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Abstract

While the ninth framework program adoption seems to be far to come, some ideas are already there and the relevant stakeholders are getting around to intercept signals which can allow to predict reliable scenarios for the next programming period.

1. Introduction

Bearing in mind Horizon 2020, which was presented in 2011 under the Polish presidency and formally adopted on December 2013 by the Lithuanian one, we are stepping now into the phase where the Commission is carrying out its informal consultation with the aim of having its proposal ready for 2018 and adopted under the German presidency at the end 2019.

First of all, it is relevant to underline that the European geo-political-economic context has dramatically changed if compared to Horizon 2020's one: there are new challenges, both domestic and global, an increasing wave of conflicts, an increasing wave of migration, terrorist attacks. Last but not least, the European financial situation is far to be steady.

The political message which clearly emerges from the EU Institutions recalls that research and innovation (as all the other policies) should more and more support the sustainable economic recovery of Europe, being based on knowledge intensive products and services, able to compete at global level. The Commission seems to be mainly oriented towards impact on both economic return and financial rationalization. It is not by chance that all the Commissioners' activity should first respond to the "better regulation" and "better spending" principles.

Even the European Fund for Strategic Investments (EFSI), which President Juncker has personally baptized with his name (Juncker plan), is the attempt to maximize the leverage effect of the EU expenditure. Surprisingly the first check of viability made by the European Investments Bank (EIB) on the EFSI project, concerns the financial accountability while research is not as such by definition.

In this context, research and innovation investments will be the first affected, beside the wide consensus expressed by the Ministers of Research in occasion of several Competitiveness Councils, where has been remarked that this kind of investments have to be considered pivotal for the Europe's future. Most developed Countries' experience demonstrates that knowledge intensive economy is the most resilient to the financial instability. In a such uncertain landscape, it's difficult to forecast the 9th Framework Program design, but few concrete evidences reinforced by some informal rumors, can suggest the scenario we have drafted.

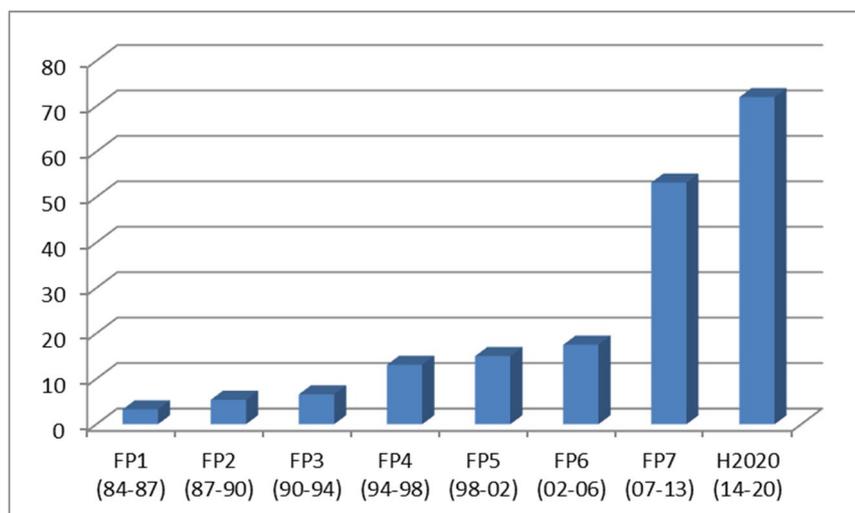


Fig. 1 – Budget allocation from FP1

1.1 EU Multiannual Financial Framework 2021-2028.

With UK that at that time could be probably not anymore an EU contributor, and some other MS which are tempted to have less engagement with the EU, it will be hard to get 1080 billion euros as the previous programming period. Moreover, there are some emerging needs as migration or rare/neglected diseases, which are yet absorbing resources in the current MFF likewise in the next one. Next negotiate in the Council for the budget allocation among the Balance Sheet's chapters will see the usual clash among the "like minded" Countries (favorable to a contraction of the overall EU budget), the "friends of cohesion" (usually the EU 13 Countries) and those in the middle, who will run around to predict which could be the most convenient configuration. With these preconditions, the 80 billion euro allocated to Horizon 2020 it's a record hard to be reproduced, even though the European Parliament will probably ask for the same budget of 100 billion euro as it did for Horizon 2020. We consider wisest to expect a reduction for FP9.

