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Broadening Aims and Building Support in Science, Technology and Innovation Policy: The Case of the European Research Area

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Abstract

The aim of this article is to analyse the evolution of the ideational framework of the most ambitious initiative in supranational research governance so far – the European Research Area (ERA), launched by the European Commission in 2000. In order to do so, the ERA initiative is analysed against the background of the long-term development of the science, technology and innovation policy ideas. The analysis reveals that over the course of 14 years, the policy aims of, and support for, the ERA initiative have considerably broadened. While economic competitiveness goals initially dominated the Commission's initiative to launch the ERA, the initiative has gradually expanded towards social and scientific aims as well as stronger involvement of member states and stakeholders. Recent "big ideas" of excellent science and Grand Challenges help increase support for the ERA initiative among the research community and society. In the broadened ERA ideational frame, diverse aims of scientific freedom, societal relevance and economic competitiveness co-exist but attention to the relationships between them has been limited. Further exploration and conceptualization of the relationships between diverse policy ideas is an important challenge for future research policy studies and practice.

Keywords

European Research Area; Science; technology and innovation policy; Economic competitiveness; Grand Challenges; Scientific excellence

There is tension between those who stress the importance of an autonomous "Republic of Science" and those who emphasise that considerations of social and economic value and cost, judged in considerable part by non-scientists, should play a major role in determining basic research allocation decisions. The controversies here shade over into a semantically adjacent area – the relative emphasis that should be placed on basic versus applied research. (Nelson 1977: 65)

Toward what is the European Union's (EU) research policy aiming? Is the EU supporting research so it can become the most competitive economy in the world? Does it want to promote research of the highest scientific quality? Or does it see research as a tool to solve major societal problems in areas such as health, environment and energy? How compatible are these different aims and what roles do the long-standing tensions and controversies, as indicated in the opening quote from Richard Nelson (1977), play in the current EU research policy? What are the values, ideas and interests involved in the diverse aims of EU research policy? These are timely questions considering the EU's increased involvement in the field of research policy. While the majority of research funding is allocated at the national level, the EU's involvement has gradually increased over the decades (Borrás 2003; Peterson and Sharp 1998). This article will focus on the most ambitious EU project in this field so far - the European Research Area (ERA) initiative, launched in 2000. The ERA initiative covers a broad set of activities including reforms of national research systems, cooperation and coordination among national research funding activities, improved career systems and mobility of researchers.

While a number of previous studies have addressed the emergence of the ERA initiative in the context of the EU's research policy (Chou 2014; Delanghe et al. 2009; Edler et al. 2003; Prange-Gstöhl 2010), the novelty of this analysis is to study the evolution of the ERA initiative and its main goals from the launch of the initiative in 2000 until 2014, in light of the long-term development of science, technology

and innovation (STI) policy¹ ideas. Analysing the ERA initiative against the background of the long-term evolution of the STI policy frame enables us to also shed light on how old policy ideas appear in the ERA initiative in new forms, helping to mobilize support for the initiative. Additionally, applying a historically developed research policy frame for the interpretation of recent ERA developments draws attention to further conceptual work needed. This article proceeds as follows: firstly, the concept of framing is introduced and the historical evolution of the STI policy frame is discussed; secondly, the evolution of the ERA initiative from 2000 until 2014 is analysed with a particular focus on its main aims and actors involved; and finally, the concluding section conceptualizes the evolution of the ERA ideational framework in the context of the long-standing STI policy ideas.

SCIENCE, TECHNOLOGY AND INNOVATION POLICY FRAMING

To study the main ideas, rationales, interests and values guiding STI policy, the concept of “frame” is used, ‘in which facts, values, theories, and interests are integrated’ (Rein and Schön 1993: 145). According to Donald Rein and Martin Schön (Rein and Schön 1993: 146), ‘framing is a way of selecting, organizing, interpreting, and making sense of a complex reality to provide guideposts for knowing, analysing, persuading, and acting. A frame is a perspective from which an amorphous, ill-defined, problematic situation can be made sense of and acted on’. According to Rein and Schön, frames are developed in interactions among individuals, interest groups and institutions and can be used strategically for problem-solving, agenda-setting and decision-making. Thus, the concept of the frame is useful for exploring changes in the content of STI policy.

While diverse ideas on the role of science, technology and innovation in society have been debated over centuries, STI policy as a distinct public policy area was established after World War II (Elzinga and Jamison 1995). Scholars depict the evolution of this policy field as a cumulative three-step expansion from “science policy” to “technology policy” and later to “innovation policy”, where every subsequent step is broader and incorporates ideas and instruments from the previous ones (Borrás 2003; Lundvall and Borrás 2005). Expansion of this policy field has also been conceptualized as evolution of policy paradigms and frames (Biegelbauer and Borrás 2003; Sanz-Menendez and Borrás 2001), generations (Boekholt 2010) and periodizations (Elzinga 2012), helping to make sense of changing ideas. It is important to keep in mind that this is a cumulative process and not a succession of strictly delineated and clear-cut historical stages.

The evolving STI policy frame has been spread internationally by an epistemic community of experts and policy-makers that has largely operated via the Organisation for Economic Cooperation and Development (OECD), which has played a leading role in the development of STI policy (Lundvall and Borrás 2005; Elzinga and Jamison 1995). The international policy frames have influenced the development of the STI policy of the EU and its member states (Borrás 2003; Sanz-Menendez and Borrás 2001) and appropriate policy instruments (Boekholt 2010). Today’s debates about the objectives, values and governance of the ERA can be better understood by taking a long-term view of how the policy ideas in this area have emerged and evolved.

