, INPACT will develop innovative drugs to **kill bacteria**".*

Promising "bacterial destruction", as well as to "kill bacteria", appears to be a curiously informal way to communicate the success to the population. This, plus the inclusion of the "innovative" to promote the potential accomplishment, seems to provide more sustain to the affirmation, and perform what we could understand as a blackboxing of the developing technology.

While is important that the vocabulary used sounds appealing and reader-friendly, the previous quotes can lead the public to misunderstand what the developed technologies are about. I also found this within the SS15 (robots to help diabetic children), where they refer to the robots which will allegedly help the children, in the following way:

*"Paediatricians can program the robot to set individual objectives for each child. Researchers noticed that kids who have an **electronic pal** like this are happier to come back for their regular check-ups".*

"*Researchers are planning to get more children involved in this experiment, and to develop a cloud-based network that will link robots and tablets, helping the **electronic pals** to learn and grow with the children*".

The robots are not treated as mere aiding machines, but instead they are referred as if they were human friends or assistants. After the "electronic pal", they say that the kids will be "happier" to follow their diabetes treatment. This assigns an inherent positive value to the robots, not strictly technology-wise, but envisioning how this will improve the kids' adherence to their long-term medical procedures. Here, Horizon 2020 promises that "electronic pals" will, somehow, help the children, seemingly framing the problem in a frivolous way. Praising the use of an app is another way of boosting hope for the patients, in a case which can be addressed as only a diagnose device which not necessarily will provide a useful solution to diabetes.

Other *Success Stories* use colloquial wording to enforce the public support through conveying an intense need. This can be noted in the SS12 (robots and the elderly):

*"Researchers conclude that **whatever the cost**, the goal of supporting and encourage older people to stay active and independent for longer, is worth pursuing".*

The whole idea behind providing robots to help old people sounds nice, futuristic and problem-solving. The "whatever the cost" and the "worth pushing" are used to mean that the implementation of this development on a real scale should be enforced, regardless how expensive or feasible providing robots to each and every elderly citizen in Europe can be. This narration is overly emphatic on trying to demonstrate that the life quality of those people will be improved, though the sustainability of the solution remains unclear[14]. A priori, we can think that a massive implementation of robots to aid the elderly people is not a cost-effective solution, but the colloquial wording within this declaration suggests otherwise.

I identified a *spin-off* from the use of colloquial wording within some cases in which the importance of the problems seems minimized. More specifically, we can observe a different colloquial-wording style, used to boost public adherence within stories which seem to over-simplify medical issues. The SS23 (airbag helmet for bikers) is an example. Within the subtitle, it includes a short description of its intending development:

*"An EU-funded project has created an airbag bike helmet that is eight times safer than its traditional counterparts. It is both comfortable **and attractive** in a bid to motivate more people to cycle responsibly".*

This *Story* discusses the safety problems related to the low usage rate of bicycle helmets. The way this discourse fragment portrays this new development, is a colloquial way to pose a benefit of this artifact. Moreover, they transmit the idea that part of the success of this project is the attractiveness of the helmet itself. This is a reduction of the importance of the problem, turning an issue of safety into one of aesthetics, as a form to tackle down the potentially harmful conduct of not wearing a helmet, therefore constituting a piece within the enactment of success. The SS12 (robots and the elderly) is another case, where one of the scientists involved talks about the importance of the development of robots for the elderly:

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[14] The UN expects that by 2030, the population aged 60 years and older will reach 1.4 billion (from the 901 million registered on 2015), while by 2050, this population is expected to reach 2.1 billion (UN, 2015). It is in that context that despite, in general, is not the aim of my thesis to discuss the sustainability of these projects, in particular, the sustainability of providing robots for the elderly is, at best, arguable. Therefore, I use it here as part of the argumentation.

"'Our vision is that eventually the robot will be part of a kind of 'smart home' environment for the users. The robot has sensors that could check temperatures, if the person has left the fridge door open, or the oven switched on, for instance', added Martins. 'So far robots are not able to measure that for themselves, or they need to be close by to monitor these factors. We aim to do this remotely, which is why the robot is equipped with many different sensors'".

While the first half of this paragraph might sound promising, the second half of it reveals that, as said before, it is a mere possibility. The final part tells what the robots can concretely do: sounding an alarm when the fridge has been left open. But this has already been solved by modern refrigerators (precisely, through sound alarms). Then the whole problem of the population ageing in Europe is reduced to such simplification. But the way it is written still portrays the project as important and helpful, therefore willing to earn public support and creating hope (despite we can assume leaving the fridge door open is not the most critical part of the population's ageing problem).

5.1.4   Complex wording

As I stated in the previous subsection, most of the documents are written in a simple and direct way, seemingly understandable for the majority of people. However, in what we can consider as a counterpart of this, I also identified pieces of text which use far more technical language, with more complex words. We can notice this within a few *Stories,* specifically when they describe what the technologies being researched are about. Interestingly, there is the case of two *Stories*, which use both complex and colloquial wording (in different parts of the documents), so they are not excluding categories. I interpret this contrast as a writing style aiming to prove the policy worthy and successful, through the explanation of scientific phenomena to people who do not necessarily have the knowledge to comprehend it (but who are prone to accept it because they are not likely to question the source). This is a common science communication issue, where people do not often question the information they receive, if they believe they have less relevant knowledge than those who generated the information (Macdonald, 1995; Lock, 2011).

Though the *keep it simple* rule is vital for science communication, it is also important that the *Stories* use an adequate technical language. Thereby they can avoid being imprecise or sloppy, as well as keeping potential confusion away when talking about science. But there is the risk of turning into the opposite: if the people do not understand what is being done in these research projects, the science communication gap can be broadened.

It is worth mentioning that I found complex wording within 4 documents, and all of them were about cancer (one about new drugs, another about new medical equipment, and the other two about in-lab research and modeling of the disease). These technologies and developments are not for the public to purchase (such as the airbag helmet), or to be used by patients at home (unlike the robots for the elderly). Instead, they are meant to be strictly utilized by medical professionals, inside medical centers or laboratories. In these cases, the readers of the *Success Stories* will only be mere 'spectators' if they ever get in touch with these new medical advancements. This means that we can expect the message these documents carry to be differently shaped. They do not have to persuade the public to make different decisions, but rather show them what the biomedical technologies can offer in case they are diagnosed with cancer.

Within the previous subsection I mentioned that all the 3 **TD**-type documents use *colloquial wording*, and how this was a manner to ensure that the *Stories* reach the general public. This observation becomes more noteworthy when we see that, on the other hand, none of those same *Stories* use *complex wording*. This reinforces the previous idea of how information is translated to the consumption site, specifically in those cases in which the developments aim at the public as the final user itself (instead of medical staff or laboratory technicians).

When we look specifically at what falls into 'complex wording', all the cases are broad descriptions about specialized biochemical topics. This category is not about simply discussing whether the *Success Stories* turn the simple into the complex. Instead, is about showing how the inclusion of specific pieces of information, which most of the people are not likely to understand, is still used as a part of the stylistic structure of the discourse.

I did not find any of the quotes shown below neither in the titles, nor in the subtitles. This indicates a stylistic aspect then: this kind of wording has been used when there is broader room for explanation and elaboration, instead of constrained-space paragraphs (title, subtitle), where ideas have to be written in a more compact, simple and direct shape.

As I analyzed in the previous subsection, the SS06 (development of new anti-cancer drugs) holds some colloquial expressions ("bacterial destruction" and "killing bacteria"). Interestingly, that same document also offers pieces of text that contain complex wording:

"The molecules are known as chimeras. These chimeras will combine anti-tumoral or anti-microbial molecules with antibodies which are able to bind selectively to cells and/or transport a dissolved substance actively across cell membranes".

For a person who is into molecular biology, this might be a simple paragraph. But that is not the reality for the majority of the society. Presumably, most people are not likely to know what an antibody, or a cell membrane are. The SS22 (better understanding of cancer progression) contains another example, which describes the science behind cancer progression:

"Proteoglycans (PGs) and glycosaminoglycans (GAGs) are structurally diverse carbohydrates within the extracellular matrix and cell surface. They have recently been identified as novel biomarkers and important players both within tumor cells and their microenvironment. They integrate signals from growth factors, chemokines (signaling proteins secreted by cells) and integrins (the proteins that attach the cell cytoskeleton to the extracellular matrix). Their expression has also been shown to modulate the various hallmarks of cancer".

It is interesting that this was the only category highlighted within this *Story* (besides the regular problems/needs, and the corresponding promises). The whole document is rather short (only 17 lines in the body of the text) and the quoted paragraphs about complex wording constitute almost 40% of it, allowing us to deduce that the writers have strived to construct this text in such a way. Unlike the rest of the *Stories*, this one is written, as a whole, in a more technical and formal style. But the purpose of this is unclear, since most of the people are not experts in histology and do not understand the importance of the extracellular matrix or the chemokines. We can note that the wording is much too focused on the molecular biology, which explains the science underneath, but does not necessarily fit within a narration of success. A priori, one can think that cancer patients are more interested in the potential increase of their survival probabilities, rather than what is happening with the cellular organelles. We can reinforce this idea after looking at another quote from that same *Story*:

"The team behind the GLYCANC project believes that dysregulating the function of PGs and GAGs would simultaneously affect all of the molecular steps that lead to cancer metastasis. This is the focus of the team's research".

This paragraph explicitly talks about the project's aim (in the sense of what is being done inside the laboratory), but at the same time I am not clear whether the potential benefits are understandable to the public. Instead, the use of these words might seem to set a barrier of 'technical wording'. This could prevent the public from fully understanding the real promises embedded in this *Story*. This might be a strategy to gain momentum based on the wording, but at the same time representing a possible science communication issue.

As we could see in this layer, the *Success Stories* use different resources to show the information. The subtitle can be used for different purposes (either to show the aim of the project, or portray a general

biomedical issue). Most of the documents show healthcare problems, and all of them narrate needs and offer promises. But the linguistic means used are not always the same, in the sense that the wording can follow different patterns (more colloquial or more complex). This impacts in the way the reader might receive the information.

5.2 Second layer: rhetorical structure and the contents of the argumentation

This layer elaborates about the rhetorical resources used to sustain the making of promises, and how the *Success Stories* describe the current problems and the potential solutions they promise. The knotting of these discourse strands allows me to describe how Horizon 2020 persuasively transmits hope to society through their promises, using different means. These include the life-saving possibilities, the personal stories sharing the reality of those patients who will be helped, and the researchers explaining what their projects are about.

The narrative and wording employed in the documents is also an object of analysis, in the context that the interests and identities of the readers can shape the writing of a scientific text, aiming to promote the authors' interests and translating it into the readers'. These rhetoric resources aim to persuade the readers, while transmitting the goals of the writers (Sismondo, 2010).

5.2.1 Life-saving promises: the epitome of hope

We can observe that the promises within the *Stories* have not been homogenously portrayed across the whole set of data, in terms of their perceived 'intensity'. Despite it is not my goal to classify, or rank how 'intense' the promises are, we can note that some of them are clearly different. While every document promotes better futures (sometimes in different ways), within some cases this is stressed at the extent of offering, literally, life-saving solutions[15]. Those cases explicitly use terms such as "life-saving" or "saving lives", among others, sharing noticeable stronger promises. This is interesting to analyze in the sense that Horizon 2020 does not seem to spare any efforts to promote visions of bright futures, through the offering of such sensitizing expectations, as a strategy to present biomedical research as beneficial for society. As I have mentioned, every project involved in this thesis is still under development. Also, that hope is explicitly enacted through promises, in many cases even written with conditionals. In that context, within

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[15] As evident as can be that some projects are indeed life-saving (e.g. a cure for cancer), here I will only consider those texts which explicitly use the keywords "life-saving", "saving lives", and the alike. Therefore, the aim is not to judge whether a given development will effectively save lives or not, but rather to analyze how this is verbalized within the *Success Stories* to enact promises.

some cases the promise is taken one step further, and a future scenario is constructed based not just on offering a simple relief, but on the lives which could be potentially saved.

The first particularity I found within the life-saving discourse, is that it was present within the *drugs*, *medical equipment* and RMT type documents, but not within any of the TD-type documents. While some of the TD projects can actually save lives (e.g. the airbag helmet for bikers), it seems that Horizon 2020 does not 'need' it as a resource within the rhetoric of success. When we observe more in detail, none of the TD-type developments are cancer-related (while the other document types do include cancer projects). This makes sense when noticing that there is no *life-saving* promises either: the TD projects avoid to promise the addressing of life-threatening situations. So it seems that the life-saving rhetoric is specifically used to tackle down major life-threatening diseases: six cancer documents, one heart conditions document, and one liver conditions document.

A basic expectation that one can have when presented a life-saving research project, is that is backed with an already-proven trial, instead slogans or tags. But this is not always so. We can observe the SS01 (a better probe for cancer surgery) as an example:

"EU-funded project PRISAR is developing a hybrid probe that doctors can use to more precisely target cancerous tumours in image-guided surgery and during post-operative radiotherapy treatment. The project aims to improve treatments for cancer patients and save more lives".

This sentence has a powerful statement: it aims to save lives. It is the final goal of the research project, but somehow they omit that, since still under development, such potential outcome is only a possibility. Though it is unspecific in what ways it will "improve" the treatments (could be either length or cost, for instance), the message transmitted is that if you are a cancer patient, your life could be saved. Tying this with the (previously elaborated) use of conditionals, it seems contradictory to promise to save lives, while at the same time preceding those promises with conditionals. This appreciation is enhanced by the fact that this is the subtitle of the document, this means, it is given more importance than if included amidst the body of the text. We can note this same resort in the SS07 (a test for detecting a woman's cancer risk):

"An EU-funded project is developing a single genetic test that would indicate an individual woman's risk of developing breast, cervical, womb or ovarian cancer – potentially saving lives".

This life-saving claim is in the subtitle of the document (enhancing the importance of the message). The "saving lives" is as well positioned within the very end of the sentence, thus inciting the reader to think that is a reality (or closer to be achieved) instead of a mere projection. This shapes the promise as taken

for granted, while it is not so guaranteed. Another important topic is that within these two *Stories*, the "EU-funded" is used as a collective symbolism of the life-saving initiatives.

Within one *Story,* the sense of life saving is intensified to the point of being included at the very title of the document. It is the SS16 (new liver dialysis device), and its name invites the reader to immediately assume that this project is all about success and better futures:

"Saving lives with a new liver dialysis device".

Noticeably, they use the continuous tense ("saving"), implying that it is something already happening. It encourages us to think that lives *are being saved* right now. When going further through the document though, we can read that nothing is yet to be ensured. They mention that this new technology "could soon revolutionise the treatment", adding a quota of ambiguity. Further in the text they write that a "first clinical trial" is under way, implying that this is perhaps a much too early stage, so as to communicate such idea of success to the public. We can spot this again in the subtitle of the SS17 (detecting cancer on a DNA molecule):

"A novel approach to analyzing DNA for signs of mutation and disease is leading to highly accurate tests for early-stage cancer, antibiotic resistance and genetic disorders, potentially revolutionizing medicine and saving lives".

We can identify the aim of this project within this quote. Again, they use the strategy of placing the life-saving promise at the end of the sentence. The "highly accurate" creates an idea of precision and exactitude for this technology. But then, the "potentially" unveils the mere possibility. We can make a similar observation out of the SS06 (development of new anticancer drugs):

"These revolutionary developments could lead to potentially life-changing new drugs for cancer patients, among others, improving and saving innumerable lives".

