Evaluation report of the FP7 COOPERATION Specific Programme

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Disclaimer

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CIP	Competitiveness and Innovation Framework Programme
CP	Collaborative Project
CSA	Coordination and Support Action
CSOs	Civil Society Organisations
EERP	European Economic Recovery Plan
ERA	European Research Area
FAFB	Food, Agriculture and Fisheries, Biotechnology
FP	Framework Programme
H2020	Horizon 2020
ICT	Information and Communication Technologies
IU	Innovation Union
KBBE	Knowledge-Based Bio-Economy
MINT	Mathematics, Informatics & computer sciences, Natural sciences, and Technology
MS	Member States
NMP	Nanosciences, Nanotechnologies, Materials and new Production Technologies
PPPs	Public Private Partnerships
RTO	Research and Technology Organisation
SME	Small and Medium Sized Enterprise
SNA	Social Network Analysis
SSH	Socio-economic Sciences and Humanities
TRL	Technology Readiness Level
WP	Work Programme

Evaluation aspect 1 - Rationale

The COOPERATION Programme was the largest among the four Specific Programmes under FP7, with a total budget of €32.413 million (2007 - 2013). A total of 7.800 grants were dispersed over 87.600 grant holders (participants). A total of €28.336 million were contributed by the EC. On average, each grant was €3.62 million. Under the programme, research support was provided to international cooperation projects across the EU and beyond. In ten thematic areas such as transport or energy, corresponding to major fields in science and research, the programme aimed to promote the progress of knowledge and technology. In an overview by the EC, the COOPERATION programme was described with "Research will be supported and strengthened to address European social, economic, environmental, public health and industrial challenges, serve the public good and support developing countries."

In terms of objectives, we can identify two that were formulated when FP7 was launched, namely

- focus on scientific excellence ("contribute to the Union becoming the world's leading research area") and
- transnational cooperation (European Research Area).

According to the NCP survey when asking about the extent of achievement of the strategic objectives - 50% rated them as 'average'. However, its role in contributing to ERA was rated by 44% as high (9% very high), and for its contribution on achieving scientific excellence, 65% though it was high and 16% even though it to be very high. Thus, the FP seemed to have clearly met its stated objectives of the first half of the programme. At the same time, innovation has been added as objective in the middle of the programme without necessary changes in implementation modes.

The overarching objectives were operationalised by the thematic priorities such as:

- coordination and integration of research outputs,
- policy support to the Union and Member States,
- knowledge creation,
- knowledge transfer,
- technology development,
- bringing together science, industry and other stakeholders,
- improvement of competitiveness of European industries, as well as
- individual thematic goals such as improved health, to develop integrated, safer, 'greener' and 'smarter' pan-European transport systems, or adaptation of energy system

Thus the objectives at theme level were aligned to the overarching goals of FP7, and further to this integrated the key words from the grand challenges (GC). The self-understanding of the thematic priorities differs: some are policy-oriented such as environment and SSH which rather broad objectives and a focus on the traditional instrument of research consortia, while others have a more practical orientation and greater involvement of innovation actors and have developed new instruments apart of the traditional research consortia. While this innovation drive was not explicitly formulated with the objectives and in the starting phase, those that had (traditionally) started with a relatively large industrial basis have developed partnerships or other cooperative forms (such as NMP, Transport, Energy), seemed to had less difficulties in adopting or fostering the innovation objective.

The allocation of funding seems to follow established paths and political will. Why individual themes are supported at EU-level can be explained for most of them with high costs and risks entailed in developing the required new technologies and materials which exceed the capacity of private firms (e.g., in energy, transport, space). Other factors are public-good economies (security, transport, environment) or those requiring public push- and pull-measures to overcome established paths (e.g., energy). The economic reasons for others is less evident, such as for SSH, and broad areas such as ICT have remained constant for decades. For energy for example, the ex-post evaluation noticed that "it is unclear on what criteria the distribution of research funds over the various research areas was determined".

In terms of themes, there was no major change compared to FP6. FP7 did not see a new theme or the dropping of the thematic priority – initially it was envisaged to be a continuation and constant improvement of FP6.