Science policy frame

The initial “science policy” frame emerging in the 1940s was largely shaped by the experience of the two world wars, where science played an important but also widely debated role. One of the best-known early manifestos calling for the establishment of science policy is the 1945 report “Science The Endless Frontier” by Vannevar Bush. Building on the vital role science had played during the war, the report calls for the establishment of a science policy in the United States that would support the use

of the scientific knowledge accumulated during the war for civilian purposes such as “war against disease” and public welfare. Such a policy would also support research activities in public and private organizations as well as discover and develop scientific talent. The report is well known for its call to support “basic research” (Pielke 2012), which, according to Bush, would later lead to new products and processes. Therefore, the report advocated what became known as the “linear model of innovation”, according to which support for basic research leads to the development of new products and processes which are afterwards introduced into production and market, thus fuelling economic growth (Kline and Rosenberg 1986). An emphasis on support for basic research in the report was accompanied by a call to preserve freedom of inquiry, stating that ‘[S]cientific progress on a broad front results from the free play of free intellects, working on subjects of their own choice, in the manner dictated by their curiosity for exploration of the unknown’ (Bush 1945: 12).

A number of ideas in Bush’s report were closely related to the major controversy about the role of science between the views of John Bernal advocating the social function of science (1939) and Michael Polanyi stressing the importance of academic freedom (1962). Writing between the two world wars, Bernal (1939) emphasised that recent events ‘have led to a critical examination of the function of science in society’ (Bernal 1939: xiii). According to him, the social function of science implies that science has to assist human needs and be the chief agent of change in society (Bernal 1939: 383). Bernal defines science as ‘an integral part both of the material and economic life of our times and of the ideas which guide and inspire it. Science puts into our hands the means of satisfying our material needs. It gives us also the ideas which will enable us to understand, coordinate, and satisfy our needs in the social sphere’ (1939: 408).

While Bernal responded to the attacks on scientists’ involvement in wars by advocating its social function, his contemporaries emphasised internal norms of science. One of the best-known contributions comes from Robert Merton, who stated in his 1942 essay on the normative structure of science that ‘the institutional goal of science is the extension of certified knowledge’ (Merton 1942: 270) and that the ethos of modern science consists of four sets of institutional imperatives: communism (i.e. common ownership of findings by scientific community), universalism, disinterestedness and organized scepticism².

The main critique of Bernal’s call for the social function of science came from Polanyi’s 1962 essay “Republic of Science”, which emphasised the freedom for scientists to choose their research problems and to self-organize. According to Polanyi, ‘the pursuit of science by independent self-coordinated initiatives assures the most efficient possible organisation of scientific progress. And [...] any authority which would undertake to direct the work of the scientist centrally would bring the progress of science virtually to a standstill’ (Polanyi 1962: 56). He assigns the main role to the scientific authority that scientists exercise over each other, while central political authority can, in his view, only assist or hamper spontaneous developments of science but cannot shape its advance.

While these debates on the social function and freedom of science emerged in a certain historical context, they have shaped the development of research policy worldwide and have been major points of reference in the on-going discussions about the governance of science (Borrás 2012; Pielke 2014). Arguments of Polanyi and Bernal have been used for discussing a wide range of issues from anticipation of emerging technologies (Guston 2012) to analysing the changing character of research councils (Rip 1994), evaluation and funding (Ziman 1983). Another important term that emerged during the post-war era was “big science” (Price 1963), which describes the increased role of the large scale research infrastructure and collaborations which today require complex strategic partnerships and are known as “megascience” (Elzinga 2012).

To summarize, the initial science policy frame started to evolve when this policy field was established after World War II. The big questions asked about the use of scientific knowledge for civilian purposes (Bush 1945), the social function of science (Bernal 1939), scientific norms (Merton 1942) and scientific

freedom (Polanyi 1962) are still important in shaping scientific debates today (Borrás 2012; Pielke 2014). This initial frame also sets out some of the key policy instruments which are still relevant today such as support for basic research, public and private research organizations, scientific talent and infrastructure.

Technology policy frame

During the 1970s, the STI policy frame expanded towards a more dedicated focus on science-based technologies (e.g. nuclear power, computer and space technology). Bengt-Åke Lundvall and Susana Borrás (2005: 609) note that technology policy represents ‘a shift from broader philosophical considerations to a more instrumental focus on national prestige and economic objectives’. At this time, technology policy thinking was strongly influenced by economic ideas (Edler 2003) and was perceived as a useful tool for solving wider economic problems in the aftermath of the oil crisis (Biegelbauer and Borrás 2003). As perception of global industrial competition increased, national governments used technology policy for promoting their “national champions” in specific sectors (Lundvall and Borrás 2005). The widely used rhetoric of national and European competitiveness has been criticised by Paul Krugman (1994) as a meaningless concept when applied to national economies because countries do not go out of business like companies and the international economy is not a zero sum game. Krugman calls competitiveness “a dangerous obsession”, because it can lead to wrong policies and wasteful government spending while ignoring the real causes of economic problems.

Concerns about the impact of science and technology were raised by the new social (anti-war, feminist and environmental) movements that emerged in the late 1960s. They facilitated focus on democratization, public participation and the social relevance of science and technology and contributed to interest in technology assessment and foresight of broader impacts of future technologies (Elzinga and Jamison 1995). One of the major contributions to discussing social questions of technology at that time was Nelson’s 1977 book “The Moon and the Ghetto”, which focussed on uneven technological progress whereas some socio-political issues have been tackled more successfully than others:

a country that recently had accomplished the truly remarkable feat of sending a man to the moon and bringing him back to earth safely, had wiped out scourges of infantile paralysis, and more generally had achieved an historically unprecedented standard of living for the middle class, for some reason seemed unable to provide an effective education for ghetto kids, halt or significantly slow down the rising cost of medical care, keep the air and water clean or cut down on the incidence of drug addiction and drug-related crime (Nelson 2011: 681).