One of the interesting aspects of this quote, is that is the very last line of the document (once again, the 'take-away' style of presenting the idea). This means that it tends to make the reader conclude that this is a life-saving project, despite the information is inconclusive to make such a resolution. The life-saving claims are not backed by any hard data (other *Stories* do recall figures), but instead, they only say a vague "innumerable", remaining in the site of the clichés. This configures another example of using a qualifying adjective to transmit the idea of a great number of patients involved. We can identify the recalling of quantitative information to support the life-saving claims in the SS18 (new test for pancreatic cancer):

"At this point in the progression of the disease, it is still operable, Graham notes, and patients' chances of surviving it for more than five years after the diagnosis would soar from a bleak 6% at present to a far more encouraging 50% or so".

Here it is depicted in a slightly different form. It talks about the "patients' chances of surviving" increasing from 6% to 50%, at the same time promoting the idea of a brighter future, giving meaning through adjectives: the "bleak" 6% and the "far more encouraging 50%"… or so. Using an adjective such as "encouraging" also creates hope. Through these examples, we can see then that the life-saving promises are accompanied by other resources within this success enactment, instead of being used on their own.

5.2.2   The use of personal stories: how patients share their experience

Another feature I found within the *Success Stories* was the use of accounts from 'normal people', which we can consider as a strategy for showing another reason why scientific research is important. None of the 13 documents about cancer include personal stories, this means, it is not used to enact success when the diseases are the deadliest. Instead, personal stories are incorporated within those cases in which society could think that the deadly risks are low. Thus, the use of this category can be considered a tool for sensitizing society towards the innovation policy need.

Interestingly, after analyzing the words from the people, I noted that their quotations always have a positive tone (creating hope), instead of negative one (e.g. elaborating critics, or complaining about unaddressed necessities). This means that those quotes included might have been carefully selected to fit a given narrative. In general, patients share their first-person impressions about how the research projects can be helpful for them, but do not add any further specific knowledge about the technology under development. This is an interesting feature of the narration, since we can comprehend it as a strategy to make the reader empathize with the personal situation of those suffering, and therefore to be benefited. This is also an example of users (subjects) being entangled into the discourse. Going further, I consider it as an example of an "ongoing production of reality through discourse" (Jäger & Maier, 2009, p. 37). This reality is unquestionably constructed using the experience of suffering patients, whose lives would be allegedly improved if these projects are successful, therefore using sensitizing accounts to create hope.

Though being a resource only used in a handful of cases (only three), within all those documents most of the text revolves around these patients. We can note that, when used, the quoting of patients has been intensely exploited in order to be part of the rhetoric structure. The reality of the people involved becomes a central point of the storytelling, therefore 'humanizing' it: if success can be granted, then those

benefited are "normal" people, just like the reader itself. Moreover, after reading the corresponding documents, I observed that all three of them draw upon colloquial wording, while none of them use complex wording. They neither mention the money involved, nor anything innovation-related. This sustains the idea that the core of the justification of success is about helping out those people in need (the protagonists of the narration), but without describing the more economic aspects of the projects (to be developed in the forthcoming subsection).

This resource has been only used in *drugs* (one document) and *technological devices* development types (two documents). This fits the expected, since, especially in the TD-type documents, the outcomes of those projects intend to reach the people as final users (both *Stories* about robots: for the kids with diabetes and the elderly). On the other hand, it was absent from all RMT and ME type documents. It comes unsurprisingly that no RMT-type documents use accounts from patients, in the sense that these projects are, in general, about in-lab biochemistry-research oriented, which explicitly narrate how the work of the scientists is leading society to better futures. This means, for RMT and ME projects, there is no particular need of the aforementioned 'humanization' of the storytelling: the outcomes of the research tend to be blackboxed and less tangible for the readers.

Within the SS03 (development of bacteria-resistant prosthesis), most of the argumentation is sustained by the personal accounts from one patient, with no shared collective experience, intensifying the rhetoric based on his dramatic case. The following are the first three paragraphs of the document, where the context is provided, and they tell what happened after a failed surgery:

"Ángel, from Barcelona, had his knee joint replaced with a metallic prosthesis. At first, it seemed the routine operation went well – but complications quickly became obvious".

"'Three to four days after the surgery, the knee didn't improve – it got worse: bad inflammation, pus, black spots around the wound. The doctors found it had got infected during the implantation of the prosthesis', Angel told Euronews".

"The infection endangered the whole limb and could have become life-threatening. To stop it from spreading, Angel had to have intensive antibiotic treatment and several more operations. His knee has never fully recovered".

It is not only until the fourth paragraph that the document elaborates the issue of bacterial infections on prosthesis implantations in general. This exemplifies the use of a personal story to the detriment of the more technical topics. The impression this leaves us is that if they had omitted the tragedy of the patient and his knee, the core idea of this *Success Story* would have remained mostly the same (in terms of

exposing a health issue). Why including it then? We can consider the penury of a person who could have lost his leg (according to the text) as a strategy to prove worthiness and societal benefit, ultimately to gain public support. Then we can say that the purpose of adding these quotes is to valuate the positive reaction of the patients towards the researched technology, thus creating a value out of it. This value contributes to the promised delivery of better healthcare for the society, showing Horizon 2020 as a prolific policy. Is interesting how they use one particular, specific case to support the need of a long-term, multi-national social policy (in the sense that the particular does not demonstrate the general).

We can relate this to what I previously elaborated about the *Colloquial wording*, and how the SS12 (robots and the elderly) proposes to provide robots to the elderly population in the EU. This *Story* includes, within 4 out of 15 paragraphs, the situation of Isabel Neto: a 79 year old woman, trying a robot prototype at home, which would allegedly help her on daily duties. The first aspect that we can notice, is the very title of the *Success Story*:

"How robots can enhance the lives of Europe's elderly citizens".

It has no question mark, which means that Horizon 2020 is not questioning whether this would be possible, but rather affirming that the robots will help. It is also written in present tense ("can enhance"), undermining the fact that robots are only a potential result. It is not portrayed as to happen in the future, but instead they represent it as an already-happening situation (a case of the blurred of the futures promised, discussed in the State of the Art). Next, in the subtitle, they contextualize the story with some background about this woman:

"Seventy-nine year old Isabel Neto shares her home with Hugo, a robot that's been designed to improve the quality of life for elderly people living alone. How, and to what extent, is that possible? […] *Ten years ago, Isabel suffered a stroke. She thinks the robot can be eventually be useful for her".*

And then, the woman herself speaking:

"'Nowadays I feel more or less fine; I have all my faculties', explained Maria Isabel Mendes Neto. 'But I will get older, and maybe more senile; I could for instance lose my glasses. And it would be nice if I could ask the robot to look for them. That would be really helpful to me".

Almost by the end of the article, there is the personal account of another person:

"'I live alone at home, so this robot could eventually be helpful for me in various aspects', Andre Antunes said. 'The robot could help me remember when to take my medication. That's important to me'".

These paragraphs are a clear example of the aforementioned strategy of sensitizing the reader (through elderly persons who suffered a stroke, being used as a pitiful subject). Quoting this lady using the robot has two purposes: the first one, as discussed, to share her personal experience. The second one, most important, to show also her own idea about how this robot can be helpful for her (which might or might be not the reality). The same with Mr. Antunes: they share the complicated situation of some elderly, to promulgate the sense of a problem, and a corresponding need. They finalize the text with the already quoted "whatever the cost" (earlier discussed as *Colloquial wording*). These declarations exemplify the use of personal stories as a mechanism to generate promises of a better future for the older people and, in consequence, construct hope.

We can find the last example in the SS15 (robots to help diabetic children). The first paragraph of the text starts with the experience of a family involved in the project:

"Ilona lives in a small town not too far from Amsterdam with her husband and kids, Tatum and Arjan. Both Tatum, who is 11, and her brother Arjan, who is 13, have diabetes".

The sentence includes the name of one of the patients, the place in which they live, and the composition of the family, thus contextualizing the reality of the people they are talking about. There also is a 'humanization' of the patients, portraying it as a 'normal' European family. The text then shares the experience of the mother of those children:

"'The school is half an hour by bike. So every morning a kid needs to think what he's going to eat during the day, and how much insulin is needed. They need to keep that in mind throughout the day to come back home safely, without getting low blood sugar somewhere on the way', explained Ilona Geurts".

In this paragraph we can assert the sense of a problem. It is remarkable the nature of the problem, in the sense that they do not expose a generalized social issue, but instead an individual, specific problem that one person has (again, enacting the need of a general multi-national health policy, based on one particular case). The last quote from this text comes directly from the kids:

"'Kids don't really read books that much anymore! We prefer playing with our smartphones', said Tatum while Arjan added: 'yeah, books are a bit boring, tablets are much more fun'".

It can be expected that, in general, a kid would normally choose to play with a robot rather than reading a book. Horizon 2020 is using those two kids who find this project "fun" and that "books are boring", as an argument to sustain its contribution: a value-making process based on the patients' perception.

5.2.3   Scientists speaking: the authoritative body for spreading scientific knowledge

The patients are not the only people whose words are quoted within the *Success Stories*. Also scientists working on the research projects, as well as related businessmen, have their say. Is interesting to be analyzed, since they refer in different ways than the patients to the involved projects. If in the previous subsection we could see that the patients' quotes did not supply any additional knowledge, here is not the case. Normally, scientists describe the current problems, or comment the associated promises, sustaining the importance of supporting scientific research.

After reading the *Success Stories* which include this category, is clear that the problems, needs and promises can also be transmitted without specifically incorporating what the scientists said. The 10 *Stories* which do not include any scientists speaking prove so, since they are not any less clear to offer their promises (and to transmit information in general). Then, quoting the scientists might not necessarily yield additional scientific knowledge. In fact, in some cases the words of the scientists do not provide different angles to understand what the projects are doing. Sometimes they merely rephrase already said things (by an 'omniscient narrator'), adding no new information. We can consider the fact that now are scientists the ones speaking, as a strategy to reinforce the need of research policy. This can increase the potential impact on the readers: when the scientists speak, the narration of the promises shifts from the recurrent "you" (which I elaborated in the first layer) to a much more familiar "us" and "we".

In general, we can consider the narrative of the researchers as a form of storytelling, which enables the understanding of a certain specific 'culture' of organizing information. Here we are talking about the rules that govern this type of storytelling, such as how an emotional component is unfolded within these stories, and how the building of a community is performed. Therefore, what the scientists narrate is a whole entanglement between science and society (Felt & Fochler, 2013).

This is a recurrent category, present within 13 documents, from which six correspond to RMT-type. These kind of *Stories* could be benefited by the further explanations from the researchers, so as to bridge a (possible) communication gap between the knowledge-production centers and the society. There is the risk that the public might not grasp the core of the projects explained within those texts, since they elaborate about in-lab work instead of concrete products, which would be more tangible to the population (such as the TD-type projects).

Moreover, within some cases, the text includes the position that the person speaking holds within either the project structure, university, or institution related. We can conceive this as a way to raise the 'entitlement' of those people by Horizon 2020, presenting the promises in the form of scientific knowledge, settling the potential issue of who is a knowledge authority accredited to promote hope.

This discourse strand also has another noteworthy dimension. In scientific storytelling, specifically popularization of science, those researchers can be sketched as "those 'who have made it', as elite scientists who deliver both scientific excellence and societal relevance" (Felt & Fochler, 2013, p. 83). This helps to portray the EC as contributive for the professional development of scientists, in a value-making process. A clear example is offered by the SS10 (helping people with Down syndrome), which includes several declarations from the scientists. One of them is the following:

"'After 17 years abroad, the Marie Sklodowska-Curie fellowship helped me set up a lab back in my home country Slovakia, where we identify chromosome segregation problems leading to the production of sperm and egg cells with an abnormal number of chromosomes that is typical of several genetic diseases such as Down syndrome', says lead researcher Juraj Grega, Department of Genetics, Comenius University in Bratislava, Slovakia".

This account provides two interesting pieces within the enactment of success. First, the researcher tells his experience abroad, and second, how the fellowship he was granted was helpful for him professionally. Remarkably, this paragraph is placed before the text explains what the research is about. Therefore, Horizon 2020 tries to demonstrate their societal benefits before they explain what they are actually researching. Here, society is not conceived as an 'external' entity: the scientist says "we", in a more inclusive tone. Though this account poses a biomedical problem (abnormal chromosome segregation), it contains no promises and is not a generator of hope. Those were found later in the text, when they finally refer to the *EUROlinkCAT* project:

"'This enhanced information will allow optimization of personalized care and treatment decisions for children with rare congenital anomalies', notes the project team".

The words of the researcher transmit to the public a promise of better healthcare, creating the corresponding hope. We can note that these words could fit into the narrative even if they were not directly said by a researcher, since if we take the quotation marks away, the background of the narration seems unaltered. This exemplifies the previously said about the scientists speaking as a rhetoric resource, which provides more momentum to the narrative, instead of adding specific information. The SS17 shows this as well, including several passages with words from the involved scientists:

"'We are tapping into innovations in optical mapping, genetic analysis and detection technologies and applying them in a way that has not been tried before for medical diagnosis', explains Yuval Ebenstein, principal investigator at the NanoBioPhotonix Lab of Tel Aviv University, which is coordinating BeyondSeq. 'Trials conducted so far suggest that the approach results in diagnostic tests that are orders of magnitude

more sensitive than current diagnostic tools, particularly for some forms of cancer that are especially hard to detect at an early stage'".

"Compared to current genetic and epigenetic diagnostic tools, such as DNA sequencing based tests that look for biological markers of mutation and disease across a batch of DNA molecules, the BeyondSeq technology is capable of detecting biomarkers in individual DNA molecules. 'With single-molecule detection it is possible to identify a genetic or chemical alteration in each individual cell one-by-one, even in a large blood or tissue sample, long before it could be detected with current diagnostic tools', Ebenstein explains".

"We have taken an unusual approach to developing this technology, setting up different research teams and focusing on testing different applications to determine which are likely to be most effective and have the greatest impact in practice', Ebenstein says. 'This has led to some very successful results and technologies we should be able to commercialize in a matter of years that are already attracting interest from investors and companies in the healthcare sector'".

This scientist describes emphatically what their work is about, and is notoriously enthusiastic on providing several promises. He also promotes hope based on the innovative character of the project and its commercialization possibilities (further developed within the next subsection). The second of those paragraphs also has a particularity: it uses simpler words ("genetic or chemical alteration") to rephrase what with more complex words was earlier said ("epigenetic diagnostic tools", "batch of DNA molecules"). This improves the science communication process, with the scientist acting as a storyteller, 'press-packaging' science, and converting knowledge into another form of capital.

In other cases, what the scientists tell is mostly the same as what has already been written. Moreover, scientists can also state potential benefits which already are a reality, sounding more of truisms. When the statements do not add particularly newer data, but explicitly remark that a scientist is speaking, it appears that the emphasis is not on the information itself, but on the carrier of the message. Someone with an *authority* to speak about science. We can interpret this as a cliché: the contribution of the text relies on the *who* rather than on the *what*.

We can appreciate an example within the SS07 (a test for detecting a woman's cancer risk). After the 'omniscient narrator' had already elaborated problems and life-saving promises related (and basically all the information regarding what this project is about), in the last paragraph of the document they include the claims of a scientist:

"'It's important to provide the women concerned with clear and easily understandable information that spells out the pros and cons of taking the test or not', says Odette Wegwarth, project leader and senior research scientist at the Harding Center for Risk Literacy. 'Only then can they really evaluate its potential benefits and harms and make an informed decision'".