Many thematic priorities were able to implement EU needs and GC through the annual work programmes (WPs) and the creation of new instruments. Several of the themes mention the direct influence of the policy orientations for the WPs as well as the development of new initiatives and implementation of new policy instruments. The WPs have evolved within the financial margins of the themes. Some followed more the policy context (SSH, Environment) while others are aligned more to economic and technical contexts.

Within the course of the programme, several themes mention a progressive increase in emphasis on research relevant to commercial innovation and market applications. This shift however also meant sometimes a shift from social towards economic benefits: in the agriculture thematic area, for example, there was a move away from research into diseases of public importance towards animal diseases of mainly farm economic importance. This is maybe a small example how business-oriented goals started to be addressed. These are not necessarily matching with societal goals.

Changes due to policy requests were also in the agriculture (KBBE) theme which started with a main orientation on food production, but from 2011 onwards addressed the GC and the role that renewable resources can play with respect to energy, global warming and bio-based products. The Europe 2020 Strategy in particular let to a significant change from the approach to support primarily knowledge generation to the delivery of new and innovative products, processes and services – thus from 'research consortia' the portfolio was enlarged to pilot, demonstration and validation activities. Identification and addressing exploitation issues, like capabilities for innovation and dissemination were equally newly included. The innovation dimension also introduced the European Innovation Partnership, e.g., in agriculture. This new direction created links to policies of various other DGs and promoted integrated and cross-cutting approaches.

Whether or not the calls were less or more prescriptive regarding research and innovation topics, one has to bear in mind that the dedicated Work Programmes and specific call texts are prescriptive as such. The subject has been addressed by ex-post evaluations as well as expert panels. Interviewees of the NMP ex-post evaluation mentioned the trade-off between open calls and narrowly defined calls. Open calls generally mention the societal challenges and application areas, while other calls are more specific about the priorities of the EC, specific DGs and units (or even key officials) and also mention relevant technological trajectories. With open calls, proposals may 'completely miss the mark'. More narrowly defined calls create the risk that proposals are too conservative and incremental (and that competing proposals are very similar). In agriculture, the programme moved towards less prescriptive topics to allow bottom-up approaches to deliver innovative ideas. However different opinions were voiced by the experts involved in the ex-post evaluation where the experts in the agriculture panel did not see a significant difference between the calls in terms of prescriptiveness. In agriculture, call topics were either considered too prescriptive or not prescriptive enough. By contrast, the calls in fisheries and aquaculture were seen specific and prescriptive with no change over time.

Although the experts shared a general view that less prescriptive calls are more beneficial to innovation, they indicated that being prescriptive can be a good thing when the calls should address very pertinent issues. However, highly prescriptive calls within a narrow field, or an area of science which requires large scale, expensive approaches, can result in a lack of competition. In these circumstances, as observed in the fisheries area, large consortia can dominate a competition and thereby the research agenda.

The least prescriptive would be blue sky research, which is hardly seen within the COOPERATION programme. In SSH blue sky research was a minor aspect and only included under foresight activities with 0.6% of the SSH budget. The other themes did not include such an option.

Evaluation aspect 2 - Implementation

About 25% of participants came from the private sector; the majority are universities and PROs. There are certainly leading research organisations and companies involved, however, as in any normal distribution, there is a long tail of average organisations and companies involved. In FP7, a total of 26.000 organisations participated, an increase of 25% compared to FP6. 65% of the participants of FP6 did not participate anymore in FP7. Within the COOPERATION programme, almost 20.000 organisations participated.

Participation rates and the funding shares by country are proportionate to the size of the research system. In most themes, the dominant countries were Germany, France, UK, Italy and Spain. At the same time, other factors such as reputation, openness, as well as economic drivers play a role for the overall success of partners being included in winning consortia. One can also see a big divide – in particular the new MS (EU-13) are still in catching-up mode. In none of the themes they play a significant role in terms of participation rate, leadership, or funding. There are a few changes compared to FP6 in terms of participation rates of a few Eastern MS (i.e., Poland), though one cannot speak about a significant overall positive development. The share of funding received by all new Member States is below the shares of Associated countries. The differences in funding can partly be explained with much lower personnel cost, but in terms of absolute participation rates, the EU-13 MS are less present than others.

Analysing the participation patterns per specific thematic area and per funding scheme, one tends to see a mirror of European scientific and industrial specialisation patterns. In fisheries for example we find to large extent the countries with a fishery industry while countries with a high investment in say health research, are relatively more often participating than others with lower investments (lower numbers of researchers in the field etc…).