To summarize, the technology policy frame presents science and technology as instruments to achieve economic competitiveness. Simultaneously, growing societal concerns over new technologies lead to increased public participation, technological forecasting and attention to the social implications of technological development.

Innovation policy frame

Gradually the policy frame evolved and expanded further to what became known as innovation policy in the 1990s. Building on earlier ideas about innovation, this policy frame emphasised collaboration, diffusion and the need for a systemic approach. The linear model of innovation was replaced by a chain-link model incorporating feedback loops and multiple paths of innovation (Kline and Rosenberg 1986), demonstrating that rather than being a smooth and linear process, innovation is complex, uncertain and somewhat disorderly. A related idea on the importance of policy supporting the

diffusion of innovation was put forward by Henry Ergas (1987), who made a famous distinction between mission-oriented policies promoting the development of new technologies and diffusion-oriented policies supporting the widespread dissemination of capacities of firms to respond to new technologies.

Particularly influential in this policy frame is the innovation systems approach³ focussing on the role of historically developed institutions and interactions between them in explaining innovation (Lundvall 1992). The crucial role of interaction among diverse institutions has been emphasised by a number of other approaches emerging approximately at the same time, such as triple helix, third mission and Mode 2 knowledge production. According to the Triple Helix model (Leydesdorff and Etzkowitz 1996), university-industry-government relations play a crucial role in knowledge production, and universities – also known as entrepreneurial universities - undertake important economic functions. Similarly, the concept of the “third mission” of universities (Goransson et al. 2009) envisages an extension of the university’s role beyond teaching and research to include its socio-economic contribution as well. The idea of Mode 2 knowledge production (Gibbons et al. 1994) argues that Mode 1, characterized by knowledge production in an academic context, disciplinarity, homogeneity, autonomy and traditional quality control (peer review), is being replaced by the Mode 2 where knowledge is produced in the context of application, transdisciplinarity, heterogeneity, reflexivity, social accountability and novel quality control. Innovation policy translated these ideas into instruments supporting networks and capacity building, small and medium-sized enterprises and intellectual property rights. Susana Borrás (2003: 17) distinguishes between a narrow innovation policy agenda focussing directly on supporting innovation and a wide innovation policy agenda including policies such as education and training, competition and infrastructure.

A lot of the economic thinking that had influenced STI policy ideas since the 1970s was reinforced during the 1990s through the introduction of the New Public Management (NPM) ideas, which promoted the introduction of private sector management techniques in public policy. For STI policy, NPM meant an increased focus on the evaluation of quantifiable results and competitive resource allocation (Elzinga 2012: 426). The appropriateness of NPM ideas for STI policy has been widely debated because they differ considerably from sociological views on the organization of the research community (Hagstrom 1965; Merton 1942). The limits of organizing research systems according to market principles have been pointed out (Georghiou 2006).

To summarize, the innovation policy frame aims for a more systematic approach to knowledge production and diffusion. Accordingly, it emphasises accountability and collaboration among research organizations, business, government and society. While the main focus of the innovation policy frame is on interactions and linkages between heterogeneous actors involved in the innovation process, the cumulative expansion of the STI policy frame means that this frame includes ideas from the previous frames (e.g. importance of research infrastructure, foresight, training of young scientists), though some of these ideas have been revised (e.g. chain-link model of innovation replacing linear model) or integrated in a new context (e.g. basic science organizations being one of the institutions in the innovation system rather than playing a dominant role as in the earlier science policy frame).

The main ideas of an evolving STI policy frame are summarized in Box 1. This historical review of the broadening STI policy frame helps to interpret ideas, rationales, values and interests involved in today’s research policy ‘by drawing attention to the continuation and deepening of old issues in new forms’ (Elzinga 2012: 426).

Box 1: Stylized evolution of the main ideas of science, technology and innovation policy

Science policy	Technology policy	Innovation policy
<i>since 1940s</i>	<i>since 1970s</i>	<i>since 1990s</i>
Social function of science Scientific freedom Big science – infrastructure Education of young scientists	Science-based tech Economic goals Global competition National prestige National champions Foresight Social concerns	Innovation system Chain-link model Diffusion Mode 2 Triple Helix Third mission New public management

As pointed out by Borrás (2003: 13), this three-step evolution of STI policy is ‘an analytical model for heuristic purposes’ which has not always been strictly followed in practice. For example, while policy thinking in recent decades has emphasised the non-linear character of innovation and social accountability associated with Mode 2 knowledge production, in policy practice and debates it is still possible to encounter the linear model of innovation and Mertonian norms of disinterestedness. Borrás elaborates on the complexity of capturing policy evolution, stating it is

“a stylized fact” of the transformations taking place through history. In this evolution there is not necessarily an overall predetermined rationality constantly improving it, as if there was an “end of history” where policy achieves a perfect, ultimate, formulation. Policy changes are the fruit of many complex factors, which are socially, politically, and economically embedded, and that are not necessarily improvements of one single course of history (Borrás 2003: 14).

Accordingly, this article will use the main long-standing ideas from STI policy discussed above for analysing the evolution of the ideational framework of the ERA initiative. In this analysis, policy evolution is understood not as a predetermined rational and purposeful process but rather as a constant adaptation to a changing social, political and economic environment (Borrás 2003).