In general, providing the information regarding the benefits and risks of a given medical procedure, so the patient can make an informed decision, already constitutes part of the normed correct medical practice. While the idea is not to be evaluative about the promises, it is curious that this quotation is incorporated within the text, since it adds no new information. Therefore, is not quite clear how contributive this is in terms of the knowledge provided, thus being more of a truism. They also mention that the person is a "project leader and senior researcher". We can tie this with some communication strategies that they earlier described within that *Success Story* (though not the direct quote of a spokesperson):

"As part of their work, the researchers are also examining the legal, social, ethical and behavioral issues related to the implementation of the risk prediction test. They are also developing ways of communicating the complex medical information extracted from the tests".

This is similar to what I previously stated: examining the legal and the ethical dimensions of the implementation of a medical procedure, is already mandatory within the medical procedural normativities. This means that it is not a special feature of this project, but instead quite general. The second sentence recalls explicitly that they are trying to bridge the (potential) science communication gap, effectively proving themselves upon the society as policy makers. This notion is noted again in the SS08 (diagnose of hypertension). After five paragraphs in which they depict several problems and promises, in the last one a scientist speaks, adding yet another problem:

"'In addition to increasing blood pressure, these hormones cause organ damage, they modify the blood vessels and the heart and patients have a decreased quality of life', says the project's scientific co-ordinator Maria-Christina Zennaro of France's Institut National de la santé et de la recherche médicale (INSERM). 'If we find a simple way to identify these patients whose hypertension is due to hormones, we can target them with more appropriate treatment and we would have much more success […]. *Diagnosis has to be made more rapidly, not by specialists in big regional centers but by local doctors anywhere'".*

There is again a scientist telling a self-evident truth. Finding a simpler way to diagnosis is, by default, the desired situation of every disease and health condition. It is not exclusive to hypertension or to this project. It will *always* be desirable. Then the importance of the quote is again about the *who* instead of the *what*: the scientist being a story-teller.

Other *Stories* quote people who are not only in-lab scientists, but also workers from partner companies involved (some holding high managerial positions). We can expect that within their discourse, they have a personal motivation to enforce the idea that these developments are a valuable solution. A priori, one can think that these non-scientists might be more likely to express some non-scientific benefits or outcomes of the projects. We can note a good example in the SS23 (airbag helmet for bikers), after they explain what this product will solve, the project leader speaks his voice:

"'We have made what some said was impossible, possible', says Fredrik Carling, project lead and chief executive of Swedish company Hövding that makes the helmets. 'We have developed the airbag technology so that it is activated in the event of a collision and is more effective than traditional bike helmets'".

This is the opening door for forthcoming statements about the business prospects for this project (further analyzed within the next layer). Mr. Carling enacts explicit success, assuring that these helmets are more effective than the regular ones. Considering there are no figures to support such a claim, we can think this can be his mere personal idea or a marketing motto. Also, the mindset he exposes of 'making possible what was impossible' is an example of storytelling and popularization of science. The last part of this *Success Story* has a subtitle called "*Next up? Interaction*", where Mr. Carling tells what is next for this development:

"'There is now an opportunity for the invisible helmet to speak to the user', says Carling. 'We want to connect it to the surrounding world so that it can interact with traffic to ease movement and avoid dangerous traffic situations'. The product will also be able to connect to smartphones and apps, which adds to its potential for development, he adds".

Here, he comments the future success promoting the future of the business. We can observe this also in other *Stories*, such as the SS03 (development of bacteria-resistant prosthesis):

"'Once we have these molecules, we'll test them against most common pathogens, we'll analyze their safety, and only then we'll be able to find the best way to apply them on implants, using nanotechnology and surface coating', says Pablo Roza Miguel, Institute Manager with MBA".

The document uses the words of one of the scientists to explain more in detail how they are performing the research. Interestingly, they mention that this person is not an 'ordinary' scientist, but a manager with an MBA, insinuating perhaps that he has a better understanding of the economic rationales involved in the project.

The analysis presented in this layer shows us the use of three main pieces of rhetorical structure within the *Success Stories* to persuade the readers. A common point between these rhetorical resources, is that they tend to stress the information to emphasize certain situations. They could omit that the potential new drugs are life-saving; the promises of better treatments could not include the dramatic stories of patients; and the technologies can be explained without quoting the scientists, and the information would still be clear.

5.3   Third layer: the research projects' structure

This subsection studies how the *Success Stories* construct and enact certain values, depending on how they present the infrastructure of the research projects. This broader perspective will allow us to understand what the projects are about, and how some of their features are shown to the society, in order to develop the value-making process, and how Horizon 2020 envisions their imaginaries.

This layer was elaborated considering a discursive knot in which the following discourse strands converge: innovation, business opportunities and economization (as enabling brighter economic futures); internationality of the projects; people (patients) involved and the monetary resources invested. As we can note, these categories tend to develop specific features about the projects which explain how the research is conducted.

5.3.1   Innovation, business opportunities and the economization

The first interesting aspect of the more *technical* infrastructure of the projects, is how the *Success Stories* portray their innovative character. Innovation seems published here as having an intrinsic positive value to justify the irruption of technology, not only into biomedical institutions, but also into the market. Within some of the *Stories* innovation is apparently recalled as *the* path to go for solving biomedical and societal concerns, constituting an example of the role R&I plays within the bioeconomy. Some of the documents I analyzed were expressive depictions of the *innovate or die* stance, which is a (somehow colloquial) way of considering innovation as the main driving force for the future, especially within R&I circles. This reminds us of the idea that science gets legitimized when researched and performed through innovation (Godin, 2014).

While I will not question the innovative character of the projects[16], the interesting point is that all of them seem to be naturally innovative. So what I will analyze here is how their innovative nature is (explicitly) emphasized and exploited. For instance, we can say that cancer patients are not worried whether their treatment is regarded as an innovation or not, as long as they are offered a life-saving possibility. It is also interesting to observe what type of innovation the *Stories* talk about.

The following example, within the SS06 (development of new anti-cancer drugs), shows the 'standard' use of the innovative within the documents. Here, is quite clear that the drugs (instead of a procedure or business) is the potential innovative outcome of the project:

"If successful, INPACT will develop innovative drugs able to kill bacteria and tumour cells as well as break through the blood-brain barrier. This means they could be capable of directly targeting and treating brain tumours and brain-hidden pathogens".

It is remarkable that the use of the innovation is embedded in a strong promise, which offers solutions for cancer and infectious diseases, and also uses conditionals ("if successful" and "could be capable"). This might not be coincidental, but instead a strategy to make the promise more appealing, if we consider that is the same paragraph which, in the very end, promises to save lives (earlier elaborated when they used the *life-saving* rhetoric). The 'take-away' message is that innovation can beat cancer. We can consider it as part of how Horizon 2020 represents the European commitment to innovation.

In general, when it comes to drugs, vaccines or medications, innovation is constructed not necessarily as a value itself (the end), but as a route (the means) to enact success. This is done through the promises the *Stories* embed. We can find an example in one of the most promising projects, the SS11 (HIV vaccine), which highlights its innovative nature as follows:

"Pre-clinical models will be used to complement human studies, and to select novel immunization technologies to be advanced to the clinic. To shift the 'risk curve' in product development we will develop innovative risk prediction methods, specifically designed to reduce the risk associated with the late stage preventive or therapeutic vaccine failure, increasing the chance of discovery of an effective vaccine".

Here the *innovative* is not the outcome of the project itself (the vaccine), but the means to achieve it (the risk prediction methods). Therefore, we can assert that as long as *something* within the whole research process is innovative (regardless what), it will be used by Horizon 2020 in the value-making process. We

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[16] Since is not the objective of my thesis to discuss what is innovative and what is not, or how innovative are certain projects, for this purpose I only considered those documents containing the keywords "innovation", "innovative", or the alike, instead of deliberately assuming that a given project is innovative (or not).

can note this within some cases in which innovation is exacerbated as the ultimate problem solver, such as in the SS16 (new liver dialysis device), whose subtitle says this:

"New technology could soon revolutionise the treatment of liver failure: an innovative dialysis device is currently being trialled. It aims to greatly improve the outlook for patients, helping them to recover or supporting them while they wait for a transplant, say the EU-funded researchers taking this innovation forward".

The first noticeable aspect is how the innovativeness of the project is emphasized: it is recalled twice within a space of 4 lines. Another interesting observation is that it is included in the subtitle of the document, receiving more importance within the text, being the very first information the reader will absorb. After these few words, one can already know that the project is innovative, but there is no precise information about what this development is about. We can state that 'proving', or presenting the projects as innovative, becomes more important than rigorously explaining what the researchers are actually doing. When we analyze the wording, we can learn that the *innovation* is used along other words which accentuate it ("new technology", "revolutionize", "greatly improve"). This, along with the position within the text (at the beginning, instead of in the middle), and the fact that it is embedded in a strong promise of better healthcare, can be also considered a whole strategy to collect support and momentum upon the reader. The paragraph finishes using an "EU-funded", reminding the reader that the EC is an innovation-booster, self-validating themselves as producers of contributive policies, and recalling the 'mindset' of innovation as being the future of the EU.

Up to this point, we can clearly observe innovation as being part of a scheme within this FP which will solve societal problems. Not only it is praised by Horizon 2020 themselves (through the omniscient narrator), but also by other external people. We can appreciate an example within the SS17 (detecting cancer on a DNA molecule), where one of the researchers talks about its innovation:

"'We are tapping into innovations in optical mapping, genetic analysis and detection technologies and applying them in a way that has not been tried before for medical diagnosis', explains Yuval Ebenstein, principal investigator at the NanoBioPhotonix Lab of Tel Aviv University".

This is the only quote within the text in which innovation is recalled, and it was said by a researcher (so is not the EC personnel the ones who classified this project as innovative). We can expected that a researcher from an Israeli university will naturally come up with such term, considering how important innovation is as a key concept for development in that country. In general, innovation in Israel is shown to the world as an example of a flourishing economy, almost being part of a national identity (Shteinbuk, 2011; Forbes, 2013; Bloomberg, 2017). Is interesting to notice what they are exactly calling 'innovative'

within this project: "optical mapping", "genetic analysis" and "detection technologies". All of them are concepts which sound innovative on their own, despite we can assume that most of the people is not likely to understand what they mean, but if 'innovative', then should be supported. We can consider this as the construction of innovation as a continental value.

In other cases, the sense of innovation is evoked within the context of business and commercialization. As I said before, within biomedical research, one can think that a project will be successful if, at the very end, more people can access to better treatments (measurable on lives saved, for instance). But in general terms, if a given development means no business innovation, it does not imply that it can be deemed as unsuccessful. In this case, seems that the EC is creating the business innovation as a value on its own. The SS04 (treatment for melanoma) is an emphatic example, transmitting benefits for the public, along the potential business-wise positive outcomes for young researchers. But this will not necessarily be materialized into better healthcare solutions for society:

"It is a network backed by the EU's Marie Sklodowska-Curie fellowship programme, as part of plan to advance a scientific discipline while fostering excellence and business innovation in a new generation of researchers".

"Networks supported by this type of grant are expected to support young researchers not only with training in their chosen field, but also with opportunities to develop their creativity, entrepreneurship and innovation capabilities. They typically involve partners from several sectors, enabling participants to experience different types of research setting".

"Led by the University of Leeds, the network involves a variety of academic and commercial partners who are collaborating to offer the participating early stage researchers an innovative, interdisciplinary training programme. It was set up in June 2016 for a period of four years".

It is also interesting that they call the training program as *interdisciplinary*. Interdisciplinarity in biomedical and life sciences research, has been defined as "mechanisms of knowledge production that traverse conventional disciplinary boundaries, and which have often been established to tackle specific scientific, technical or societal problems. It has been championed as an important facilitator of R&D and as a crucial driver of innovation for at least the past two decades, particularly within biomedicine as part of the broader translational medicine policy agenda" (Gardner et al., 2017, p. 34). This means, we can convey it as part of the valuating process, which would help achieve societal goals, while incorporating values for fostering innovation (ibid). We can bind this with the EC's RRI framework, where they proclaim that outcomes of scientific research policy will be enhanced, if science and innovation are directed towards societal needs. This is more likely to be accomplished if a set of several perspectives participate of the

R&D process (Von Schomberg, 2013). Once again we have a case of projects solidly classified as innovative, without providing details on what the developing technology is about, being somehow vague and unspecific in this regard… yet innovative, and likely to generate business opportunities. Mentioning that a project is innovative before properly explaining what it is about, shows us how important is the appraisal of the innovation practices, reflected in the narrative Horizon 2020 uses.

The afterthought left is that some *Success Stories* were written seemingly not to portray better healthcare services, but instead better business opportunities. This leads us to think that innovation and the subsequent market benefits are constructed as a value by Horizon 2020. Innovation policy seems staged from an economic dimension, rather than from a public health one. The SS18 (new test for pancreatic cancer) expresses this idea. Overall, this *Story* gives overwhelming importance to the commercialization strategies (six paragraphs), especially when compared to the explanations of what the technology is about (only one paragraph). These are the first two paragraphs of the text:

"The Immpact project, which focuses on the final stages of the development of the new blood test, was launched in June 2015 for a duration of two years. It is implemented by Swedish start-up Immunovia. 'The objective is to carry out the studies and commercialization activities that are needed to take our invention from a prototype to a test that is available to the public', says CEO Mats Grahn".

"The principle behind Immunovia's promising innovation is simple: pancreatic cancer leaves traces in the blood, Grahn explains, and these traces exist well before the illness causes distinctive symptoms. All you have to do is find them – and that, of course, is where things get complicated".

The first quote opens the document showing, immediately, that the project is innovative, and that there are important commercial perspectives. This is not mentioned by the 'omniscient narrator', but by the CEO, who is furthermore quoted several times (while no in-the-lab researchers speak). We can assert this as a strategy to increase the importance of the sense of innovation, through a science popularization storytelling process. Until that point (third paragraph of the text), no details are provided about what the research is about, and one can roughly understand on what grounds it is being called innovative. The description of the project, so far, is quite broad and unspecific, but is already tagged as innovative. Then there are two more quotes in which innovation is included:

"The Immpact project is entirely funded by the EU, as part of a Horizon 2020 scheme dedicated to highly innovative SMEs. This backing has enabled Immunovia to organize the remaining steps in view of the commercialization of its product in a timely fashion and helped to create confidence among potential investors, Grahn notes".

"Reimbursement by health insurance providers will be crucial to the uptake of IMMrayTM PanCan-d, and the company is hoping to secure the required approvals in the United States, Scandinavia and Germany as a first step. Further countries could swiftly follow, enabling Immunovia to take its innovation from Sweden to the world".

Both paragraphs are under a subsection named "High hopes", therefore innovation is explicitly tied with hopes of better access to healthcare. These quotes show that the innovative part of the project will not necessarily imply better biomedical futures for the society. Instead, innovation is rendered as an intrinsic asset of this technology, which in turn should be materialized into better commercialization options. The last quote reinforces the aforementioned. The expected international reach of the technology is not recalled as a means for more people to solve their health issues, but as a benefit for the company (which seems to be highly valued by the EC). They are explicitly spreading the enactment of success, strongly and directly linked to the potential commercial prospects that this project has. This is clear when they say that this technology can be exported, not in form of medical solutions (e.g. a treatment), but as an "innovation", this is, as a business enterprise. These other two quotes from this same *Story* reinforce this idea:

"The blood test for pancreatic cancer – or for the vastly predominant form of pancreatic cancer, to be precise – is the first commercial application of this technology, Grahn explains".