2 Signals and reflections.

Besides the already mentioned changes of the political priorities, Horizon 2020 mid-term review will be pivotal to forecast structure and interventions in FP9. Mid-term review is close to start and it will finally indicate what has been successful and should be maintained, what needs improvement or should be completely revised in the next programming period. As in the past, we can speculate that Commission has already in mind at least the structure of the 9th FP, since some strategic areas have already been identified. Among these, we remind a reinforced support to International Cooperation, an increased attention to the role of big industries, the support to EU 13 and, last but not least, defense research. Migration issues will surely find a place in the next framework program in line with the recent agenda for migration, which calls the mobilization of all the relevant policies in order to tackle this challenge.

2.1 Individual excellence.

Up to now, ERC seems to be an untouchable element of continuity with the past: it is considered a sound success story (next year we'll celebrate its 10 year of activity) and it is the temple of excellence, strongly appreciated by the scientific community. Still in the context of excellence, FET schemes will likely be reinforced with an extended attention on Flagships. Besides the one on Quantum technologies already established as the next Flagship, by the end of December we'll have pretty surely signals from the Commission about the next ones.

Also Marie Skłodowska Curie actions have collected a wide appreciation and, as the principal instrument of researchers' mobility, is very welcomed especially within the EU 13. Since the success rate of the new MS in Horizon 2020 is so far around 4% of the budget assigned, most probably such "democratic" program will be safeguarded.

Mutatis mutandis, then, the first pillar of Horizon 2020, which includes the support to research infrastructures too, will be more or less kept unchanged.

2.2 Innovation and competitiveness

The European policies have highlighted the role of research and innovation as a key factor in support of growth and employment (e.g. COM (2014) 339 Research and innovation as sources of renewed growth).

The innovation dimension has been already stressed within the second pillar of Horizon 2020 as a support to the real economy. This pillar has been, indeed, the starting point to explore the use of new financial instruments such as those supporting individual beneficiaries (SMEs Instruments), in addition to traditional activities in transnational cooperation.

The idea of a European Innovation Council (EIC) was launched by Moedas last June during the conference "Shape the future of Europe's research and innovation policy", in which have been highlighted the problems

and needs of the European research and innovation system. Firstly, the lack of an attracting ecosystem for investments and businesses towards knowledge economy.

What is fundamentally needed is a regulatory framework helping the innovation process, such as harmonized legislative production in line with new technologies and new products and processes, able to meet the demand of a market that changes rapidly. In this scenario even the limited EU investment in research and innovation (compared with USA, Japan, Korea, China) and the poor attitude to the use of risk capital, prevent the scale-up of many excellent companies and their possible ascent to the global market. Due to the strong orientation towards the market, and the insistent emphasis given by Commissioner Moedas to the launch of the European Innovation Council (EIC), in the future Framework Program the word "innovation" will have an even more central role.

What could be the key elements that should shape the EIC? The efficiency and effectiveness of tools suitable for "facilitating innovation in Europe in favor of productivity, growth, employment and solutions to societal challenges" will be fundamental aspects. The EIC, in its extreme simplification, should feature:

- i) Innovative ideas, proposed, at least in the initial stage, by "single team", with a strong "EU-added value",
- ii) Consolidated instruments.

The FET scheme and its specific articulation in different phases (from idea to market) could be a benchmark, but not limited to technological innovation.

In this scenario, we expect the reinforcement of the financial instruments (loans, equity, guarantees, technology transfer funds), managed jointly with the European Investment Bank (EIB) and the European Investment Fund (EIF). As well, we expect an increase of the support for SMEs, both with the tools described above, with dedicated projects, and with an "earmarked" budget for SMEs.

The pre-commercial procurement, will probably become the most suitable instrument for projects in cooperation. The "mono-beneficiary" instruments, could be further extended due to the shared feeling that many "disruptive" ideas and innovative products and technologies (e.g. graphene or Facebook), arise from individuals or from individual stakeholders rather than consortia.

These types of funding, however, have been limited so far to small amount of money allocated to feasibility studies, or support for prototyping, testing or pilot actions. When or if this type of support "mono-beneficiary & close to market" will be consolidated for other categories of stakeholders (e.g. Big Industry), it will be crucial a careful monitor of possible conflicts with the state aid rules.

2.3 Societal Challenges

While in the Seventh Framework Program (FP7), the research in cooperation was one of the main goals and not necessarily aimed at addressing the needs of the civil society, in the third pillar of Horizon 2020, research and innovation were conceived as a support to solutions to societal challenges.