EVOLUTION OF THE EUROPEAN RESEARCH AREA INITIATIVE

The policy framing perspective is seen as particularly relevant for structuring political conflict and competition at the European level, characterized by competing constituencies and contested competencies (Daviter 2007). Some earlier studies have analysed the cognitive dimensions of the EU research policy and called for “bringing ideas back in” to account for its evolution (Sanz-Menendez and Borrás 2001). Taking a bird eye’s view of the history of EU research policy since the establishment of the EU, Borrás (2003: 12) claims its evolution ‘can be portrayed as the transition from science policy, to technology policy, and finally to innovation policy’.⁴ In particular, she takes a close look at the transition from EU “technology policy” to “innovation policy” in the mid-1990s, arguing that while the main EU innovation policy documents at that time take a narrow view on innovation policy, actual EU

activities towards supporting innovation go far beyond this narrow view and include areas such as education, small and medium-sized enterprises, regional policy, information society and competition policy (Borrás 2003: 17-20). An important role in this “innovation turn” in EU policy framing was played by expert communities in the OECD and national and Commission policy fora (Sanz-Menendez and Borrás 2001). Additionally, some studies have analysed the framing of the specific EU initiatives; for example, Jakob Edler (2003) studied the influence of economic ideas on the EU research programme BRITE (Basic Research in Industrial Technologies for Europe) in the 1980s.

The ERA initiative launched in 2000 emerged during the most recent innovation policy frame. The earlier discussion of the long-term development of STI policy ideas helps to make sense of the development of ideas, values and interests involved in the ideational framework of the ERA initiative. This paper traces the evolution of the ERA initiative and its main goals from its launch in 2000 until 2014 by studying relevant literature and the main documents defining the ERA initiative (e.g. the Commission’s Communications and the Council’s Conclusions)⁵. The chronology of the key events of the ERA initiative is outlined in Box 2.

Box 2: Evolution of the ERA initiative

2000	Launching ERA and Lisbon strategy
2002	Barcelona target of R&D funding of 3% of GDP
2002	Communication “The European Research Area: Providing a new momentum”
2005	Mid-term review and re-launch of Lisbon strategy
2007	ERA Green paper – public consultation
2007	‘Fifth freedom’ in the single market
2007	European Research Council focussing on excellence established
2008	Ljubljana process on ERA governance as enhanced partnership
2009	Lisbon treaty enters into force providing treaty basis for ERA
2009	Lund declaration on Grand challenges
2010	Europe 2020 & Innovation Union
2012	ERA reform agenda and ERA Stakeholders Platform
2013	First ERA Progress Report
2014	Deadline for completing ERA
2015	ERA roadmap has to be developed

The two main phases in the development of the ERA initiative and its main ideas are distinguished here. The initial phase, from the launch of the ERA initiative in 2000 by the Commission with the endorsement from the Lisbon Council until the mid-term review of the Lisbon strategy in 2005, is characterised by the dominance of economic ideas and limited involvement of member states and stakeholders. The second phase, starting from the public consultation on the ERA in 2007, is characterised by dedicated efforts to develop a partnership with the member states and stakeholders and a broadening of the ERA goals to scientific excellence and societal relevance.

Phase I (2000-2006): The Commission's initiative dominated by economic ideas

The European Commission launched the ERA initiative in January 2000. The initial ERA document (EC 2000) sets out rationales for establishing the ERA and lists activities it should cover. However, it does not provide a definition of what the ERA actually is. The urgent need for European action was framed in terms of improving Europe's competitive position and closing the gap with the United States (US) and Japan. The document provides data demonstrating that the EU lags behind the US and Japan on indicators such as public and private expenditure on research and development, employment of researchers in industry and trade in high-tech products. Concerns of the EU lagging behind the US have been a major driving force of integration of European research policy since the 1950s (Sanz-Menendez and Borrás 2001: 34). An important problem identified in the initial ERA document is a lack of coordination between national and European research policies.

To address these problems and establish the ERA, the document suggests seven action lines: optimisation of resources and facilities at the European level, more coherent use of public instruments and resources, more dynamic private investment, a common system of scientific and technical reference for policy implementation, more abundant and mobile human resources, a dynamic European landscape that is open and attractive to researchers and investment, and an area of shared values. These seven broad lines cover diverse activities from designing effective tools to protecting intellectual property and encouraging risk capital investment to developing a shared vision of the ethical issues of science and technology. The use of policy instruments such as financial, legal and coordination measures was envisaged. While the EU was – to different degrees – already dealing with the actions listed, the novelty was bringing them together and the ambition was to develop them further under the large-scale framework of the ERA. The Commission stated at the outset that the ERA ‘will not come into being instantly in its final form. It will develop gradually’ (EC 2000).⁶

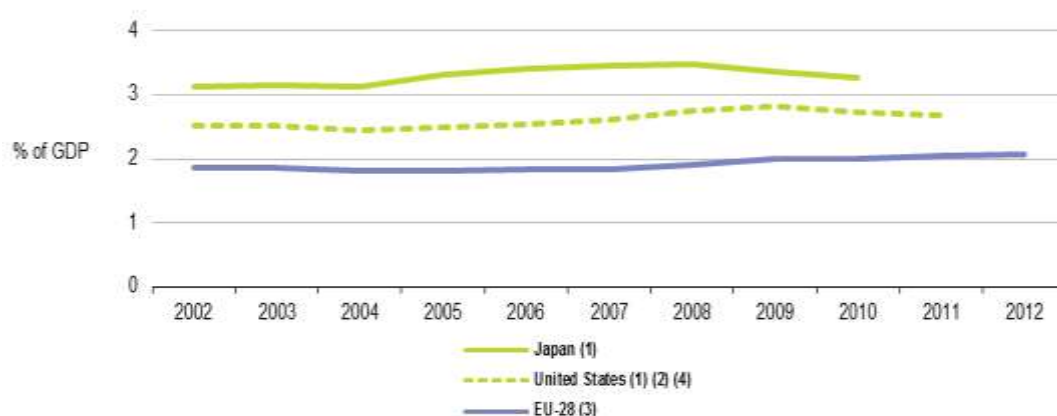
Borrás (2003: 40) sees the range of topics in the initial ERA document as ‘rather impressive’ and interprets it as a sign that ‘the Commission has wholeheartedly embraced the “systemic approach”, making the production and dissemination of knowledge the cornerstone of a truly EU “research system”, well beyond the delimited framework programme’. Heiko Prange-Gstöhl (2010: 3) points out that the list of activities was important for narrowing down the ERA concept in a situation when the Commission did not provide a definition of the ERA. Thus, while a broad range of activities listed in the ERA initial document largely fit with the dominant innovation policy frame of this time (although questions can be asked about linkages and interactions between different activities), its main aims are articulated in line with ideas about economic competitiveness, already familiar from the technology policy frame. This can be explained by the specificity of innovation policy frame, i.e. its main focus on facilitating interactions and linkages in knowledge production and diffusion, paying less attention to earlier “big questions” about the ultimate aims of policy.