"Immunovia selected pancreatic cancer as its first application because the clinical need was manifest, Grahn notes. 'There is no solution whatsoever on the market at the moment', he says".

These accounts from the CEO are quite emphatic to refer to this development as an application which achieved positive results, mostly because of being an accurate response to the market's need. It is not portrayed as a technology coming to address healthcare issues. We can identify the imagining of better futures sustained by the value-making of a commercial accomplishment. I found the epitome of this conception within this quote from the same *Story*:

"His enthusiasm is widely shared, if the ebullient response to his company's stock market launch on 1 December 2015 is anything to go by. Immunovia's initial public offering on the Nasdaq First North was oversubscribed five times, with share prices shooting up by 60% on the first day of trading".

Such a prosperous market capitalization from this start-up only shows that the project has been – up until that point, at least – auspicious. But since the stock market fluctuates daily, success can hardly be enacted as a result of a one-day behavior. Therefore, we can recognize this as a strategy to portray success based on a small-scale, one-time-event commercial success of the involved company, instead of basing it on

better healthcare futures. Not only that, but also the rising of the share prices only benefits the owners of the companies, not society in general.

Other *Success Stories* also show the business and commercialization opportunities, not related to the innovative aspect of the projects, but expressing these opportunities in different terms. One of them is how they can mean a possible career opportunity for researchers/scholars. We can interpret that providing this possibility of better job futures is a process of value-making (increasing the scientists' individual value within the job market), thus justifying the need for this research policy. But this will not necessarily purport better healthcare futures for society. Still in such cases the *Success Stories* praise the collaboration that private institutions provide (referred as "partner companies" or "commercial partners" recurrently). The SS01 (a better probe for cancer surgery) uses this resource in its closing paragraph:

"The project's partner companies are also involved in the research and training of fellows, and in providing basic entrepreneurship skills, opening up a possible career path for them in the industry".

We can find another example in the SS08 (diagnose of hypertension):

"To do this, the researchers have paired with inserm Transfert – the technology transfer company owned by INSERM – to identify and liaise with potential commercial partners".

As we can see, the mentioned activities are being carried out not by the researchers themselves, but by 'partner companies'. They are supplying "entrepreneurship skills", which in turn are likely to offer better working futures for the scientists "in the industry". The fact that they refer to the companies as "partners" is interesting. Using that word evokes a sentiment of collaboration and (mutual?) help, which I also point out as a strategy for gaining public support for the commercialization activities. This is another example of the commodification of science (sunder Rajan, 2012a).

Another form in which the *Success Stories* recall the business opportunities generated by the collaborating private institutions (industry in general), is the way those opportunities will lend technology and expertise. Sometimes, public institutions are underfunded, which impacts the possibilities of research. The higher budgets that the private sector tend to offer, would come up to solve this issue, and seems to be praised by the *Stories*. We can observe this within the SS06 (development of new anti-cancer drugs), when within the subtitle, they mention the advantages of the participation of the industry:

"Infectious diseases and cancer are the focus of the EU-funded project INPACT, which combines the expertise of both academic and industrial partners in protein engineering to develop new drug leads. […]

The project consortium is made-up of partners from academia and industry with specialized proprietary anticancer technology and know-how".

They show the industry-provided knowledge to this project as an inherent value emerged from the policy itself. Not only the know-how, but also the "proprietary anticancer technology". This could be the case of patents, or equipment, which otherwise would not be available to the researchers. The collaboration with the industry is constructed as a vital piece of the enactment of success, but the reality could be the opposite: if the industry does not evaluate a given project as worthy, they are not likely to provide their resources (knowledge, technology, workforce). This might mean a drawback to the proper development of the research (since its importance would depend on private and not public evaluation criteria). This also leads us to think that there are several forms of property emerging, thus being not clear whether these developments are 'public' or 'private', but a case of a hybrid between the two. Hence, while the profits for the industry seem promissory, is unclear that the public will also be benefited (Sunder Rajan, 2012a).

We can find other cases which exacerbate this, in the sense that the potential benefits of these projects are entirely shaped as helpful to the industry, without expressing contributions to the public whatsoever. Success then is not enacted portraying better futures for society's healthcare access, but for the benefits of the business. This observation ascribes to the idea that if healthcare businesses are benefited, then the society also will, being a case of the bioeconomy being inserted within the economy (Doezema & Hurlbut, 2017). We can appreciate this within the SS12 (robots and the elderly):

"Now the researchers are looking ahead at ways to bring their technology closer to the market. 'If the economic (health) agents are convinced that this technology can actually help to address the challenges (in Europe), then that will create a market that will automatically feed the development of these technologies', said Jorge Dias, Project Coordinator GrowMeUp Project".

According to this paragraph, the outcome of the project would be the commercialization of robots to help the elderly, but the question is evident: how many of the elderly would be able to afford them? As I commented before, providing robots to the elderly in Europe may not necessarily be a sustainable, long-term solution for the population ageing problem. While my idea is not to be evaluative towards the feasibility of this project, the analysis is that this project will not necessarily implicate an improvement of the life conditions of those people. Instead, more of an auspicious business opportunity. We can recognize the same within the SS16 (new liver dialysis device). The commercial possibilities are appraised at the extent of being portrayed as the sole benefit of the research program. Before explaining what this device is about, they highlight that the commercialization is expected to begin as soon as possible. At this point,

one can ask if success is enacted based whether on the potential business benefit, or on the access to better healthcare for society. Besides that, we can identify the possibility of commercialization success as an intrinsic value constructed thanks to this project. The text begins with the following paragraph:

"*The ALIVER project is conducting clinical trials of Dialive, a dialysis device designed to help tackle acute-on-chronic liver failure – cases where the acute condition unfolds on a backdrop of chronic liver disease. The partners involved in this endeavor plan to obtain approval for commercialization of the device in the EU before the project ends in September 2020*".

We can notice a robust promise (helping on chronic liver problems), even before the problems are stated. We can grasp the same from the SS17 (detecting cancer on a DNA molecule), again a case of the commercial possibilities being the positive potential results. Not only that, but is also another promise they provide before expressing which the actual problems/needs are. The following quote is the first paragraph of the text. So far, they have still not provided any details of what this technology is about:

"*The technology, the result of ongoing research in the EU-funded BeyondSeq project, could be commercialized and ready for use by doctors within a few years, with diagnostic hardware for clinical devices already under development*".

And the closing paragraph of the same *Story*:

"'*This has led to some very successful results and technologies we should be able to commercialize in a matter of years that are already attracting interest from investors and companies in the healthcare sector*'".

The SS21 (improvement of cancer treatments) proves that the appraisal of the probable market opportunities is a generalized goal within Horizon 2020, explicitly proposing business promises as a beneficial outcome. Near the end of the document, in fact, there is a whole subsection under the title "Business benefits" (where I found the following quotes). We can consider this as a valuation practice, in which value is created towards the business skills of the people involved in the project:

"*Another of CanPathPro's aims is to produce outcomes that businesses could develop into products, says Lange, particularly the computer model platform*".

"*Two of the project's nine-member consortium are SME specialists in industries related to medical research and with a strong track record in commercializing scientific innovation, says Lange. They will develop a business and commercialization plan to show how companies could use the project outcomes to generate new business and jobs*".

These words are provided by a man called Bodo Lange, who is not an on-site researcher, but rather a project coordinator working for a private company. The fact that is not a 'lab person' helps to frame his discourse: his goals are determined by the possible success of the company he works for (which in turn are translated into Horizon 2020's goals). Finally, there is the following quote, interesting since it sustains the idea that Horizon 2020 is a fruitful policy. More specifically, based on the use of promises of commercial developments (and how they have made this possible) to enact success. A discursive practice which resembles of a circular reference:

"Lange is positive about the project's potential […]. *He adds that the EU funding under a Horizon 2020 call for technologies for biotechnology was essential. 'This project would only be possible with this type of call'".*

It does not seem exaggerated if we say that the EC is much too focused on seeking and extracting business and industrial prospects out of their research projects, instead of the public benefit. Especially if we look at what the SS23 (airbag helmet for bikers) proposes. This case shows a concrete, already existent reality:

"The product is now being sold in 16 countries and half of all wearers did not previously don protective helmets".

Is interesting how they name this security device a "product" (which generates the idea of a marketed object), and that is "sold" (market activities). According to the text, thanks to this project, half of the users began to wear a protective element for the first time. They do not mention this as valuing the improvement of the bicycle riders' safety, but instead, how a given product has been a commercial success, valuating therefore the positive market response. This follows the idea that a classic demand-and-supply economic paradigm can produce positive outcomes for healthcare. In simple terms, this reinforces the corporatization of the knowledge production in life sciences, tending to follow corporate agendas and practices (Sunder Rajan, 2012a).

So far, I have explained what I have found in regard to how both innovation and business opportunities are enabled as constituents of better futures. A third aspect closely related to these two categories is the **economization perspectives** that Horizon 2020 can yield.

Within this **sense of economization**, I have considered the potential savings of money and time, both for the patients and the practitioners, thanks to new technologies. It is contributive for the analysis since it provides another reason for which the people who read these *Stories* should support this FP. We can observe that success is enacted generating the idea of being a driving force for the bioeconomy (which explains the relationship with the innovation and business). This analysis illustrates that economization is

always characterized as discretional, qualitative and not exact. This can mean that this strategy by Horizon 2020 might have been used to gain a more emotional than rational support. This would follow what I earlier stated as the 'emotional manipulation' and the promises of technologies sometimes expensive or not necessary to increase people's well-being, and the subsequent risk of the paradox of hope (Petersen, 2015).

An interesting observation is that within all the four **medical equipment**-type *Stories*, the *sense of economization* is present. A priori we can assume that, in general, there is a popular conception about medical equipment being extremely costly. This can lead us to think that these projects demand massive funding, sustaining the need to justify the investment in the economic benefits that it will imply. We can also note this as an example of how the development of biomedical equipment (or the lack of it) is both a health problem and an economic one (Sunder Rajan, 2012a).

Three out of these four ME-type documents are about cancer (and the other one about liver conditions). One could think that the enactment of success of cancer-related projects, could solely rely on the life-saving possibilities. In turn, this would mean that the use of the sense of economization becomes unnecessary. But surprisingly, is not the case: only one out of those 3 ME-cancer projects use life-saving promises (the SS01 for a new probe for surgery). The other two (SS02 for a new portable prognosis device and SS20 for the microfluidic chip for leukaemia treatment) do not, and are about new equipment to be used at the prognosis phase, visibly oriented towards in-lab work. These costly two projects (funded with €5M and €6M respectively) compensate the lack of the *life-saving* with the promise of economization.

Within the SS02, the promises tied to economization sound subtle and not necessarily subject to debate. They would imply an improvement of the situation the patients must already face, and in particular, high costs to be reduced. But for cancer detection, visions of better futures could be based on promises of reduction of the pain and the waiting times for the patients' examinations, being that enough so as to be considered positive for society. This is what I found:

"Most types of cancer biomarker analysis require test samples of body tissues or blood, which are then sent to a specialized lab for analysis. This process can be painful, take a long time, and cost a lot of money".

In this case, the EC constructs a value promising a cheaper treatment. Another relevant aspect is that the money involved is described as "a lot", which is an unspecific way to shape the problem (considering that recalling actual figures should be simple to do). While this cost reduction should mean better access for poorer patients (a societal benefit), it does not remain totally clear. The SS20 (personalized treatment for leukaemia) invokes the possibility of economization as follows:

"The device will utilize recent advances in microfluidics technology, which have enabled microfluidic chips to be manufactured with in-built electronic microcontrollers that are lightweight, shock resistant and low-cost yet capable of meeting complex drug flow control requirements".

This fragment explicitly tells the lower cost of the devices as part of the potential result. The wording sounds somewhat difficult to understand for lay people, apparently more oriented towards scientists (noticeably they are developing, precisely, an in-lab device). This sustains the idea of 'replacing' the life-saving promise with the sense of economization. We can understand this as a value-making process, in which the lower cost, or economization possibility in general, is a positive enough outcome, then should be transmitted as such to the public.

The SS08 (diagnose of hypertension) recalls again the problem of the patients lacking a proper diagnosis and treatment. There, they tackle down the high cost of the procedure, and is enmeshed with the rest of the promise of better healthcare access in general:

"These conditions can be relatively simple to treat, either through drugs or surgery, which can completely cure the associated hypertension. But they are difficult and expensive to detect, and can only be diagnosed in specialist centers, so many patients miss out on an accurate diagnosis and effective treatment".

Another consideration is that some of the documents are not clear on explaining whether the promise of cost reduction is meant for the patients or for the industry. The SS13 (new pill for heart diseases) is one example. This mixing of life-saving and economization features sheds light about how Horizon 2020 performs their value- and valuation-making processes. This is worth of analysis especially if we consider that patients with cardiovascular diseases (the beneficiaries of this new drug) have a highly inelastic willingness to pay. This is reflected in the assumption that, when a life-saving situation is at stake, a person is prone to pay for medicines regardless the cost. They emphasize this as part of the narration of success, where besides promoting the hope of a potential life-saving new medicine, it is elaborated the possibility of a cost reduction for the treatment. At first, is not clear if this cost-reduction promise is for the patients or for the drug producers:

"The use of polypills could simplify healthcare delivery, improve the cost-effectivenes of treatment and support the comprehensive prescription of heart protective drugs".

But another paragraph within that *Story* confirms that the cost-reduction is meant for the industry:

"The SECURE consortium, which includes Trinomia developer Ferrer International, will also measure and compare the effect of standard versus polypill treatment strategies on healthcare resource use and costs".

Now seems to be clearer that the economic benefits are likely to be received by the businesses, and if such is the case, some could think that it will trickle down to the patients. But, in general, a cost reduction for the industry (producers) does not necessarily imply a price reduction for the customers, so the social benefits are unsettled. Again, the bioeconomy is inserted within the economy. We can also notice this within the SS14 (stem cell treatment for diabetes), where the sense of economization is found in the promise of cost reduction, yet is unclear how meaningful it can be:

"NEPHSTROM will also develop and validate a new combined manufacturing approach that improves the production of the MSC drug and reduces costs, making it a viable option for routine clinical use".

The sentence ends promising that this step towards economization will make the drug more accessible to the population. But the promise seems more industry-oriented, and, from there, it might mean that the public will be able to get a lower-cost medicine. This idea is reinforced after we look at other stories, where they consider, among the potential economic benefits, a "reimbursement strategy". It has already been discussed how this reimbursement resource can be considered a problematic governance mechanism (Gardner et al., 2017) instead of something inherently positive for the patients. The SS16 (new liver dialysis device) is such a case:

"The ALIVER consortium, which is led by University College London, also intends to assess the health economic benefits associated with its innovation and develop a reimbursement strategy".

If we read that promise, we can learn that the magnitude of the expected economic benefits is rather imprecise, and more important, whether the beneficiaries will be the industry or the patients. We can assert the mentioning of a university as the consortium leader within that sentence as a strategy to make the reader to consider that this initiative is about (public) knowledge production, providing more sustain to the idea of the societal benefits. This quote, as well as the rest ones incorporated in this discourse strand, give interesting traces of how the EC communicates biomedical innovation policies as contributive, as well as how they give value to certain practices in the field due to the potential economization, innovation and business activities in general.