The third pillar of Horizon 2020 accounts for the largest budget, and addressed seven societal challenges. (approx. 29.7 b€), with different typologies of projects: from the Coordinated Support Actions to Eranet-Cofund or Innovation Actions, without any specific preferential allocation of funds for some technology readiness levels or industrial participation. In practice, this pillar can be considered a sort of evolution of the Cooperation Program in FP7, where, however, cooperation is now considered a mean and not an objective.

Having in mind a possible reduction of the FP9 budget and the growing political attention to those research activities, capable to provide services/products largely impacting into the economic system, how the EU will support the research addressing the societal challenges?

In this context, the promotion of Joint Programming (JP) activities, which are mainly driven by Member States and Associated countries, can be considered a reasonable strategy for the Commission to facilitate the implementation of common strategic programs for research and innovation.

The concept of JP comes from the evidence that the majority of investments in research and innovation at the EU level is fragmented, and although the social challenges are considered as such in most of the Countries, joint actions to address them are extremely rare. In fact, without any EU incentives, Member States in terms of joint calls account for less than 1% of their RTD's national budgets (excluding ESA). This voluntary joint programming budget (about 7 billion euro in seven years) accounts for approximately a quarter of what was allocated by the EU for social challenges in Horizon 2020.

The EC, therefore, insists to reduce fragmentation, avoid unnecessary duplication and increase the critical mass through joint actions. This objective is in line with the "European Research Area", which aims at achieving a Europe with inter-operative research programs, trans-national mobility of funds, data, research and knowledge. For this reason, interventions aimed at facilitating the process of coordinating national research programs in those priorities identified by Member States, can be a reasonable proposal by the Commission to tackle the societal challenges. In this scenario, JPIs (Joint Programming Initiatives) could play a major role transforming themselves in a structural element of FP9, as Joint Technologies Initiatives (JTI) have already been in Horizon 2020.

The EC could therefore provide the "glue money", as now within the instruments ERANET-Cofund or EJP (European Joint Programming), to promote cooperation among stakeholders and in those issues where Countries have committed to invest. If the "in-kind contribution" will not be considered as an eligible standard to access the EU budget, this choice could facilitate those countries with more funds for joint calls.

Some weak signals can already indicate a change of approach towards this direction. As an example, during the annual event on Public-Public Partnerships to be held soon in Brussels, five thematic areas will be discussed: Health, Environment and Climate Change, Bio-economy, Innovation and Technology, Energy. If some of them can be associated to some societal challenges in Horizon 2020 and others to some existing JPIs or to the SET-Plan, a session focused on Innovation and Technology seems to be not appropriate, unless it addresses the research in cooperation for these transversal and enabling issues. Probably it will address low/medium TRLs, while EIC will focus on higher TRLs, financial instruments and support to SMEs.

2.4 Security and defense research

Among the novelties in the coming Framework Program for Research is well shared the opinion that security and defense research will play an important role and the EC seems already favorable to invest for it as much as 3.5 billion Euro in the final 3 years of Horizon 2020. Since 2014 new needs and priorities have emerged in the EU social context and Research & Innovation (R&I) are asked to provide them a response. Terrorist attacks, war conflicts very close to the EU borders, migration toward the EU from Africa, Middle East and Asia are urging the EU to discuss and consider (also from operative points of view), topics so far evaluated at low priority or rejected as politically difficult. Now the topics regarding protection, security, defense and infrastructure resilience are analyzed in depth and are at the top of many research agendas at Member States as well as at Union level.

A fundamental document is "A Global Strategy for the EU's Foreign and Security Policy" (June 2016), where the Vice President of the EC, Federica Mogherini, focuses the attention on sensitive topics as security (including cyber), synergies on defense (including the roles of EDA- European Defense Agency and NATO- North Atlantic Treaty Organization) and intelligence activities coordination.

All these operative environments require a strengthened research capability, taking into account that defense related research is more and more considered the actions with highest EU added value; a true "game changer"! However, a paradigm change is mainly required because, in the last ten years, the EU Member

States have globally reduced their defense R&I investments by 32% and presently the defense R&I account for only 1.02% of the total defense budget.

The new needs for defense research (exclusively for military purposes and/or dual-use) involve many technologies including robotics, 3D printing, drones, Internet of Things, augmented reality, quantum cryptography. Some of them will be included in the future calls of the PADR- Preparatory Action on Defense Research that might lead, in the FP 9, to the EDRP-European Defense Research Program.