The dominant economic rationales for the establishment of the ERA were strongly supported by the Lisbon strategy, launched two months thereafter. The Lisbon strategy set an ambitious goal for the EU in the next decade: ‘to become the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion’

(LEC 2000). The strategy endorsed the ERA initiative and assigned it an important role in achieving the strategy's main goal. Specific steps for the establishment of the ERA were outlined, including encouragement to develop an open method of coordination for benchmarking national research policies, identifying indicators for assessing performance and setting up a European innovation scoreboard (LEC 2000). This focus on quantitative indicators is in line with the New Public Management approach.

Accordingly, the Lisbon strategy established a number of quantitative targets including the so-called "Barcelona target" defined in 2002 to achieve research and development (R&D) funding of three per cent of gross domestic product (GDP) with one third coming from government funds and two thirds contributed by the private sector (BEC 2002). The "3 per cent target" was set taking into account the higher R&D investment levels in the US and Japan (see Graph 1) which had already concerned EU policy-makers for some time. While increasing R&D funding is seen as important, the need to pay attention to quality, efficiency and composition of funding has been emphasised as well (CEU 2014).

Graph 1: Gross domestic expenditure on R&D in the Triad, 2000-2010 (% of GDP). Source: Eurostat



Less than three years after launching the ERA initiative, the Commission undertook an early review aiming to reinvigorate it (EC 2002). In this document, the ERA concept began to emerge more clearly as defined by three related and complementary ideas: an "internal market" for research with free movement of knowledge, researchers and technology; improved coordination of national research policies; and development of European research policy that goes beyond funding activities.⁷ The document states that one of the main factors hampering progress for the ERA is insufficient participation from the member states. A low overall level of member state involvement is seen as a major barrier to tackling weaknesses such as the fragmentation of activities and the limited degree of coordination between national research policies. Achieving a substantial increase in member state involvement is one of the main objectives, along with the need for increasing the impact of the activities underway and consolidating the conceptual and policy framework in which the project is being implemented. Similar to the initial ERA document, the Commission presented a long list of activities to be strengthened that largely repeated those mentioned in 2000 (e.g. mobility and infrastructure), but also emphasised some new aspects such as the international dimension of the ERA and its openness to the world.

In 2005, the mid-term review of the Lisbon strategy found limited progress towards its ambitious aims to become the most competitive economy. The strategy was re-launched as the Growth and Jobs strategy based on a close partnership between the Commission and the member states⁸. These developments further influenced the evolution of the ERA initiative.

Phase II (2007-2014): Developing partnership and broadening aims

After the initial review of the ERA initiative in 2002 and the mid-term review of the Lisbon strategy in 2005, the ERA initiative gradually started to be better defined, to involve more actors and to broaden its ideational scope. While the Commission and economic ideas still played an important role, the member states and stakeholders were increasingly involved, and ideas on scientific excellence and addressing societal challenges acquired more prominence. The status of the ERA was strengthened by providing the concept a basis in the Lisbon treaty, which was signed in 2007 and entered into force in 2009. Article 179 states that the EU has an objective to achieve the ERA 'in which researchers, scientific knowledge and technology circulate freely' (EU 2010).

Simultaneously, the ERA aims were more closely linked to the core of the European integration process, namely the single market and its four freedoms. The communication on the single market (EC 2007b) introduced knowledge and innovation as its new frontier, saying 'the single market originally conceived for an economy reliant on primary products and manufactured goods has to adapt to foster openness and integration in a knowledge-based, service-oriented economy'. The document stated that in addition to the four established freedoms of the single market – free movement of people, goods, services and capital – "the fifth freedom" of free movement of knowledge and innovation has to be promoted.

Important changes in the ERA initiative were triggered by the 2007 ERA Green Paper (EC 2007a) that launched a public consultation on the ERA, activating European and national policy-makers as well as public and private research organizations to work on the creation of the ERA (Prange-Gstöhl 2010: 8). The Green Paper states that the scientific community, business and citizens need the ERA to have the six following features⁹: an adequate flow of competent researchers, a world-class research infrastructure, excellent research institutions, effective knowledge-sharing, well-coordinated research programmes and priorities, and a wide opening to the world.

The ERA Green Paper mentions a number of new ideas and institutions that became significant in the following years. In particular, the social aims of research became more visible in this document. In the context of globalization and the emerging scientific and technological powers of China and India, the Green Paper presented the ERA as a cornerstone for a European knowledge society. The document states the importance of research in fulfilling EU economic, social and environmental ambitions and referred to the need of identifying major societal challenges¹⁰ jointly and for establishing joint programmes for society-driven research. Additionally, it emphasised that European research policy should be deeply rooted in European society and that besides the pursuit of scientific excellence, it should support policies for sustainable development in fields of major public concern such as health, energy and climate change. In the context of the recent deadline (set in 2010) to complete the ERA by 2014, it is interesting that the Green Paper suggested that the ERA vision may not be fully realised for 10 or 20 years – around the year 2020. The document envisaged an important role for the two new ERA institutions – the European Research Council (ERC) and the European Institute of Technology.