The policy-focused theme Environment explains the participation and success rates by country with its focus on scientific excellence: "*the main beneficiaries were those that invest more in R&D*". If Environment focused on excellence, then NMP can be taken as a theme focusing on excellence and innovation. In NMP, the areas with most business enterprise participation were the ones related to production technologies but industry participation was also high in more fundamental research areas such as Nanoscience, Nanotechnology, and Materials. SMEs were more numerous than large companies in almost all areas. "*This reflects the market structure of the industry sectors involved as well as the fact that large enterprises work more often at lower TRLs than SMEs.*" But not only companies close to the innovation end participated, also higher education organisations were numerous.

While FP7 was rather stable in country participation rates, the move towards innovation brought also other participant types than the traditional research organisations on board. A stronger involvement of industry, policy makers and others stakeholders such as consumers associations, standardisation and legislation organisations and Professional Associations was evident. The direct participation rate of the non-traditional types was limited.

In terms of types of participating organisations there is an overall leader with the higher education sector, which dominated in terms of participations and funding allocation (overall FP7: 39% of applicants and 33% of beneficiaries). Successful – in particular also as being coordinators - were also RTOs. In more industry-lead themes such as transport, NMP, or energy, the shares of companies were in the range of 40-50%. Research and Technology Organisations (RTOs) and higher education organisations in these priorities had lower shares with around 20% each.

Given that almost every university and larger research performing organisations (RPO) in Europe has participated in one or more projects, one can clearly say the programme attracted the best research organisations[1]. At the same time as this attraction of the best, there is a longer tail of average organisations. The focus on excellence seems to be a barrier for a wider integration of several new MS as well as new organisations since they tend to lack the 'reputation' which goes along with 'scientific excellence'.

As regards whether innovative firms were attracted, since so many companies participated, the odds are high that innovative ones were participating. If we use the CIS data which starts from the perspective of the firm which is asked if the firm has received FP7 funding, we find that in CIS 2013, 2.5% of the innovative companies said that they received funding from FP7 (e.g., Germany, France, or Italy 3.7%, 2.2% and 0.8% respectively. The ICT evaluation concluded that "*large segments of highly*

[1] The 'best' is relative: it could be in terms of size, or reputation, the best in terms of number of innovations (patents) or scientific achievements (publications) – it is perhaps not an explicit selection criteria but an implicit idea to fund 'the best'– in the absence of clear benchmarks but through the knowledge or informed understanding of the evaluators in the selection procedures.

innovative SMEs did not participate in the FPs" (p. 79), confirming previous work by Breschi et al (2012)[2].

The network analysis of FP7 showed that about 72% of all FP7 participants were new. There are differences between the thematic priorities. 63% of FP7 energy participants were not active in FP6 whereas 'small world' networks were identified in ICT and NMP, indicating that despite the large number of participants, they 'tend to know each other' and are formally quickly connected. The results suggest that the FP is sufficiently open to new participants. The network effects seem to be slightly skewed: in particular SMEs tended to be involved only once – in the Energy priority for example, almost 80%% of the participants of FP6 and FP7 participated only once. These participants may have widened their networks thanks to their participation but not deepened it due to missing recurrent participation. The same can be said for the FP6 participants that did not any more participate in FP7.

While there is a general openness, analysed by country one notices a lower level of involvement of new MS participants. One reason may be the decrease of average project participants (the Health theme for example saw a general trend from FP6 to FP7 towards projects with around 9% fewer participants per project; in Energy the average number decreased from 14 (FP6) to 11 (FP7)), but given the higher absolute number of projects and participating organisations, the geography of the network tends to focus on old EU-MS.

In SSH the average number of project participants was around 11. The size of the project was mentioned in a survey by SSH researchers as a hampering factor for participating; smaller and medium scaled projects would be preferred. The reduction of the number of large consortia and decrease of the average number of participants per consortium was also mentioned by survey respondents in the NMP evaluation. The Energy evaluation noticed that the large networks as supported under FP6 were highly demanding in terms of management and coordination.