5.3.2   A continental future: Internationality of the projects

12 out of the 23 documents elaborate about projects which involve institutions from different countries (either universities, research centers or private companies), thus emphasizing their international nature. We can interpret this as showing Horizon 2020 able to integrate the efforts, knowledge and resources

from different sides, in order to achieve continental-wide solutions[17]. Therefore, promoting brighter futures and seeking public support through the *Success Stories*.

The internationality of the projects is apparently considered as an asset itself by Horizon 2020, then is a piece of the value-making process. But is it also positive for the public? We can assume a given patient is not likely to consider important that his life-saving medicine was developed in several countries. But it is still being transmitted by these stories as a part of the enactment of success.

This category is predominantly found within the **drugs** and **research/modeling/test**-type documents, which tend to demand intense in-lab work. Both of them, combined, account for 9 out of the 12 times this category was found. More than the mere internationality of the initiatives, in terms of enumerating countries, we can also note that these *Stories* tend to mention that the projects have a European scope. This drives their discourse through a continental collective symbolism of hope and success (though the countries involved are not always listed), and a conjunct effort to provide better medicines and healthcare treatments to society. Such is the case of the SS04 (treatment for melanoma):

"MelGen is enabling more than a dozen-young scientists from universities around Europe to hone their research skills, in a bid to help take targeted treatment of melanoma another step ahead".

It does not name the countries involved, but sets importance on the continental amplitude of the project. They mention the effort of a "network", and that several European universities providing young scientists are collaborating, again constructing the continental endeavor as a value on its own. These are two similar examples:

SS03 (development of bacteria-resistant prosthesis): "*Finding new antibiotics is just one of many challenges tackled by this European research project*".

SS05 (boosting translational cancer research): *"Developing new anti-cancer treatments is expensive, and national, public funding organizations across Europe dedicate substantial resources to this task. Linking their research programmes helps to ensure these funds are used to best effect".*

Considering that these projects are part of an EC program, seems natural that they do involve several countries. Therefore, we can observe how the 'European' is used within the discourse, almost as a cliché for promoting hope.

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[17] Though almost all the projects do include teams from several countries (which we can see in the technical details of each document), for the purposes of the analysis I will consider only those *Stories* which explicitly mention it within the body of the text.

Other *Stories* explicitly list the countries participating. We can interpret this as a quantification of the internationality which shows the readers the scale of the projects. The SS11 (HIV vaccine) expresses this within these two paragraphs (the first one being the subtitle of the *Story*):

"The European AIDS Vaccine Initiative (EAVI2020) brings together leading HIV researchers from public organizations and biotech companies from across the world in a focused effort to develop protective and therapeutic HIV vaccines. The EAVI2020 consortium unites scientists from 22 institutions, pooling their knowledge and expertise to develop novel candidate vaccines that can be taken through to human trials within five years".

"To overcome this bottleneck some of the most competitive research groups in vaccine discovery from European public institutions and biotechs from 9 EU countries together with top Australian and Canadian groups and US collaborators, have agreed to join forces in EAVI, providing a pool of international expertise at the highest level".

Both quotes highlight that the project is "European", therefore stressing the effort for better biomedical futures as a continental policy. But what is exactly this "across the world"? If we look at the technical details of the project, the only non-European countries involved are Canada, the US and Australia. Then the "across the world" is a metonym to express that this is broader than an EU effort, and it also includes three other countries (which in general can be considered as important R&D actors). The rhetoric use of this linguistic resource, resembles the construction of 'worldwide biomedical development' as a value on its own. The allusion to the "expertise at the highest level" also contributes to this idea, since we can expect that, when it comes to HIV vaccine research within EU-funded projects, the scientists involved in fact are experts. This is communicated within the *Story* as the solution to the "bottleneck". But is this expertise going to solve this "bottleneck"? One could think that the reason behind the lack of an HIV vaccine (the "bottleneck"), is essentially the inherent complexity of the vaccine-production process itself (or the endemic underfunding of scientific research), rather than because of the lack of 'international efforts'.

Sometimes the internationality of the projects is more than the mentioned cliché: it seems to be part of the construction of futures, in the sense that it enables the expectations of subsequent outcomes of the multinational ventures. We can observe this within the SS14 (stem cell treatment for diabetes):

"The clinical trial will take place in Ireland, the UK and Italy on a particular type of stromal cell therapy".

"This approach will involve the creation of a network of four European cell production centers".

The second quote has an implicit promise: the implementation of international centers across the continent, which should imply better healthcare for the population. In this case, there is not only the construction and transmission of a mere continental value, but also the promotion of success through promising better healthcare futures. While this observation can be collected from several similar quotes across other *Success Stories* which also name the countries involved, the SS17 (detecting cancer on a DNA molecule) comments in a very interesting way the multinational efforts that this project feeds on:

"Within the BeyondSeq consortium various teams in Europe and Israel are exploring different potential applications for the groundbreaking technology, including diagnosing inherited genetic disorders such as spinal muscular atrophy (SMA), analyzing bacteria for antibiotic resistance and developing diagnostic tests for colorectal, lung and blood cancers".

This paragraph is quite interesting, since the involvement of several countries is juxtaposed with the very core promises of this project, which seems like a resource to strengthen those promises, despite they are only "potential applications". We can acknowledge this as a case in which Horizon 2020 tacitly assumes that the results can still be possibly unsuccessful. Two other paragraphs within the same text exemplify this once again:

"Within the BeyondSeq project, a team at the Technion Institute in Israel is using single-molecule analysis…".

"Meanwhile, a team at project partner Gothenburg University in Sweden is using similar technology to analyse bacteria for signs of antibiotic resistance".

We can infer that mentioning these universities increases the importance of the project upon society, considering their high qualifications[18]. This enforces the idea that the internationality is factually contributive to the success of the project, appealing to the significance of involving renowned educational institutions. This is pretty much the same that we can extract from the SS20 (personalized treatment for leukaemia). This document has a subsection called "Chip holds much promise" and includes the following quote, which alludes to the countries involved to enhance the subsequent promise:

"The MEDLEM multidisciplinary team – consisting of researchers and private companies from France, Germany, Serbia, Australia and Thailand – plans to test its approach in both laboratory and clinical trials.

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[18] As of 2016's ARWU, the Technion was ranked 44 in sciences, and the Gothenburg University 50 in medical sciences (ARWU, 2017a; ARWU, 2017b)

The planned microfluidic chip will measure the patient's bio-phyisical parameters in real time and deliver correctly adjusted doses of medication at optimal frequencies".

Other *Stories* provide yet another dimension within this category, which overlaps, or entangles, with the business opportunities (from the previous subsection). The SS23 (airbag helmet for bikers) is an example, narration which includes other actors with different roles (not researchers):

"Independent tests, carried out at Stanford University in the United States, found it to be far more effective than standard helmets".

"Hövding has already created an app that has helped map out dangerous interchanges and traffic trouble spots in London".

"Donations also support a project in Africa".

The developmental phase of the project happened solely in Sweden until it was ready to be commercialized, then other countries took part. We can conceive the inclusion of those other countries as a way to bolster the idea of success and international cooperation, despite the safety tests carried out in the US were an independent (and later) activity from the development of the project itself. The same with the London initiative and the Africa charitable project. These two last locations appear as places favored with positive consequences out of the airbag helmet, despite they had no participation in the research itself. If we can say that success was possible in these locations, it is exclusively in a business/economic sense, not biomedical.

The SS05 (boosting translational cancer research) also highlights the European nature of the project and the potential business opportunities associated:

"Transcan was set up in 2011 by public funding organisations supporting translational cancer research – research that aims to develop promising scientific leads into new ways of predicting, detecting and treating cancer. It spanned 15 EU countries as well as Israel, Norway, Taiwan and Turkey. The partners, including several well-known cancer charities, funded 30 projects with a total of €33 million from national research budget. Projects focused on various aspects of cancer prevention as well as biomarkers that enable personalized medicine".

Despite this *Story* is about the second version of this network, they start recalling the history of the previous version, which, according to the text, was successful. They promote the favorable foresight of this project appealing to the fact that the enterprise already worked in the past, therefore it should work in the future. Also, the multi-nationality aspect of the project insinuates, with no details why, that this

also had to do with the past accomplishments (using the budget involved as an indicator). This is retaken on the last paragraph of the document, where they say the following:

"Further work in Transcan-2 will be aimed at developing strategies to extend the network, enhance its coordination and ensure efficient dissemination of outcomes conducted both by the consortium and funded projects".

We can acknowledge the previous as an implicit explanation of how beneficial the international collaboration is, and how can be used to grant success for biomedical research programs. Therefore, a form of presenting biomedical research policy as contributive, but without explaining in details why is it so.

5.3.3   Working with you. People involved on trials

Part of the narrative of the *Success Stories*, and which describes a piece of their structure, remarks how many people/patients are participating of the medical trials or the experimental treatments within Horizon 2020 projects. It is noteworthy that it uses actual figures, and the use of quantitative data is interpreted as a way to ground the information, giving some idea about the scale of the research. Not only that, but it also provides the impression that a project, though still in progress, is already starting to benefit people (instead of portraying benefit as just a hypothetical idea). Incorporating the number of patients involved gives a similar conception of what I explained in the *patients speaking* subsection. This, in the sense that renders the research process as being closer to the public, and more connected with their needs of better healthcare, humanizing the narration. Moreover, it can also be considered a collective symbolism of medical conditions being overcome. The use of the amount of patients involved becomes a piece of proving the research as contributive and beneficial to the public.

I found this discourse strand within seven documents, from which six are either *drugs* or *research/modeling/test* type. It is distributed across almost all the diseases: cancer, diabetes, heart conditions, Down syndrome and liver conditions. We can expect the use of this category within the drugs and RMT documents, since those projects normally need patients for the developmental phases, in order to obtain the corresponding legal permission for commercialization.

Some of the documents include the number of patients without implying, at first sight, any particular meaning-making other than framing the magnitude of the projects. One example is the SS18 (new test for pancreatic cancer). This *Story* is heavily slanted towards proving worth through the commercial potential

that the project has (earlier elaborated within this discursive knot), and in that context, the use of the samples from patients also fits into that narrative:

"Named IMMrayTM PanCan-d, the new test is currently being validated through a number of clinical studies. The conclusions of one of these studies, where it was used to assess 1400 samples taken from known sufferers and healthy controls, are already available. The findings indicate that the test can detect pancreatic cancer in its early stages with an accuracy of 96%".

Is interesting that this quote mentions that "one of these studies" has been successful, but is not clear out of how many. While it might or might not be statistically relevant, it is still used to create hope. Other *Stories* tie the patients involved with other categories present on this subsection. Such is the case of the SS14 (stem cell treatment for diabetes), which I recently mentioned for indicating that the clinical trials were in UK and Italy. Within the same paragraph in which it is highlighted the internationality of the project (tying the discursive knot), they write this:

"NEPHSTROM will conduct a 'Phase 1b/2a' clinical trial in 48 adult patients with progressive diabetic kidney disease to evaluate the safety and efficacy of an MSC treatment. The clinical trial will take place in Ireland, the UK and Italy".

While 48 patients seem somehow a small quantity of people for a medical trial (for those who are not familiar with the medical testing procedures), it can be providing interesting results for the testing stage. We can comprehend the inclusion of the "*Phase 1b/2a clinical trial*" (a concept which most of the people might not be familiar with) as a form of adding more importance to the mentioning of the experimental phase. Makes it look like more formal and technical, creating hope based on the structure of the research itself and the wording.

This discourse strand becomes more interesting when we analyze it after the previous subsection. Within some cases is used jointly with the recalling of the European (international) nature of the projects. This enforces the idea that the people participating in the tests are a resource that makes the research process more reliable (giving a notion of high quality standards), boosting hope as a result of the collective effort. Within this narrative the EC portrays themselves as policy makers able to create value out of their continental reach. This narrative, which bonds the patients involved and the construction of hope, becomes noticeable within the SS09 (breast cancer prevention):

"In attempting to reach its objectives, B-CAST is making use of existing resources linked to the Breast Cancer Association Consortium. Specifically, the team's work includes collating clinical information from

some 80.000 breast cancer patients with risk factor information, as well as generating new data on molecular characteristics of a subset of some 20.000 tumours from a unique global pool".

In general, the success of these projects is partially sustained by the promise of improving the patients' adherence to the treatment. Including the number of people involved on the trials is a way to increase this support. The SS08 (diagnose of hypertension) includes this in the following quotes:

"For the first phase of the study 500 people have been recruited from specialist adrenal disorder centers across Europe. There are 300 patients with curable hypertension, 100 with a different form of high blood pressure, called 'primary hypertension', and 100 with normal blood pressure. […] Next, the team will expand the study to include 4000 people with various types of hypertension recruited from six major expert European centers, to see whether these biomarkers can reliably identify patients with curable hypertension".

This *Story* promises to find suitable biomarkers (noticeably, without the use of conditionals, providing the notion of granted positive results), then developing a "reliable" blood test to be verified in a larger, randomized trial, and afterwards, materialized into clinical grade tests. It enacts success in an 'escalated' shape, through several steps which include different groups of people (they use the patients within the construction of brighter futures). They mention several times the number of patients involved within different testing phases, which we can identify as a form of humanizing the narration of success (as in the use of *personal stories* category), eventually as a tool to better reach the public. The SS13 (new pill for heart diseases) also sustains this idea, linking the internationality and the patients involved:

"The trial is being conducted across seven EU countries – Spain, Italy, France, Germany, Hungary, Poland and the Czech Republic – where more than 3200 patients will be monitored to determine rates of adherence and the efficacy of treatment".

Perhaps the most interesting case I found for this discourse strand was in the SS10 (helping people with Down syndrome):

"The five-year EUROlinkCAT project, funded by H2020 and launched in 2017, is using EUROCAT to link 21 registries across 13 countries with a view to investigating the health and educational outcomes of 200.000 children as they grow up. 'This enhanced information will allow optimization of personalized care and treatment decisions for children with rare congenital anomalies', notes the project team".

This quote is the closing paragraph of the document, using it, presumably, as a 'takeaway' piece of text for the readers. This *Story* is not only about the EUROlinkCAT project, but also about three other projects.

The rest of the text also mentions patients being helped, using indistinctively 'children', 'adults' and 'people'. In particular, the "children with rare congenital anomalies" also sounds as a sensitizing catchphrase for the readers. Not that it is unprecise or colloquial, but evoking the kids has an inherent dramatic feeling. Besides, they invoke the different countries involved in the project, and that is funded by Horizon 2020. Presumably, as a manner to show the potential benefits of the internationality nature, plus appealing to the emotional component that helping kids can provide. If the promise is about helping "children", instead of "patients" or "adults", is a particular case of humanizing the narration. We can conceptualize this as an example of the social contribution of science as a rhetorical resource.