The ERC launched in 2007 became a crucial element of the ERA, contributing to widening and strengthening the ERA initiative through new ideas and support from additional stakeholders¹¹. It was largely built on the ideas of scientific elite about high quality research, academic freedom and self-governance of the research community (Luukkonen 2014). Thus, while excellence was not prominent on the initial ERA agenda, it has become a visible part of it since 2007 (Luukkonen 2014: 33-34). The ERC has been widely appreciated by the scientific community, which had previously been dissatisfied with the perceived quality, applied orientation and top-down nature of the EU Framework Programmes and wanted more funding for basic research in Europe (Luukkonen 2014: 40). The establishment and success of the ERC broadened the ERA ideational frame with long-standing ideas about the role of basic research and self-organization in the academic community that have been popular since the early days of the science policy frame. The broadened STI policy frame raises

questions about how such support for basic research (now called “frontier research”) interacts with other institutions in knowledge production and diffusion process.

The increased engagement of a broader set of actors in the ERA triggered by the public consultation on the Green Paper (EC 2007a) was strengthened by the launch of the so-called “Ljubljana process” during the Slovenian presidency in 2008 (Prange-Gstöhl 2010: 9). Its core idea was to strengthen the ERA governance as an enhanced partnership between the member states and the European Commission with broad support from stakeholders and citizens (CEU 2008). Additionally, within the long-term vision for the ERA, the Council emphasised the role of the “knowledge triangle” of research, innovation and education (CEU 2008).

At this time, the social aspect and public support received increased attention within the ERA framework, in particular through the Grand Challenges concept¹². In 2008, the ERA expert group recommended that the ERA should be constructed as an essential element of Europe’s response to a series of Grand Challenges. According to them, a focus on Grand Challenges would provide substance to the ERA and increase support for the initiative and research in general, as Grand Challenges would ‘capture public and political imagination, create widespread interest among scientific and business communities and NGOs and inspire younger people’ (ERA expert group 2008: 37).

During the Swedish presidency in 2009, the concept of Grand Challenges was put high on the European research policy agenda by the Lund Declaration, saying ‘European research must focus on grand challenges of our time moving beyond rigid thematic approaches. This calls for the new deal among European institutions and member states, in which European and national instruments are well aligned and cooperation builds on transparency and trust’ (Lund Declaration 2009). The declaration stated that solutions have to be found in areas such as global warming, tightening supplies of energy, water and food, ageing societies, public health, pandemics and security. To respond to the Grand Challenges effectively, the ERA was seen as important for developing ‘processes for the identification of Grand Challenges, which gain political support and gradually move away from current thematic approaches, towards a structure where research priorities are based on these Grand Challenges’. The focus on Grand Challenges in STI policy has spread around the world during the last 10 years. It has many similarities with earlier STI policy ideas about the social function of science and social concerns and it re-emphasises the importance of “big ideas” in the innovation policy frame, which initially paid little attention to the “big” policy aims.

When the Lisbon strategy expired in 2010, it was replaced by the Europe 2020 strategy for smart, sustainable and inclusive growth (EC 2010a). The Europe 2020 strategy adopted many ideas from the Lisbon strategy including the target to invest three per cent of GDP in R&D. The ERA initiative is particularly important for one of the seven so-called flagship initiatives of the Europe 2020 strategy, namely the Innovation Union flagship (EC 2010b), which sets 2014 as the deadline for completing the ERA. This target date has received some criticism for either being set too early¹³ or for being of limited use for such a complex and far-reaching initiative as the ERA; as stated by a major stakeholder organization Science Europe, the ERA ‘is a long-term project, and to strive for its “completion” would be to lack ambition’ (Science Europe 2013).

The deadline to complete the ERA by 2014 is an important focus of the ERA reform agenda launched by the Commission in 2012 (EC 2012). This document provides a consolidated definition of the ERA based on the Lisbon treaty and the Council Conclusions stating that the ERA is ‘a unified research area open to the world based on the Internal market, in which researchers, scientific knowledge and technology circulate freely and through which the Union and its Member States strengthen their scientific and technological bases, their competitiveness and their capacity to collectively address Grand Challenges’ (EC 2012). Additionally, the document sets out five ERA priorities which combine earlier ERA action lines (EC 2000, 2002, 2007a): more effective national research systems, optimal

transnational cooperation and competition, an open labour market for researchers, gender equality, and optimal circulation of scientific knowledge including via the digital ERA.

As a pragmatic approach towards implementing these priorities, a reinforced partnership between member states, the Commission and research stakeholder organizations has been suggested (EC 2012). While the gradual involvement of the stakeholders has developed since the public consultation on the ERA Green Paper in 2007, the reinforced partnership envisages a new explicit role for the stakeholders. This new role led to the Commission signing the first joint statement with major stakeholder organizations (EARTO et al. 2012) to work together towards the achievement of the ERA. In 2013 this partnership was renewed (EARTO et al. 2013) by six stakeholder organizations: the European Association of Research and Technology Organisations (EARTO), the European University Association (EUA), the League of European Research Universities (LERU), a Nordic research funding organization NordForsk, an association of European research funding and performing organizations Science Europe and the Conference of European Schools for Advanced Engineering Education and Research (CESAER). The ERA Progress Report 2014 mentions that the Stakeholders Platform is a good instrument, contributing to ERA policy-making and implementation (EC 2014). According to the report, this platform could be expanded to include additional research players.