Linked to the size of an average project is the potential number of participants and their geographic origin. While basically in all themes the MS participated, the clear continuing dominance of EU15 MS and the lower participation rate of EU13 countries does not suggest a thorough widening of the research network. In fact, the drive for excellence may have been a barrier since none of the new member states universities is listed among the top 300 universities in the Times Higher Education ranking (2013-2014). The Czech Charles University is within the group 300-350, and the only one in a new member state among the 400 universities covered.

Thus several themes reported 'favourite' country groupings: "the highest frequency in collaborations occurred amongst partners from France and Germany, the two Countries with the highest participation and funding absorption rates in Transport". The agriculture theme observed a strong collaboration between northern and southern countries but collaboration in the east-west direction was much less obvious. In many themes the EU15 represented between 80-90% of the programme participations while the EU13 MS represent only around 5-10% of the unique participants. It thus comes to no surprise that networking is concentrated among the old EU15 MS. The FP7 Monitoring Report 2013 shows that the number of links between the old EU-15 MS

2 Breschi, S., Fisher, R., Malerba, F., Okamura, K., Smid, S., & Vonortas, N. (2012). ICT Network Impact on structuring a competitive ERA. Brussels: European Commission.

are very dense, within the new MS the collaboration is rather weak and also between old and new MS, the links are with a low density.

There is however also the dominance of a 'core' of participants which are involved in often more than 10 projects. Concentration of research leadership in relatively few research organisations has been mentioned e.g., in agriculture where two organisations accounted for 26% funds for coordination and each of these also participated in excess of 40% of projects. Without doubt, for these core organisations a high networking degree can be calculated. If we consider that most selected consortia are built based on established relationships and truly new partners without collaboration experience with at least one of the consortium partners are less common[3], additional network effects may be more limited than the various surveys of participants suggest when asked about positive effects of their participation.

Analysing the distribution of participants and funding we note that industry obtained almost one third of the budget while in terms of participations made one quarter. Industry as such as well as SME involvement is linked to industry structures of the various themes. The largest share of industry was in Transport, ICT, NMP, and Energy but the largest share of SMEs was in NMP and Security. Very low involvement of industry and SMEs are in Environment and (non-surprisingly) SSH. The introduction of an SME threshold has increased SME participation such as Health, but the industry involvement increased substantially also due to new instruments such as the joint undertakings.

Obviously, the themes were more or less successful in attracting industrial partners. The average EU contribution to SMEs within FP7 was €260,000 which is about two thirds of the average contribution to other industry (€391,000). The participation and funding varies among the various themes (and instruments, also within the CAPACITIES programme).

While the 'industry-oriented nature' may be more natural for some themes, in other themes the increases in industry involvement is linked to new requirements and instruments: in topics of high interest for SMEs/industry, a minimum percentage (15%, 30%) of the EU contribution had to be allocated to SMEs.

From 2011, SBIR-like topics were introduced in the Health theme which aimed to put SMEs in the "driving seat" in EU grants. Projects limited to a maximum of five EU partners, with three-year duration, a maximum EU contribution of € 6 million and at least 50 % of the budget allocated to SMEs.

Not only did formal requirements play a role, but also new policies were mentioned such as the Technology Roadmaps and Implementation Plans, developed with the SET-Plan Industrial Initiatives. This seemed to be a milestone in defining a coherent medium-term Research, Development & Demonstration (RD&D) strategy.

The geographical distribution of successful applicants remained similar to FP6: the large, research intensive countries have the highest shares of participants as well as in terms of EC contribution. They are equally dominating in terms of coordinating. There are no big surprises but it seems that the existence of large national programmes are a reason for lower than expected application rates at country level (as indicated by the Environment theme). Thus, in terms of country coverage, there is no

3 See DG-RTD's Research Management of FP projects report (PwC 2014)

substantial change. In terms of type of participants, industry participation increased considerably in the second half of FP7.

The average success rate within the FP7 Cooperation programme was 22% in terms of applicants, 20% in terms of proposals and 22% in terms of EU contribution. The average proposal success rate is 20%, which is four percentage points above the comparable priority area in FP6 “Integrating and strengthening the ERA”.[4] The overall success rate by country and/or theme varies significantly. In terms of participation rate, it seems the ‘easiest’ to be selected and participate in Transport while in SSH, the success rate is the lowest – thus an oversubscription can be seen here.