The PADR Work Program 2017 (with 25-million-euro budget) will consist in three calls on autonomous platforms, force protection and soldier systems, and horizon scanning and technology watch. This engagement demonstrates that the EU is now convinced that only defense R&I can make EU more independent, secure and inclusive.

However, this challenge does not involve only science, because the EU must take into account also many political and legal aspects. TFEU article 45 already assigned to EDA the responsibility for defense research, but its *modus operandi* is not always compatible with that of the FPs. Many solutions are under investigation and EDRP might turn to be an "Annex Program" of the future FP 9.

2.5 Testing FP 9 within Horizon 2020

The last phase of Horizon 2020 has envisaged few changes, some of those aimed at experimenting possible innovative approaches for FP9. This is the case of so-called "Focus Areas" included in the work programs, not related to specific calls with allocated budget, but describing instead crosscutting issues. They can be therefore considered as a sort of narrative of the role of research in support of the challenges the European Union is facing. This shows the EC's willingness to make future calls less prescriptive and more "mission-oriented". Some of these areas, as Circular Economy, Resilience to emerging crisis (financial, political, environmental or social) or climatic emergency (with specific mention to COP21) are tied to the respective EU' relevant policy. Some others as internationalization, cyber-security or digitisation are considered as means to achieve an open, modern, secure and sustainable Europe.

The scoping papers 2018-2020 as well contain some strategic elements which can be easily introduced into next framework program. For instance, eight themes arising out of the Commission's foresight exercise, deserved a place in the actual programming period:

- Hyper-connectivity and big data driving change and innovation;
- Falling cost of energy as a potential game changer;
- Migration and demographic dynamics triggering changes for innovation in Europe;
- Pressure on health systems and health inequalities;
- Climate change, oceans and space; vi) Primary sector innovation being key for sustainability and well-being;
- Biotechnology as the next wave of disrupting technologies;
- Increasing instability as a new reality for societies.

The transformation of Horizon2020 should also comply, according to the rules and guidelines of the Research Commissioner, Carlos Moedas, with the so-called three "Os" (Open Innovation, Open Science, Open to the World).

3. A possible scenario

Based on the speculation above, what seems under represented is the “*research in cooperation*”, which, since the early Framework Programmes, has constituted a significant source of funding for many of the European RPO’s Research Performing Organizations.

The general Brussels feeling, unless new schemes will appear, is that research in cooperation financed by the EU, as it is now structured, will be replaced by more flexible instruments, driven by profit and closer to market. This "economy driven" approach will not take into account the societal impact of research which has been, indeed, a sign mark of Horizon 2020. The trans-national cooperation, an aim in FP7, then a mean in Horizon 2020, in FP9 could be considered just an option, and probably only as a “glue money” in those issues where member States are already committed.

The way to support “*research in cooperation*” and to achieve the goals set by the social challenges remain so far unclear. A greater effort from Member States will be undoubtedly required, in terms of co-financing and synergies with structural funds and, thus, also in the identification of priorities, to be aligned with the national ones or within joint programming initiatives.

About this possible approach, the Council will probably not find easily an agreement. Also the European Parliament, as bulwark of the citizen’s interests, will not be happy to adopt a framework program that appears to be discriminatory for the new Member States and, above all, not very adherent to the principles set out in the Treaty establishing the European research purposes and objectives (art. 179 TFEU).

Following this analysis and due to this historical period, as stated in the opening, the Framework Program 2021-2027 may be conceptually and structurally very different from those adopted until now.

Below, a comparative scheme aimed at summarizing (given the well-described uncertainties in the text) a possible evolution from Horizon 2020 to FP9. The possible evolution scheme, however, assumes the pillars in the representation as a continuity with Horizon 2020.