Additionally, the 2012 reform agenda envisages the development of the ERA monitoring mechanism (EC 2012). The first comprehensive ERA Progress Report was prepared in 2013 (EC 2013). After reviewing it, the Council (CEU 2014) invited the member states and the Commission to develop an ERA roadmap by mid-2015 at the European level to provide a shared understanding and facilitate national efforts in implementing ERA objectives. The ERA Progress Report 2014 (EC 2014) presents the development of the roadmap as a major step in strengthening the implementation of the ERA. The launch of the new funding programme Horizon 2020 in 2014 is seen as providing new momentum for the ERA implementation (CEU 2014). The three priorities of Horizon 2020 (EC 2011) are excellent science, societal challenges and industrial leadership¹⁴, which are related to the diverse STI policy ideas of scientific freedom, societal relevance and economic competitiveness.

The ERA Progress Report 2014 (EC 2014) concludes that the conditions for the completion of ERA are now in place, and 'it is now up to Member States and research stakeholders to implement the necessary ERA reforms and make ERA work'. While 2014 was previously set as a deadline for completing the ERA, the 2014 progress report states that 'the completion of ERA, like the internal market, remains a gradual process'¹⁵ (EC 2014). To summarize, the ERA initiative has indeed developed gradually since its launch in 2000. Initially, the Commission presented a rationale for the ERA and a long list of activities it involves but did not even define it. It took approximately a decade for the ERA initiative to acquire some of its essential features such as a treaty basis in 2009, explicit partnership with stakeholders in 2012 and its first comprehensive monitoring report in 2013. Thus, during 14 years, the ERA initiative has developed from the Commission's project dominated by economic rationale to a broader initiative involving member states and stakeholders and having a wider range of economic, social and scientific aims.¹⁶

The initial ERA initiative has been criticized for being a collection of activities with no vision and no mission (Delanghe et al. 2009). Such an approach largely fits with the innovation policy frame that emerged in the 1990s focusing mainly on interactions and linkages among institutions and actors involved in knowledge production and diffusion rather than on "big questions" about the vision and mission of policy that dominated during earlier science and technology policy frames. However, during the last ten years this innovation policy frame has been changing and "big ideas" such as the need for research to address Grand Challenges has become popular around the world. Today the ERA is still largely characterized by a collection of activities (reforming research systems, supporting collaboration and competition, facilitating mobility), which are regularly monitored but "big

questions” of vision and mission such as societal challenges play an increasingly important role in defining the ERA.

CONCLUSIONS AND OUTLOOK: FROM TENSIONS TO INTERACTIONS?

The long-term evolution of STI policy ideas discussed earlier helps to analyse the ideational development of the ERA initiative and the strategic use of “big ideas” (such as excellent science and Grand Challenges) to broaden support for the ERA among the research community and society.

The ERA initiative was launched at the time of a broad STI policy frame emphasizing a systematic approach to knowledge production and diffusion. While the innovation policy frame that emerged in the 1990s influenced the ideational framework of the ERA initiative, it does not fully explain its development from 2000 to 2014. The initial list of ERA activities covering research, innovation and societal involvement (EC 2000) largely corresponded to the innovation policy frame, even if the links between different activities were not always explicit. However, the original rationale of the ERA initiative was framed more narrowly, emphasising economic competitiveness (EC 2000), an idea, which has been widely used in policy framing for several decades despite criticism it has received (Krugman 1994). While the initial document (EC 2000) mentioned the need for a broad-based debate¹⁷, social and scientific aims (known in science policy since the 1940s) were not invoked in framing the key reasons for launching ERA.

The strong initial focus on economic aims corresponded to the goals of the Lisbon strategy with which the ERA initiative was closely linked. Historically, economic rationales had already been at the core of European integration. Accordingly, the ERA initiative was framed in the context of the internal/single market and its four freedoms, i.e. as an internal market for research (EC 2002) and as the fifth freedom (EC 2007b), although in research policy literature, the limits of organising research systems according to market principles have been pointed out (Georghiou 2006). However, initial reviews of the ERA (EC 2002) and the Lisbon strategy showed limited success in achieving economic goals and demonstrated the need to involve the member states.

An important change in the ERA initiative came with the Green Paper in 2007 (EC 2007a), which launched a public consultation. In addition to economic aims it also emphasised social and scientific goals of the ERA. The scientific elite has been supportive of the ERC funding research on topics chosen by scientists themselves and judged by their scientific peers (Luukkonen 2014). Thus, the ideational framework of the ERA has been extended to include long-standing ideas from an early science policy frame such as academic freedom and self-governance (Polanyi 1962). Another institution, the European Institute of Innovation and Technology, has been established to implement ideas of the knowledge triangle between education, research and innovation. The concept of the knowledge triangle largely builds on innovation policy ideas such as innovation systems (Lundvall 1992), triple helix (Leydesdorff and Etzkowitz 1996) and the third mission of universities (Goransson et al. 2009).

The strategic use of ideas to strengthen the ERA and enlarge its support has been particularly emphasised in recommendations to use the concept of addressing Grand Challenges as a rationale for the ERA (ERA Expert group 2008). The experts explicitly suggested the use of the Grand Challenges concept as a way to increase support for the ERA initiative among political, scientific and business communities, civil society and younger people. The Grand Challenges concept, strengthened by the Lund Declaration in 2009, has broadened the ERA goals to addressing social issues such as health, environment and climate change. The concept emphasises the social goals of research, which have been a recurring theme in expanding the STI policy frame for more than half a century, e.g. in debates about the social function of science (Bernal 1939) in the initial science policy frame, the need to

address pressing social issues (Nelson 1977) in the technology policy frame and the more recent approach of the Mode 2 knowledge production (Gibbons et al. 1994) in the innovation policy frame.