5.3.4 Quantification of our efforts: the money involved

I will start this subsection showing the general Horizon 2020 funding for the 23 *Stories*, which comprehend a total contribution of €139.2M. For the purposes of this analysis, I grouped the projects by development type, facilitating the finding of patterns. They are distributed as follows:

Development type	Quantity of documents	Total money contributed	Share from the total	Average money invested per project
Drugs	5	43.442.996 €	31%	8.688.599 €
ME	4	14.027.821 €	10%	3.506.955 €
TD	3	8.683.329 €	6%	2.894.443 €
RMT	11	73.108.235 €	52%	6.646.203 €
Total	**23**	**139.262.381 €**	**100%**	**6.054.886 €**

Table 7: distribution of the resources according to the development types

The first observation is that the *Medical Equipment* and *Technological Device* documents represent the less expensive projects (both as a share of the total, and the per-document average amount). A priori, we can think that this could be rhetorically used to transmit the idea of an efficient use of resources (in terms of modest investment resulting on important healthcare gains). But no ME or TD documents use, at all, the *Monetary resources* category.

Three *Stories* tell explicitly how much money they spent[19] (one drugs and two RMT documents). Those development types are, precisely, the ones representing the largest share of the money invested. The subsequent observation is that those documents use this as a rhetoric measure, in order to show that the EC is making grand efforts for providing better futures for the society, quantifying their contribution to

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[19] This can be either within the title, subtitle or the body of the text. As I commented earlier, this excludes the information box at the end of each document with the project details.

scientific research through massive expenditure of money. This reminds us of the earlier mentioned example of how the rhetoric of hope was mobilized in cases of cancer (Petersen, 2015). This resembles as a vision based on RRI rationales, and how H2020 tends to approach commercialization, by investing in future revenues of the potential capitalization of biomedical research.

After reading these documents, and noticing how the money involved is highlighted, we can note that the narration evokes the idea that money is being spent where it is most required, therefore the most needed solutions for the society will come up. Some cases have the particularity that the money involved is written even before they explain the details of the research project. This gives the idea that, in such cases, the monetary figures become more important than the scientific aspects themselves. Another observation is that they seem to be promoting that if there was a failure in the past, it could be fixed with future success, due to the increase on the money invested. Perhaps the most interesting and clearest case we can recall is the SS11 (HIV vaccine), where money is mentioned directly in the title (the only *Success Story* to have this particularity):

"HIV scientists launch €23M project to develop vaccine".

What makes it especially interesting, is that within that sentence the money involved is directly tied to the ultimate goal of the project: to develop a vaccine which would solve the "global pandemic" of HIV/AIDS. This problem is further elaborated within the body of the text, where they mention that 35 million people are affected, and despite 30 years of research no vaccine has been developed. In this case, telling the people that such a large amount of money will be invested in a vaccine development, might lead the reader to think that money is the key to (enact) success. But based on this information, is not clear that such conclusion can be unquestionably made. If we want to know that, we would need, for instance, the historical expenditure on HIV/AIDS research. The relationship between the money involved and the promised better futures, is also constructed using another element: the EC role as policy makers.

Another document to feature this is the SS05 (boosting translational cancer research). As studied in the *Internationality* sub-section, this *Success Story* is about a program called Transcan-2, the second version of the original Transcan. It widely acknowledges the benefits of joint ventures which improve translational research on cancer. It talks about money not once but three times. Within the text, the following quote shares some information regarding this previous version of the enterprise:

"Transcan was set up in 2011 by public funding organizations supporting translational cancer research […]. The partners, including several well-known cancer charities, funded 30 projects with a total of €33 million from national research budgets. Projects focused on various aspects of cancer prevention as well as biomarkers that enable personalized medicine".

It translates the positive results of the past into a possible achievement for the future, so as to enact success. Is interesting how they declare the presence (in the first version) of charitable institutions, which raised capital for cancer research, as a positive value (while, ideally, cancer should be a priority issue for research funding and not dependent on charity). Therefore, they make a valuation process out of the possibility of funding cancer research from charities. On the next paragraph, we can find the following quote, in which they mention the money involved for the current Transcan-2 program:

"Transcan-2 continues to foster coherence and synergies among the participants' national and charity funding programmes. Based on an analysis of research needs and opportunities it has issued four calls for proposals, and so far funded 37 projects, worth € 35 million, to advance work in selected priority areas".

As I said, this *Story* is not about that first version of the program, yet they insist on including the involved monetary figures in the past, showing the economic efforts made back then. It is an interesting statement if we consider that the Transcan-2 program runs from 2015 to 2019. This is, they indicate money involved, but for projects that are not part of the program the *Success Story* talks about. Within other quotes, they, again, recall what has been done in the past, this time binding explicitly the "EU efforts" with the money spent (meaning making):

"Since 2011, these calls have been supported by the EU with a total of €8.6 million".

"Developing new anti-cancer treatments is expensive, and national, public funding organizations across Europe dedicate substantial resources to this task".

Summarizing, in one quote they talk about investing €33M, then €35M and later €8.6M. But this can lead to confusion, especially considering that the project itself was funded €6.7M by Horizon 2020 (noted from the project details). This means that the monetary figures they recall, were not necessarily provided by this FP (but this is omitted within the discourse). I also noted this idea within the SS10 (helping people with Down syndrome), again tying the intense funding, with the subsequent (expected) societal benefits:

"Since 2007, EUR 196 million has been allocated to research on a wide spectrum of congenital anomalies, including dedicated funding for 9 projects focusing on Down syndrome".

"For its part, the EU has been a major funder of projects and initiatives aimed at promoting inclusion, boosting knowledge and improving the lives of people with Down syndrome and their families".

The Horizon 2020 contribution to this program, as observed in the project details, corresponds to only €7.7M (and not the €196M quoted). This means that they describe not only what has been funded under this FP, but also the financial aid that the EC has provided in the past (but they are not explicit on this),

again constructing and promoting their identity as long-term, large-scale policy makers through the rhetoric of the money invested.

For closing and summarizing this subsection, I could observe through these set of quotes, that there is a form of enactment of success based on the money invested by the program, a discourse strand which mingles with other related forms: explicitly recalling the presence of the EC, portraying themselves as authoritative policy makers, and 'brokers' of a brighter future. They show, in practical and concrete terms, how the work done by Horizon 2020 is beneficial for society. Not only that, but also the specific mingling of these categories with those from the other two layers (money involved and life-saving; internationality and scientists speaking; use of personal stories and colloquial wording, to name a few) allows us to understand how the discourse of success is constructed as a fabric, fed by different strands.

6 Conclusions

My analysis explains how the EC proves itself as responsible producers of a worthy policy such as Horizon 2020 upon society, specifically in the biomedical research field. The three-layer examination allows us to understand that this is done through different discursive strategies in which the topics relate to each other and overlap (Wodak & Meyer, 2009). This is summarized as follows, with a corresponding example:

- **Strategies of nomination**. Through linguistic devices, such as the use of conditionals to elaborate promises which remain in the field of the possible instead of providing assurance. For instance the SS19: "*If the expected results are achieved, the project outcomes alone could benefit up to 30.000 CRC suffers in the EU today, not to mention those diagnosed in the future*".

- **Strategies of predication**. Through discretional positive evaluations of some features present in the sponsored projects, such as highlighting how innovative some projects are, or the economization that they would provide. For instance the SS18: "*The Immpact project is entirely funded by the EU, as part of a Horizon 2020 scheme dedicated to highly innovative SMEs. This backing has enabled Immunovia to organize the remaining steps in view of the commercialization of its product in a timely fashion and helped to create confidence among potential investors, Grahn notes*".

- **Strategies of perspectivization**. This has been done through the framing or representing a discourse, for instance using personal stories, the words of the researchers involved, or praising the internationality of the projects. For instance the SS04: "*MelGen is enabling more than a dozen young scientists from universities around Europe to hone their research skills, in a bid to help take targeted treatment of melanoma another step ahead*".

- **Strategies of intensification**. Through life-saving promises, or the *Stories* about the robots which will help kids with diabetes and the elderly, solving their health problems. For instance the SS06: "*These revolutionary developments could lead to potentially life-changing new drugs for cancer patients, among others, improving and saving innumerable lives*".

These strategies allowed me to conceptualize how the different categories (as discourse strands) formed the discursive knots. This was a form of identifying discourses which are intending to serve particular EC ends, such as optimistic predictions about the future of biomedical practice and healthcare access. The discursive knots show where the different discourse strands (categories) relate to each other, mingle, and create a given reality. These knots are tied by collective symbols which allow to "interpret reality, and have reality interpreted for us" (Jäger & Maier, 2009, p. 48). In the first layer I found stylistic and layout

forms of showing what the projects are about, as well as the problems, the needs and the promises they held. There, I identified the use of colloquial wording to make the *Stories* more appealing to the public, therefore bringing them closer to the scientific research; *complex wording* to enforce the authoritative role of scientists within scientific storytelling; and juxtaposing conditionals to the promises, offering solutions that are still mere possibilities. This layer constitutes a vital piece within the rhetoric to justify the FP. There was particularly one interesting value-making process here: the SS23, when the company which produced the airbag helmets was praised for its charitable activities in Africa. This valuation process deemed as important a social activity in another continent (not implying better healthcare for the EU). The second layer had as collective symbolism a deeper use of rhetoric to justify the need for Horizon 2020. This was materialized through the promises of life-saving developments, the personal stories of people already being helped, and scientists commenting about the impressively positive futures to come. Besides the rhetoric, these three resources are also employed with a clear aim: creating value (life-saving), humanizing the narration (personal stories), and improving the science communication process (scientists speaking). The third layer tied together different discourse strands which explained how the research is conducted: favoring innovation; promoting marketable outcomes; integrating different institutions from different countries; using patients in real trials; and commenting the actual investment figures, amplifying the power of discourse. This layer exploits the presence of biomedical innovation (in different forms) to support the policy need. We can therefore conclude that the construction of brighter futures, it is not about the quantity of promises shown, but rather about the quality of them, and how they are utilized. In some cases, a few lines can be enough to make the reader think that things will just become more and more positive for the patients.

The *Success Stories* can influence the public opinion, securing the compliance of the policy itself (a form of performativity), enforcing the sense of what is possible and, especially, desirable. This idea gains momentum when is accepted that the EC, as both policy makers and document publishers (the same institution, but not the same people!), channel the possibilities on a certain (self) determined direction, scripting the imaginations of the future. Hilgartner's metaphor of the theatrical stage (2000) helps to frame this conception, in the sense that Horizon 2020 and the *Success Stories* are at the front of the stage (showing the policy to the public), while the EC is at the back (deciding what is to be shown).

6.1   Values and valuations shaping biomedical futures

As discussed in the Theories section, the process of future-making is based on imaginaries and values (Adam & Groves, 2011; Irwin & Soneryd, 2016). In this case, these futures have been designed by Horizon

2020 and presented to society, sustaining the idea that the exploitation of the future is mostly made by intellectual currents and political institutions (Adam & Groves, 2011).

The future-shaping values enacted in the *Success Stories* are several. Imaginaries are constructed through the valuation practices elaborated in the analysis section, seem to be institutionally stabilized through repeating the same arguments several times (e.g., the SS18 with six paragraphs about the commercialization perspectives). The main values identified were the incorporation of commercial partnerships so as to exploit private (third-party) knowledge and resources (personnel, equipment, commercial platforms); scientists participating of the science popularization practice and colloquial wording, so as to narrow the gap of public understanding of science; and the innovation, transmitted as a form to put in practice what the EC states about RRI. This also allows us to conceive Horizon 2020 as a case in which scientific research policy becomes a site of value-making.

The potential business opportunities were one of the most important values I identified. The *Success Stories* portray private benefit as an inherent value of scientific research, and the valuation work of preparing these different healthcare developments for the market. In some cases the *Stories* elaborate the marketable possibilities even before explaining the biomedical or scientific aspects behind the projects, thus showing us what the EC has determined as important when valuing scientific research. This allows us to conclude that business opportunities are a value rendered with higher importance than the scientific knowledge itself. A related value is the internationality of the projects, and the collaborative nature of the research, helping to construct a European future. Another value-making process was the promotion of future success based on the successful experience from the past, used to prove the worth of the policies the EC can produce (e.g., the case of the TRANSCAN-2 project). We can conclude that the discourses of success promoted by Horizon 2020 are a form of "visions of desirable futures driven by science and technology", which in turn are opposed against "fears of either not realizing those futures" (Jasanoff & Kim, 2009, p. 121), proposing continental benefits through imaginations of "risk and benefit, public good, and nationhood" (ibid, p. 122). We can see this in the example of those *Stories* which emphasize the European nature of the projects, and the collaboration between different countries involved (e.g., the SS11 and the 9 EU plus three other countries). The discourse of success found in these documents define futures and imaginaries through their promises. They are a case of "new forms of life by projecting positive goals and seeking to attain them" (Jasanoff & Kim, 2009, p. 122). Thus they create a social sense of European belonging (reinforcing the social value of biomedical science offered by Horizon 2020), making social order. We can conclude that they aim to construct their FPs as a sociotechnical imaginary, since is a case of state power exercise, selecting the development priorities, the funding, and

the investment infrastructure (ibid). Therefore, the *Success Stories* have performativity while (re)presenting the biomedical research policy.

In the case of the *Scientists speaking* (especially when business people is quoted, instead of scientists), we can go back to the corresponding discussion about RRI framework. There, it is crucial to consider the multiple stakeholders participating in a certain project and those who will benefit from it (Sunder Rajan, 2012a; Owen, Stilgoe, Macnaghten et al, 2013). In this case, the science communication instances are mostly centered on the biomedical innovation, narrated by people which seem to be more entitled. The *Success Stories* exploit that (e.g., the case of the "manager with an MBA" from the SS03, or the "CEO" who speaks in the SS18), promoting certain values (better healthcare, in general, or marketable options), therefore portraying societal benefits. The fact that some actors are speaking on behalf of others reinforces the idea of the authoritative voice, being difficult for the lay people to be a counterpart and speak back to science, being a case of the dominant model of science popularization (Felt & Fochler, 2013).

The values accompanying innovation stimulate not only economy but also policy itself. This, in terms of start-ups and spin-offs regarding healthcare enterprises (such as the Immunovia case), or the "interdisciplinarity" and "innovative" training program in the SS04. This exemplifies the strategies of predication mentioned at the beginning of the conclusions, deeming, in a discretional way, what is contributive from the research (in this case, the innovative character of the new technologies).

6.2   The rhetoric to justify biomedical research policy

In general, the different discourse strands conform patterns which mean institutionalized ways of talking and acting. These patterns include the enactment of success through diverse discursive practices, such as the use of conditionals, life-saving projects, or innovative treatments. These become pieces within the puzzle which is the rhetoric used to reach the public, convincing them of possible better futures.

Horizon 2020 promotes the idea that their research means contribution for Europe, strengthening the continental partnerships and increasing the public funding for science, presenting a future of better healthcare, which not only depends on the EC itself, but also on the market. They evoke, in general, a notion of European innovation as key for better healthcare access career (e.g., the SS04 promoting "career paths in the industry"), thus constructing a rhetorical representation of better futures.

Life-saving promises are rhetorically used to justify biomedical research as interesting and contributive. In some cases, these life-saving perspectives were unprecise, yet they were still included. An example are those *Stories* which mention that the potential developments might save lives, but not providing figures

to sustain so, such as the SS07, which says that *"An EU-funded project is developing a single genetic test that would indicate an individual woman's risk of developing breast, cervical, womb or ovarian cancer – potentially saving lives".* These life-saving promises boost hope in the patients through the use of rhetoric (though sometimes lacking certainty), exploiting also the technological innovation that RRI practices offer, emerging within a European context. We can highlight the SS11 (HIV vaccine) as a clear example, since they blend the life-saving promises with the innovative nature of the research, the continental-wide approach, and the high financial efforts involved (€23M mentioned in its title). This HIV case is a paramount example of a strategy of intensification to enforce the rhetoric.