Horizon 2020

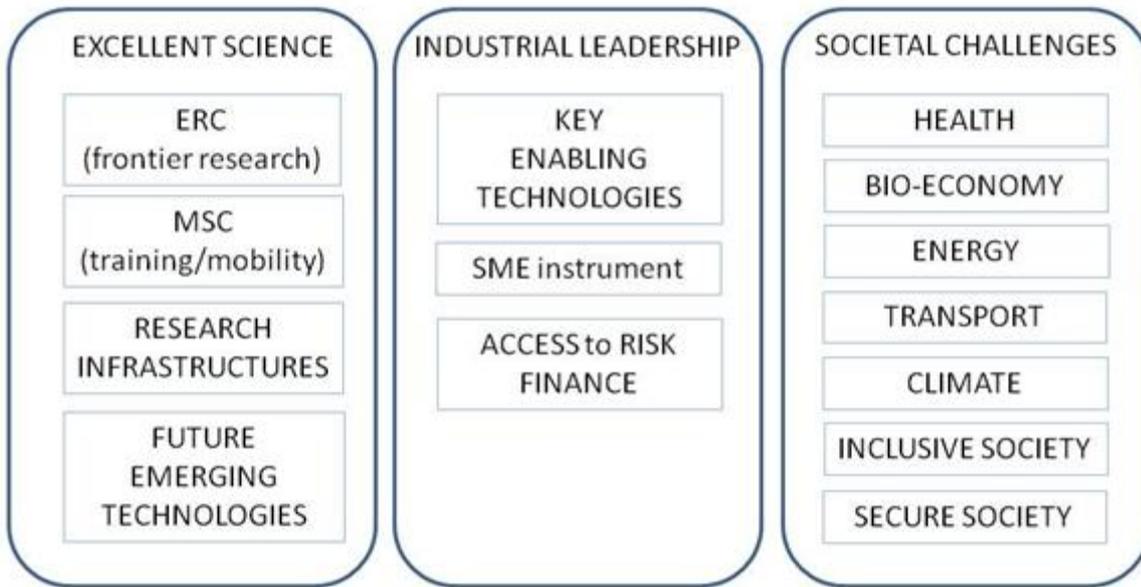


Figure 1: Horizon 2020 Pillar Scheme

FP9?

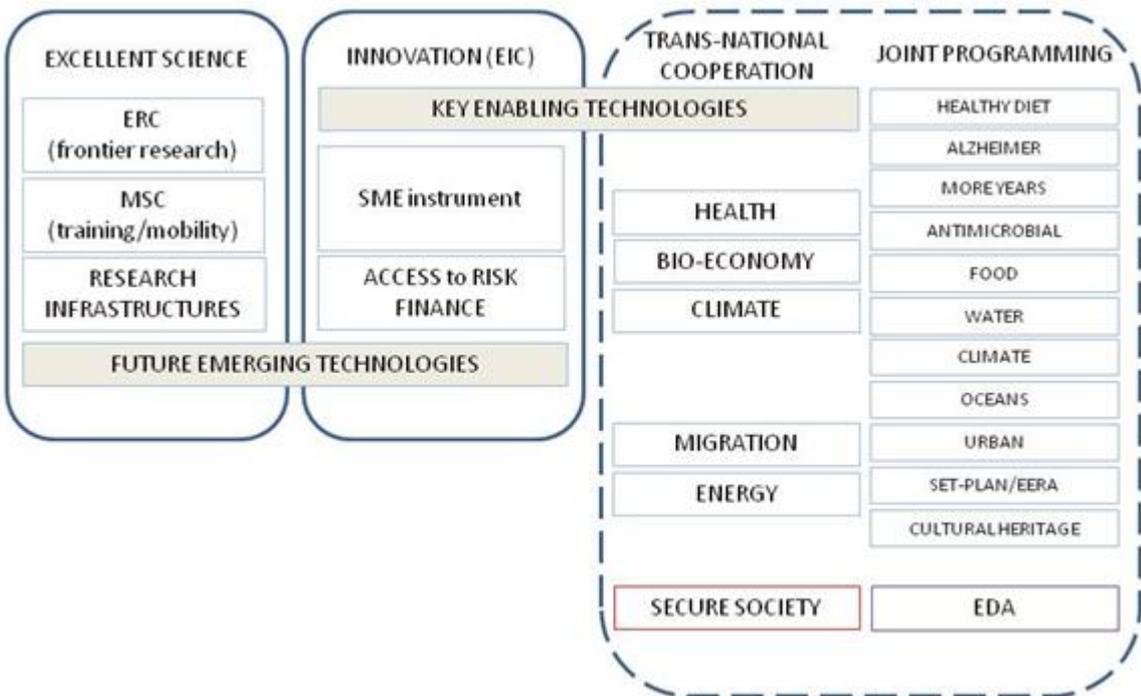


Figure 2: FP9 scheme keeping the pillars as in Horizon2020

The first pillar remains fundamentally unchanged compared to Horizon 2020, and linked to scientific excellence. The second focuses on issues with higher innovation impact and strong attention to the market. The third insists on societal challenges and on “research in cooperation” but with the important role of co-financing from the Member States. Still difficult to predict the aspects related to the search for security and defense research.