The success rates for industry and in particular SMEs seems to be directly linked to the various industry structures that are linked to the themes. The proportion of SMEs vis à vis industry as a whole was rather high in Environment (75%), Health (80%); KBBE (74%); and SSH (75%) themes with a rather low industry participation rate (from 5-25%). SMEs participated to a lesser degree in Transport, Energy, Security, ICT (below 50%), or NMP and Space (below 60%), the themes with a much higher industry participation rate. While the shares of SMEs may be relatively high, in terms of financial contribution they were rather low.

The largest theme was ICT, followed by Health and Transport. While in ICT and Transport industry participation was very high, the Health theme was dominated by universities.

The two stage proposals were used in the Health and Environment priorities. According to the Health theme, it has lowered the burden for applicants in particular SMEs since it required only a seven page proposal in the first stage. It also enabled the work-programme to evolve, including less prescriptive topics and thereby allowing bottom-up approaches to deliver innovative ideas.

Overall, the average TTG within the COOPERATION programme was 372 days, for the whole FP7 313 days. The shortest average TTG was achieved in ICT (which also dealt with the largest number of signed agreements) with 257 days and the longest was in Space (average 419) and Security (Average 501) days. Due to differing two-stage proposal calculations, the FP7 average calculation is not fully comparable to FP6, were the “time to contract” period was on average 384 days.

The various simplification measures are fully recognized and appreciated by participants. The most successful were (in no particular order):

- The introduction of a unique registration facility (URF);
- A major reduction in the number of certificates related to financial statements to be provided with periodic claims;
- A considerable reduction in ex-ante controls and revised protective measures for financially weaker participants;
- The extension of lump sum financing for subsistence and accommodation costs;
- The application of personnel costs in a manner integrated to the business accountancy systems;
- The resolution in payments for participating in research of SME owners and natural persons without a salary;

4 see FP6 Final review, p.4

- The establishment of the Research Clearing Committee.

Other administrative bottlenecks were not mentioned, however several reports pointed out a lack of active support concerning information exchange between projects or themes.

FP7 also saw the **introduction of pilot initiatives** such as inducement prizes. Only two themes mentioned pilot or inducement prizes which were introduced only recently. Thus, effects were not seen or measured yet.

The question about the **ratio of fundamental/basic versus applied research** was addressed by the Health theme. There "a very rough estimate is that the ratio of fundamental/basic versus applied research is around 30/70". Several other themes address the issue through TRL analysis. According to the latter, the majority of the projects in the various themes (except SSH) were in the levels up to demonstration; TRL 1 and 2 seemed to be less often than 3-4 but this depends to a large extent on the theme.

In terms of **direct contribution of contractual Public Private Partnership (PPPs)** to the European Economic Recovery Plan (EERP) one can sum up the €2.1 bn from the EU budget on green cars, energy efficient buildings and factories of the future. These are all PPPs under the NMP theme.

- Factory of the Future (FoF) PPP: About 13% of the projects and of EC contribution. Funding by NMP theme is €400m out of €600m EC funding; industry and EC each contribute 50%.
- Energy efficient Building (EEB) PPP: accounts for about 7% of the projects and for 8% of total EC funding in NMP. Funding by NMP theme is €250m out of total of €500m EC funding, industry and EC each contribute 50%.
- Green Car (GC) PPP: It comprises 2% of the total number of NMP projects and 2.5% of EC funding in the NMP Theme. Funding by NMP theme is €60m out of total of €500m EC funding; industry and EC each contribute 50%.

Among the various specific instruments that were available and used in FP7, the **ERA-NETs and Joint Programming Initiative (JPI)** received positive feedback from national policy makers as regards the value of coordinating national research activities. The KBBE theme noted clear indications of important 'critical mass' formed as a result of collaboration. Overall, in ERA-NETs and ERA-NET Plus, the five most active participating countries accounted for 40% of the participations (France, Germany, NL, AT, DK).

The novel instrument of the Joint Technology Initiatives (JTI) and Joint Undertakings (JU) were appraised in greater detail. Both are forms of public-private partnerships (PPP). The IMI evaluation panel noticed the significant achievements in terms of scientific excellence and in general IMI has attracted the industry side. The open innovation framework facilitated the formation of consortia, including a wide range of participants. The panel suggested a wider opening to SMEs not included in EPIA (the main private sector partnering association within IMI) and a clear strategy to achieve wider societal impacts.