We can say something similar from the potential business developments, which are presented as contributive by Horizon 2020 as meaning societal progress, despite they are likely to provide mostly private profit. The SS16 with the new liver dialysis device exemplifies this, where they mention how innovative the product is and the enormous commercial success to come, long before they start to explain the science behind the development. The rhetoric of success is based not on the better healthcare access to people, but on the industrial benefits.

I identified a case of *bias of evidence* in the *Scientists speaking* category. The possible lack of (enough) concrete scientific evidence to support the claims, is replaced (and eclipsed) by the utterly positive and optimistic declarations of the experts. The incorporation of the *Personal stories* also enable this conclusion. We can stress this argument even further, concluding that quoting scientists pursues the scientific literacy of lay people. The latter understood as citizens who would feel more empowered to make healthcare decisions and gaining a greater sense of control over their own health. These two discourse strands form an integral part of the rhetorical structure (second layer), therefore help to answer the question about how the rhetoric is used to justify the program.

The abounding use of conditionals (18 documents) shows a tendency to propose promises of better futures, backed on qualitative information and claims (sometimes appealing to emotional components) instead of quantitative data (statistical figures) for the production of hope. This is an important rhetoric resource to justify the policy. We can acknowledge this as a way to communicate uncertainty, disregarding the risk of portraying what could be deemed as Petersen's *false hope*. This would bolster the authority of science and expertise, and reinforce Horizon 2020's professional boundaries (Gieryn, 1999). We can also affirm that incorporating certain words ("could", "would", "might"), is a case of operative wording, since the state of the knowledge the *Success Stories* share, does not allow to predict, with enough certainty, the future social scenarios. Another observation that we can make, is that within the *Use of conditionals* category several quoted discourse fragments used the words "revolutionize" or "revolutionary". Though not conditionals, this says something about the wording. For many years, institutions such as the EC have

promised that biotechnological developments will have a revolutionary impact, but avoiding to exactly specify when will that happen (Goven & Pavone, 2015). As I earlier discussed, promises are performative, building consensus around developing technologies and enrolling diverse actors (in particular, both scientific and social). This generates change in the present, independently whether those promises will materialize or not (Brown, 2003; Goven & Pavone, 2015). Labeling those promises as 'revolutionary' fits within this concept, and permits us to conclude that it is not just words, but stating promises of 'revolutionary' sciences is performative, hence part of a political strategy from the EC. The *conditionals* then participate of the construction of a sociotechnical imaginary, portraying a future as closer to the public than what it really seems to be. This is a case of a strategy of nomination, enhancing the rhetoric within the storytelling, therefore justifying the policy.

6.3   Biomedical innovation to stage the policy need and enact success

The *sense of economization*, as well as the *commercialization/industrial opportunities* discourse strands, are strategies used by the EC to promote specific ends and ideas. In particular, we talk about the bioeconomy ruling the future-making of healthcare access for the population. This case can also be an example of what has been pointed out as the "purchase of health-restoring and health-enhancing products and services in the marketplace" (Petersen, 2015, p. 42). Additionally, these two categories, altogether with the *sense of innovation*, mingle within a discursive knot, in which the successful imagined future for the EU is constructed by the EC through bioeconomy. This would boost the national competitiveness and increase the growth of capital (Pavone & Goven, 2017), enhancing the involvement of capital with biomedical science (Petersen, 2015). This conforms a mean of persuasion used by the EC, being a case of transition from preventive medicine to anticipatory medicine (ibid). Here, the *Success Stories* have performativity in the sense that while proving success, they can shape what the patients understand as important, therefore can influence their decision-making.

The *industrial opportunities and commercialization strategies* category was one of the most recurrent (in 11 documents). Furthermore, within three *Success Stories*, this was talked about, specifically, in the very first paragraph of the body of the text (more importance given within the narrative). We can consider it as a 'bias of evidence' case of uncritical optimism: this happens when tests, treatments and devices which "promise to generate profit for industry tend to be prioritized over low-tech or no-tech options" (Petersen, 2015, p. 55). This, in the sense that people would tend to be keener on the more marketable options, though these options might not be as helpful as the public think. This is also a case in which the EC can be stimulating the (unnecessary) consumption of healthcare goods and services, by portraying it

as socially and economically desirable. This increased consumption has been deemed as a way of promoting hope to create emotional manipulation, therefore economic exploitation (ibid). Moreover, this resembles the Stanford University experience, in which the results of its research in life sciences area, and how the relationship with the industry was boosted, was one of the factors of the biotech boom of Silicon Valley (Sunder Rajan, 2012a). This positive case of an 'entrepreneurial university' looks similar as what Horizon 2020 proposes, as a standard of knowledge and technology transfer, naturalizing the commercialization of the life sciences, protecting the business' interests in spite of those of the society, being an "ideological embrace of the market" (ibid, p. 7). At this point, we can link this conclusion with the *Sense of innovation* category, in terms of how the political and economic regimes provide incentives for innovating. This happens not necessarily based on a cause-and-effect logic, but rather on a co-productionist way (Jasanoff, 2004; Sunder Rajan, 2012a): the market invests in life sciences, but also life sciences invest in the market. This can also allow to conclude that the *Success Stories* value the public health as a market opportunity (Sunder Rajan, 2012a). This category also evokes a lack of enhancement of translational medicine practices in favor of a pure business development and public investment, ending on private profit. This reflects a possible case of supply-side strategy, instead of a demand-side, Keynesian approach (Gardner et al., 2017) to solve a demand-side crisis.

We can conceive the previous ideas as bioeconomic activities which spread promissory practices (speculative claims of possible achievements). In the case of start-up companies, they secure venture capital in the present, through the construction of expectations which would increase their assets: a political economy of hope (Pavone & Goven, 2017). They promise somewhere-in-the-future technologies, not clarifying where exactly that future is. At the same time are performative, projecting speculations and mobilizing investors (increasing their likeliness to invest) and patients (increasing their likeliness to consume). These stories of innovation, specifically the ones narrated by the researchers, conform a case of scientists being storytellers of science, adding more authenticity to the information they talk about, and in particular, favoring a more innovation-friendly climate (Felt & Fochler, 2013), therefore enacting success and clarifying the need of the policy.

We can assume that the *Success Stories* have an underlying political purpose (since they can be considered as political documents, as earlier explained), but they seem to rather neglect, or hide, their political dimension. I could observe this in some blackboxing activities, where the expected outcomes are portrayed as fundamental (e.g., the robots for the kids with diabetes), therefore exempted from further analysis. An example is the omission of some details of the projects (deployment, availability, cost). The people might not understand some of the biomedical aspects behind them, but they are likely to accept the futures constructed by the discourse of success. We can identify the blackboxing when the

technological developments are close to be made available, while the people are still not aware of how they work. This is a way of using the expected benefits of biomedical innovation in order to deem the policy as needed, as well as using rhetoric to gain public support.

We might consider the use of scientists speaking (as well as other actors within the projects) as the construction of a *team* in Hilgartner's theatrical analogy, being a "social group whose members are defined, not with respect to formal organizational structures, but by virtue of their engagement in mutual cooperation to manage impressions" (2000, p. 13). They would be participants of 'dramaturgical cooperation', collectively staging a performance. We can see them as part of rhetorical and narrative techniques used by Horizon 2020 to persuade audiences of their credibility, making the public reach certain conclusions. The *Success Stories* are scientific documents, which tend to use the framing of problems, the presentation of evidence (either qualitative or quantitative), and also the layout itself of the text in order to drive the reader through certain logical paths. This is also supported by the *allies* that scientists can recruit to strengthen their positions. In particular, we can find inscriptions, such as data and statistical figures (Latour & Woolgar, 1979). The mobilization of these resources grants support, therefore persuasively enhances Horizon 2020's claims of policy need and enactment of success. Also participates of the creation of this FP as a sociotechnical imaginary.

6.4   The rhetorical (re)presentation of biomedical research and healthcare futures

The *personal stories* are a case of production and distribution of hope, exerting a powerful hold on popular imagination through the narration of personal stories of success (Hage, 2003). Generally, we can expect that patients would tend to adopt optimistic stances in relation to their conditions (Petersen, 2015). In the particular case of the robots for the elderly and the robots for kids with diabetes (SS12 and SS15, which use this resource the most), they reflect a form of an institutional aim of fostering hope on 'futuristic' technologies (a value-making process). We can stress the argument further and understand this as what Petersen has called "heroic efforts to overcome adversity" (ibid, p. 90), in the sense that symbolic and emotional factors might shape the healthcare decision-making of the patients (another form of the rhetorical representation of the benefits of the policy). At this point we can have a brief look at the morality of the promises. In the specific examples of fighting cancer and usefulness of robots, we can understand that imaginaries are based on a future in which technological developments can address healthcare needs, based on the promises that the scientific research provides. But noticeable, there is a lack of promises of solving those problems through other means. This would be based on the exploitation of the anxiety that such medical conditions (ageing and diabetes) generates in those affected. In both

cases I could notice that the EC can be steering the consumers' decisions through marketing devices. If so, the attention (and the discussion) is driven away from the political, social, and economic dimensions of the diabetes and ageing issues. These can be two examples of a discourse inhibiting the not-sayable (Jäger & Maier, 2009), which would be a less-diminishing way to shape both medical problems. Said in other words, the use of *Personal stories* is a case of what has been called promissory marketing within the economy of hope (Novas, 2006; Hartley et al., 2017), offering benefits for perhaps relatively few people, and unaffordable for many others. Another interesting element here is that the temporalities of this offering are at an undefined place, ranging from the (emerging) present, to promissory futures where, speculatively, the economic benefits out of biomedical R&I will be capitalized (Sunder Rajan, 2012a). In turn, this should provide conditions for producing this featured bright futures (as a part of a sociotechnical imaginary). The fact that the urgencies also seem to be diverted in favor of these new technologies, allows us to conclude that Horizon 2020 is using the bioeconomy to address social problems. This is done weakening the opposition to the underlying causes of those problems, while at the same time the sustainability of the provided solutions is not questioned (Goven & Pavone, 2015). A scenario in which the rhetorical elements within the discourse favor the technical over the social.

We can extrapolate the previous analysis to the *Scientists speaking* category, as a case of political economies of desire/hope. Quoting the scientists involved provides an affective economy of promises, working through the discursive apparatus of hype, praising the desire of young, professional scientists. This can enhance the promising of benefits of research upon society besides the very material outcome of research itself (Fortun, 2012; Felt & Fochler, 2013). Furthermore, we might understand the combined use of patients speaking, scientists speaking and colloquial wording as a 'science popularization' structure, constructed upon a given narrative (Sismondo, 2010). This is a valuation process in which the policy makers share what *they* have deemed as important, in order to value the incorporation of multi-national teams within their research, as inherently contributive for the success of the FP. The position of the researchers being quoted is used as a rhetorical element.

My already-said idea of the *Success Stories* inhibiting the non-sayable, can be further generalized. Biomedical research is presented as interesting, contributive and beneficial through the exploitation of a rhetorical representation of hope. But *hope* is a complex term, which can involve different consequences (e.g., the 'false hope'). Within the *Success Stories* biomedical research is presented in such a way, that those possible negative outcomes are totally suppressed. This is not innocuous, since it can motivate actions while leading society through uncertain scenarios. This can be reflected, for instance, in the fact that the *Stories* omit the possible risks that certain drugs under research can have, or that the robots might too expensive for the people to purchase. This is a case in which the biomedical innovation seems

rhetorically used in a value-making process to stage the need of the policy. Also the imaginary constructed is located in an undetermined future.

I could not assess whether the *Success Stories* question the power relations or not. Therefore, no RRI repoliticization of the scientific research policy making was identified, though I have concluded within this chapter that Horizon 2020 seems to be pursuing to build trust with society. The same applies to the (re)configuration of knowledge and expertise. I was not able to explicitly see neither the networks of power within those documents, nor the necessary knowledge hierarchies (the quoted scientists can be deemed as authoritative knowledge producers, but not within a specific hierarchy or structure). This leaves small to no room for dissent, based on the political normative assumption that the definition of what the societal needs are, is an epistemic problem which should be delegated to the experts (Doezema & Hurlbut, 2017). This evades the potential emergence of public resistance towards new technologies. Also, we can assert that the imaginaries and the future-making processes, seemingly, were not settled collectively. Without the consideration of a more entitled or informed citizen, the corresponding sociotechnical imaginary can be debatable, in the sense that its visions of desirable futures might not have been collectively held or publicly performed. This, despite these new futures can be in fact grounded in mostly positive visions of social progress.

Sociotechnical imaginaries helped me to understand the creation of shared futures and imaginations of positive visions of social progress, which offered a stabilized and continuous thread. The positive outcome of these Horizon 2020 funded projects, pave a path to a better continental future (e.g., through the life-saving promises, or the representation of innovation policy needs). Imaginaries also provide a thread of continuity and stability, in the sense that Horizon 2020 is not a mere spot, one-time program, but rather follows (and improves) what previous FPs have done (and which will be continued to be done in the future). The *Story* of the Transcan-2 project exemplifies this, since it broadly praised what was done in the past, in order to sustain the expected future success. The narratives of the *Success Stories* enacted an imagined vision of the future public good (e.g. citizens with robots), as well as managing risk (e.g. the *Stories* including the patients involved within the trials, or those which mention improvements on the medical practice itself). If we recall Jasanoff's definitions about what are the implications of institutionalized sociotechnical imaginaries (2015), we can conclude that this is a case in which sociotechnical imaginaries have configured a given time-space understanding. Thus, allowing the use of past achievements to make promises of future developments through policy discourse. This also is a valuation process within innovation practices, which praise already valued versions of the past through the narrative (Asdal, 2015). Horizon 2020 is apparently recurring to a circularity to justify the need of the policy, being backed by past achievements, to promise a given future (the self-fulfilling prophecy).

According to Jasanoff (2015), discourses are tied to imaginaries, being both collective and systemic, sometimes focusing on language more than in materialization. When it is about science policy, we can see programs of action which help to articulate a sociotechnical imaginary. In this case, the corresponding discourses should reflect what that imaginaries aim to. The imaginary of success in biomedical and healthcare research policy is also based on the four strategies mentioned at the beginning of this chapter (nomination, predication, perspectivization and intensification). As a part of the narrative of the *Success Stories,* they help to identify why certain discourses represent values which construct this imaginary. This narrative contains life-saving treatments and medicines, personal stories humanizing the biomedical research, the financial efforts done by the EC and the international collaboration for the sake of better social futures are some of those values transmitted to the public.

The merging of the innovation, the economization and the commercial opportunities, help to construct this sociotechnical imaginary, settling the bioeconomy as a central matter of concern to define worthy. This imaginary is being translated to society communicating technological progress, using biomedical innovation to stage the policy need through the technical infrastructure of the projects (including the amount of money invested). Horizon 2020 is constituted then as a sociotechnical imaginary, in which biomedical research policy is innovative, multi-national, performed by experts, life-saving and a source of business opportunities. Through the economy and the moral of its promises, the EC portrays Horizon 2020 as a policy complying with RRI directions, hence a solution for the healthcare issues within the continent. Therefore should be supported by the public and its funding should be granted.