To summarize, linking the ideational framework of the ERA initiative to long-standing STI policy ideas (for an overview see Table 1) also helps to analyse the broadening of the ERA aims and to understand the ERA initiative within the broader context of research policy ideas 'by drawing attention to the continuation and deepening of old issues in new forms' (Elzinga 2012: 426).

Table 1: Main ideas in the ERA initiative and their roots in long-term STI policy ideas

Main ideas in the ERA initiative	Their roots in long-term STI policy ideas
Contribution to international economic competitiveness, internal market, 'fifth freedom'	Economic perspectives of 1970s on contribution of STI to global competitiveness
Scientific excellence, frontier research, autonomy, European Research Council	Scientific freedom (Polanyi 1962; Bush 1945)
Grand/societal challenges	Social function of science (Bernal 1939), solving social problems (Nelson 1977), Mode 2
Knowledge triangle of education, research and innovation, EIT	Innovation systems, triple helix, third mission
Monitoring: Lisbon strategy, Europe 2020, Scoreboards, Progress Reports	New Public Management, quantification of objectives

Thus, the broadened ERA ideational frame¹⁸ as found in a recently consolidated ERA definition (EC 2012) and Horizon 2020 priorities includes 'distinct, yet mutually reinforcing, priorities' (EC 2011) of scientific excellence, societal challenges and economic competitiveness. While these different ideas coexist and ensure a broader support for the ERA initiative, links and relationships between them are underdeveloped. It remains to be seen if and how the ERC grants supporting excellent science could be mutually reinforced with projects addressing societal challenges and promoting industrial leadership. This lack of interactions between diverse ideas in science, technology and innovation policy is not unique to the ERA initiative. Research policy studies have paid relatively little attention to the interactions among these diverse ideas. While tensions among them have been emphasised (Borrás 2012; Nelson 1977), possibilities to combine diverse ideas of excellence and relevance (Irwin 2014; Rip 2011) need to be further explored and conceptualized. Further articulation of tensions and interactions among diverse policy aims and specific instruments designed to implement them could facilitate the development of a more comprehensive ERA frame.

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¹ In this paper, the terms “science, technology and innovation policy” and “research policy” are used as synonyms.

² Known by their abbreviation as CUDOS norms, see Elzinga 2012.

³ Including national, regional, sectoral and trans-national innovation systems.

⁴ For an elaboration of a similar argument see Sanz-Menendez and Borrás 2001.

⁵ The Commission has prepared detailed documents on specific aspects of the ERA initiative such as mobility, infrastructures and networking of national programmes (EC 2002). An analysis of all of these numerous documents is far beyond the scope of this paper, which focusses on the key documents defining overall objectives and activities of the ERA initiative. Detailed information on specific aspects of the ERA initiative can be found on the official ERA website http://ec.europa.eu/research/era/index_en.htm. Accessed 2 August 2014.

⁶ Lepori et al. (2014: 401) state that ‘the ERA represented in 2000 an empty frame of reference’. However, this statement is not based on the analysis of the ERA initiative and relevant documents but on the study of one specific element of the ERA, namely joint European research programmes, the majority of which were launched after 2000. Against the background of the ERA initial document (EC 2000) listing numerous ongoing activities, their general statement about the ERA can be questioned.

⁷ This approach to the ERA concept as combining these three elements is also used later in the ERA Green Paper (EC 2007a).

⁸ For more information on the Lisbon strategy for Growth and Jobs see its official website http://ec.europa.eu/archives/growthandjobs_2009/. Accessed 2 August 2014.

⁹ These six features largely consolidate action lines mentioned in the initial ERA documents (EC 2000, 2002).

¹⁰ At this time, the concept of “Grand/Societal Challenges” was becoming popular in STI policy around the world, in particular after the Gates Foundation launched its Grand Challenges in Global Health initiative in 2003. Available at <http://grandchallenges.org/>. Accessed 27 October 2014.

¹¹ In the ERA reform programme (EC 2012), the ERC is mentioned as one of the examples of progress in building the ERA.

¹² The concept of “Societal Challenges” (used in STI policy interchangeably with “Grand Challenges”) was already mentioned in the ERA Green Paper (EC 2007a).

¹³ It is earlier than 2020, as mentioned in the ERA Green Paper (EC 2007a).

¹⁴ The details on the implementation of these three priorities are provided on the Horizon 2020 official website <http://ec.europa.eu/programmes/horizon2020/h2020-sections>. Accessed 2 August 2014.

¹⁵ The idea that the ERA will develop gradually was mentioned already in the initial document launching the ERA initiative (EC 2000).

¹⁶ To implement these aims, a range of financial, coordination and legal instruments are used including new funding schemes within the recent EU Framework Programmes (Edler and Kuhlmann 2011), joint funding programmes among the member states (Lepori et al. 2014) and Open Method of Coordination (De Ruiter 2010). A variety of policy instruments addresses issues such as research careers (Chou and Real-Dato 2014), citizen participation and infrastructure (Ryan forthcoming). An analysis of these instruments and their implementation is beyond the scope of this article.

¹⁷ It was stated that this broad-based debate ‘should unfold first and foremost in the European institutions’; only afterwards was it mentioned that ‘it is also essential to hear the views of the scientific community, the world of industry and, more broadly “civil society”’, and the member states would be invited to organize debates at national and regional levels (EC 2000).

¹⁸ The findings on the broadening of the main aims of the ERA initiative in this paper are similar to the observations of Meng-Hsuan Chou (2014) on the ideational widening of the ERA concept and Terttu Luukkonen (2014) on the evolved ERA concept.

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