The science-society agenda that the *Success Stories* try to promote does not necessarily enhance the debate on policy making, help educate the people on R&I topics, or to discuss about biomedical futures. It rather looks like an effort for making people to empathize with a given future: that one in which the H2020-sponsored projects all come to a happy ending, thus proving the institution and the program as worthy and beneficial for a better future. But in this case, the decision may have been made solely framed under a technological deterministic idea, which is that no social drivers for the dynamics of the R&I transformation are to be found. This is specially so, if we think of a desired perspective embedded in this case, understanding that it is not intended to predict, but rather to interpret and account social (and technical) phenomena (Jasanoff, 2015). Therefore, this might lead us to conclude that the corresponding sociotechnical imaginary did not consider collectively held forms of social life (i.e., incorporating the public), but indeed institutionally stabilized by the EC. In the end, this imaginary provides a combined vision of European science and European society based on values made on what the EC itself has declared as the important and worthy. They envision a society in which the success due to biomedical research

might not be equal to better healthcare access, but a strengthening of the dominant neoliberal commodification of healthcare and life sciences.

6.5   By development type

When we perform the analysis of the documents by development type, other conclusions emerge.

The 11 *Research/Modeling/Test*-type texts take half of each one of the following categories: *complex wording, life-saving, innovation, scientists speaking, people involved* and *industrial/commercial opportunity*. Besides, when data-crossing the RMT-type documents with the diseases they involve, we can appreciate that 9 out of these 11 documents correspond to cancer-related projects. We can conclude that cancer research is justified upon society through a broad range of rhetorical and narrative resources, in order to enact success, showing how Horizon 2020 tackles it down becoming a worthy policy. In particular, the profuse use of *conditionals* in the RMT-type *stories* (within 10 out of the 11 documents) helps us to sustain the idea of developments still on the realm of the potential, not necessarily being nearly to become a reality. We can conclude that the use of conditionals are part of the stylistic structure which is part of the rhetoric to justify the need, in particular, of the cancer research.

Regarding the *drugs*-type documents, we can highlight that it is the only development type in which each and every category is present. When we look at the diseases involved, we can observe that the 5 drug-type documents correspond to 5 different diseases (HIV, heart conditions, diabetes, bacterial infections and cancer). This means that they do not portray a specific or predominant health condition, but are distributed among them, therefore reaching more different patients. The conclusion we can elaborate is that when is about developing drugs, the success is represented through a variety of rhetorical, linguistic and narrative resources as part of the discourse, independent of the disease. The most recurrent category within this type is the *countries involved* (4 out of 5), which means that, in particular, they tend to praise the internationality of the projects, valorizing the multi-national contribution, valuing the EC sponsoring continental-wide solutions. This also becomes part of the elaboration of a sociotechnical imaginary (as part of the institutional stabilization).

The *Technological devices* type documents enable another kind of conclusion. As a reminder, these three projects are the robots for the elderly, the robots for the kids with diabetes, and the airbag-helmet for bicycle riders. They seem to portray a case of *optimism bias*, stimulating people to make certain healthcare decisions. But is not clear how contributive these decisions are in terms of their cost/benefit or well-being. The *optimism bias* is based on the public's perception of the benefits that a given

technological product can provide them (which might be distorted from reality). This tendency seems supported by the fact that no *complex wording* was used within any of the TD-type documents, therefore they use the rhetoric in a certain way, bringing the public closer to the technology. We can find here other means used by the *Success Stories* to stage the need of biomedical innovation. On the opposite, we can interpret the fact that all the TD-type *Stories* use *scientists speaking,* as a maneuver to render the projects as more formal, in particular to balance the use of the *colloquial wording* within the narration. Scientists can be regarded here as acting storytellers, creating a case of popularization of science (another rhetorical resource to justify the policy). Another observation is that despite the *conditionals* category is, in general, the one used the most (within 18 out of the 23 documents), in particular the TD-type *Stories* are the ones which use *conditionals* the least: only once. If we understand the use of conditionals as a wording resource to portray technology which is still under development (and is still unknown whether it will be a reality or not), this means that it becomes less necessary to use conditionals. Therefore, the outcome of those projects therefore seems more tangible to society. The robots and the airbag helmet are somehow already 'available' (even if they are still prototypes): the narration makes them more visible to the people. The conclusion is that they blend the benefits of biomedical innovation, with the use of rhetoric (in the form of personal stories) to justify the policy. Also, a case in which values are constructed based on what has been determined as important, but that definition has been made by Horizon 2020 to shape the public's decision-making.

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8 Appendix

8.1 List of the 23 *Success Stories* used

1. A more accurate imaging probe for cancer surgery
2. A portable device to detect the signs of cancer
3. A surgical strike against bacteria
4. Advancing the treatment of melanoma
5. Boosting translational cancer research
6. Breaking down barriers to develop new anticancer drugs
7. Cancer test would pinpoint high-risk women
8. Developing a blood test to diagnose curable hypertension
9. EU funds promising breast cancer risk research
10. EU research funding targets help for people with Down syndrome
11. HIV scientists launch 23 million euro project to develop vaccine
12. How robots can enhance the lives of Europe's elderly citizens
13. Improving heart health with a single pill
14. Project to trial stem cell diabetes treatment
15. Robots interact with children to help with their diabetes
16. Saving lives with a new liver dialysis device
17. Screening technology detects cancer in single DNA molecule
18. Spotting pancreatic cancer early
19. Targeted treatments for advanced-stage bowel cancer
20. Targeting leukaemia with personalised treatment
21. Tools for modelling and predicting cancer progress
22. Understanding cancer progression to improve treatment
23. Airbag bike helmet seeks to bolster safety
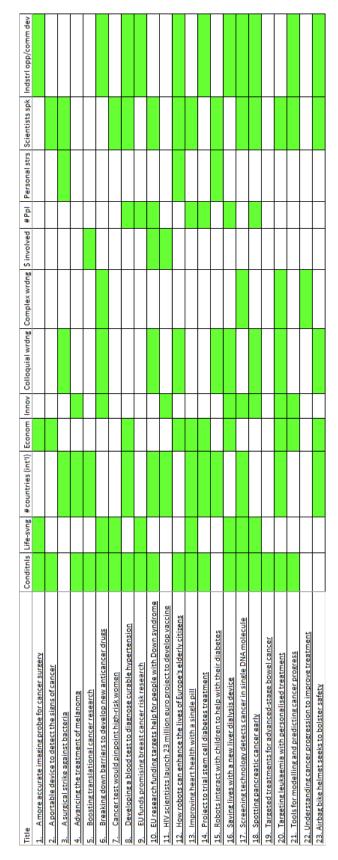
8.2 Summary of the categories per document

Table 8: summary of the categories for each Success Story

Title	Conditnls	Life-svng	# countries (int'l)	Econom	Innov	Colloquial wrdng	Complex wrdng	S involved	# Ppl	Personal strs	Scientists spk	Indstrl opp/comm dev
1. A more accurate imaging probe for cancer surgery												X
2. A portable device to detect the signs of cancer	X			X						X	X	
3. A surgical strike against bacteria	X		X			X						
4. Advancing the treatment of melanoma	X		X		X							
5. Boosting translational cancer research	X		X					X				X
6. Breaking down barriers to develop new anticancer drugs	X						X					X
7. Cancer test would pinpoint high-risk women		X										X
8. Developing a blood test to diagnose curable hypertension	X		X	X					X			X
9. EU funds promising breast cancer risk research		X							X		X	X
10. EU research funding targets help for people with Down syndrome	X					X						X
11. HIV scientists launch 23 million euro project to develop vaccine			X		X			X				
12. How robots can enhance the lives of Europe's elderly citizens	X					X						X
13. Improving heart health with a single pill	X	X	X						X		X	
14. Project to trial stem cell diabetes treatment	X	X										X
15. Robots interact with children to help with their diabetes			X			X			X			X
16. Saving lives with a new liver dialysis device	X	X	X		X	X						X
17. Screening technology detects cancer in single DNA molecule				X	X	X						X
18. Spotting pancreatic cancer early												
19. Targeted treatments for advanced-stage bowel cancer	X											
20. Targeting leukaemia with personalised treatment	X		X		X	X	X				X	X
21. Tools for modelling and predicting cancer progress	X											X
22. Understanding cancer progression to improve treatment			X			X	X				X	X
23. Airbag bike helmet seeks to bolster safety												X

Table 8: summary of the categories for each Success Story

Legend:

- Conditnls: use of conditionals

- Life-svng: sense of life-saving
- # countries (int'l): Involvement of several countries and/or internationality of the projects
- Econom: sense of economization
- Innov: sense of innovation
- Colloquial wrdng: colloquial wording and trivialization
- Complex wrdng: complex wording
- $ involved: monetary resources involved
- # Ppl: People (patients) involved on trials
- Personal strs: use of personal stories
- Scientists spk: scientists speaking
- Indstrl opp/comm dev: Industrial opportunity and/or commercialization strategies

8.3   List of Abbreviations

CDA: Critical Discourse Analysis

DA: Discourse Analysis

EC: European Commission

EU: European Union

FP: Framework Programme

H2020: Horizon 2020

RI: Responsible innovation

RRI: Responsible research and innovation

R&I: Research and innovation

R&D: Research and development

9 Abstract English

For years, STS scholars have acknowledged the existence of a dominant model in science communication. It works in a way in which knowledge is produced by the scientific side, and communicated to the public, with the latter being neglected the option to speak back to the former. This model is also sustained by the assumption that society is mostly composed by lay people, lacking scientific formation and knowledge. And when society is unable to understand science, two problems arise: a moral and a political one. The moral means individuals being unlikely to make rightful choices, while the political implies that people will not support public funding of scientific research. Scientific storytelling emerges to bridge the gap, improving the scientific knowledge transfer process. In order to gain societal support, as well as proving the importance of the policy, the information being spread to society has to include what the storytellers have deemed as important after a valuation process, in which certain values have been enacted. At the same time, these values are portrayed in visions of the future, which should be transversally accepted by society as sociotechnical imaginaries (Jasanoff, 2015).

But how to do so when the science being communicated corresponds to a €77B continental scientific research policy, covering more than 25 countries and 400 million people? This thesis analyzes how Horizon 2020 has communicated the success of their projects through a set of documents called *Success Stories*. The European Commission uses these documents to promote the hope and the social value of scientific research, appealing to the bioeconomy and the possible capitalizations of biomedical sciences. 23 of those documents were studied, specifically about healthcare and life sciences research, using Critical Discourse Analysis. 12 different categories were coded, where the most important where the use of conditionals to construct their promises of better futures; the scientists speaking as the authoritative body in scientific knowledge; the commercial opportunities that these research will provide; how innovative these developments are; the life-saving perspectives that some projects offer; and the use of personal stories to sustain the importance and humanize the research, among others. My analysis had three different layers grouping different categories, which mingle and form a discursive knot. The first one was about the layout, stylistic structure and argumentation; the second one about the rhetorical structure and the contents of the argumentation; and the third one considered the infrastructure of the research projects.

My main findings were the use of rhetoric means to communicate the potential outcomes of these projects, despite in some cases they will not solve long-term problems, or are projects still at an early stage. Other situations use the humanization of the narration in order to obtain the public support, portraying an idea that this research will help 'normal' people. This allows us to understand a given institutional direction of using rhetoric to enact hope, therefore expose to society the value of Horizon 2020.

10 Abstract Deutsch

STS-Wissenschaftler*innen kritisieren seit Jahren des vorherrschenden Modells Wissenschaftskommunikation, bei dem Wissen von der wissenschaftlichen Seite produziert und an die Öffentlichkeit kommuniziert wird. Der Öffentlichkeit ist in diesem Modell nicht die Möglichkeit nicht gegeben ist, zur Wissenschaft zu sprechen. Dieses Modell wird auch durch die Annahme gestützt, dass sich die Gesellschaft zum größten Teil aus Laien zusammensetzt, denen es an wissenschaftlicher Bildung und Wissen mangelt. Und wenn die Gesellschaft die Wissenschaft nicht verstehen kann, entstehen zwei Probleme: ein moralisches und ein politisches. Das moralische Problem beinhaltet, dass es unwahrscheinlich ist, dass das Individuum die richtigen Entscheidungen trifft. Das politische Problem hingegen deutet darauf hin, dass die Bevölkerung die öffentliche Finanzierung von wissenschaftlicher Forschung nicht unterstützt. Wissenschaftliches Geschichtenerzählen wird oft eingesetzt um die Lücke zu schließen und den wissenschaftlichen Wissenstransfer zu verbessern. Um gesellschaftliche Unterstützung zu erhalten und die Wichtigkeit von Policy zu beweisen, muss die Information, die an die Gesellschaft verbreitet wird, beinhalten, was die Geschichtenerzähler nach einem Bewertungsprozess, in dem bestimmte Werte inszeniert wurden, als wichtig erachtet haben. Gleichzeitig werden diese Werte in Zukunftsvisionen dargestellt, die von der Gesellschaft als sociotechnical imaginaries (Jasanoff, 2015) transversal akzeptiert werden sollten.

Aber wie geschieht dies, wenn die zu vermittelnde Wissenschaft einer kontinentalen wissenschaftlichen Forschungspolitik in Höhe von 77 Mrd. EUR entspricht, die mehr als 25 Länder und 400 Millionen Menschen umfasst? Diese Masterarbeit analysiert, wie Horizon 2020 den Erfolg ihrer Projekte anhand einer Reihe von Dokumenten namens Success Stories kommuniziert. Die Europäische Kommission nutzt diese Dokumente, um die Hoffnung und den gesellschaftlichen Wert der wissenschaftlichen Forschung zu bewerben und die Bioökonomie und die möglichen Kapitalisierungen der biomedizinischen Wissenschaften anzusprechen. 23 dieser Dokumente wurden unter Verwendung der Critical Discourse Analysis untersucht. 12 verschiedene Kategorien wurden kodiert, wobei die wichtigsten die Verwendung von Konditionalen war, mit denen Versprechen einer besseren Zukunft geschaffen werden; die Wissenschaftler*innen, die als authoritäres Organ für wissenschaftliches Wissen sprechen; die kommerziellen Möglichkeiten, die diese Forschung bietet; wie innovativ diese Entwicklungen sind; die Lebensrettungsperspektiven einiger Projekte; und die Verwendung persönlicher Geschichten, um unter anderem die Wichtigkeit der Forschung zu erhalten und sie zu humanisieren. Meine Analyse bestand aus drei verschiedenen Ebenen, die verschiedene Kategorien gruppieren, die sich miteinander vermischen und einen diskursiven Knoten bilden. Beim ersten ging es um Layout, Stilstruktur und Argumentation;

beim zweiten über die rhetorische Struktur und den Inhalt der Argumentation; und der dritte betrachtete die Infrastruktur der Forschungsprojekte.

Meine wichtigsten Ergebnisse beziehen sich auf die Verwendung rhetorischer Mittel, um die potenziellen Ergebnisse dieser Projekte zu kommunizieren, obwohl sie in einigen Fällen keine langfristigen Probleme lösen oder Projekte noch in einem frühen Stadium sind. Andere Situationen nutzen die Humanisierung der Erzählung, um die Unterstützung der Öffentlichkeit zu erhalten, und stellen damit die Idee dar, dass diese Forschung „normalen" Menschen helfen wird. Auf diese Weise können wir eine bestimmte institutionelle Richtung von Rhetorik zur Darstellung von Hoffnung verstehen, die der Gesellschaft den Wert von Horizon 2020 offenlegt.