Governance aspects are addressed by JTI evaluations. For example the Fuel Cell and Hydrogen JU recommends a more prompt decision-making, greater executive authority of the Executive Director and sharing of administrative functions either with other JUs or to take them back into the Commission services. The final evaluation of the three research partnerships mentioned above, also recognized the achievements but recommends to adapt the governance model in order to “guarantee long-term sustainability and impact”. In particular they mentioned the need for increasing transparency of the process to external bodies and the formalization of roles of the industrial partners and their relationships with the Commission.

External views differ (incl. the critical reviews of the European Parliament in April 2015, which see the dominance of industry as critical in several JTIs). The main reason for the criticism on these new partnerships is an imbalance favouring industry needs and ideas and thus being a convenient subsidy for private sector R&D. In terms of measurable outputs (publications), one cannot state that the partnerships produce more than traditional research projects. This can be expected since there is a larger share of industry with a low propensity to publish. Nevertheless, the JTIs managed to leverage substantial budgets from the private sector and

Evaluation aspect 3 – Direct achievements

For the first time, we have direct output data from FP projects in terms of publications. More than 42.000 documents are registered so far. However, this is only a part – since in December 2014 (the cut-off date for the figure above), only 48% of all FP7 research projects were completed. Thus, once all projects are completed, one can expect a by far higher number of publications.

There is a clear difference between thematic priorities which reflects different publication habits. The absolute numbers are not very informative given differing publication habits per scientific field and differing shares of participant groups: for example a high share of companies among the participants is likely to reduce the propensity to publish while for academic partners, publications are an important output factor. According to Table 7 (Annex), the differing outputs per theme can be seen. Given that for example Health is a large theme and it belongs to the prolific disciplines in terms of articles, it comes to no surprise that almost 50% of the COOPERATION output is coming from this field. The following themes are NMP (almost 18%) and Environment (12%).

Compared to overall publication figures by country or theme, the number of publications out of COOPERATION projects as recorded in the database of outputs is rather limited with 23,000 (FP7 all: 43,400 between 2011-2014). However, since a large share of FP7 projects are still running, the overall numbers can be expected to rise. For the network analysis of FP7, a total of 150,000 publications were identified as FP outputs for 2007-2014, among those 50% from COOPERATION. In terms of costs per publication (i.e., EU funding per publication in the internal database) the KBBE theme estimated the output ratio per ten million euro invested at 54 publications, in Energy 24.

The themes estimated the share of publications in highly cited journals (top 10% of journals in terms of SJR within a given scientific category). For COOPERATION, almost 50% of all publications were in the top 10% of journals. The level of excellence and extent of the contribution was measured in more detail in the NMP theme: In the Web of Science 0.36% of all NMP publications since 2008 obtained more than 100 citations and are considered “highly cited”. Within this group (4.758 publications), 22 publications were from NMP funded projects (equalling 0.56% of all NMP publications).

The overall number of registered IPR is limited with around 1.700 (February 2015), further selecting the COOPERATION programme only, the number is just above

1.000. Registered IPR concerns mainly patent applications (83%), however, trademarks, utility models and registered designs are equally occurring. In total the NMP and Health themes generated more than 50% of the IPR.

While many projects have registered patents in the monitoring system, recent analyses suggest that the real number of patents is higher and the real new knowledge gained equally much higher than the number of registered patents suggests. According to the NMP patent analysis the database presents a significant underestimate of the real patent output of projects which is estimated to range between 56% and 15% of all project patents (Callaert et al 2015)[5]. While 64% of the projects (185 out of 290) report no patenting activities, the survey results indicated several other forms of IP protection avenues such as trademarks (22%) and design registrations (22%). A large number of projects opted for secrecy (60%), defensive publishing (20%) or open source strategies (27% (ibid.). The majority of IPR within the SESAME database concerns patents, and in particular EPO and PCT applications. This signals a wider expected market than national ones but also that the applicant does not know the final market yet.

If we **analyse dissemination of research results and technology and knowledge transfer activities**, the results are mixed. Obviously, the projects needed to disseminate their results – whether through publications, conference papers, workshops, or films, databases, or patents. While there is the assumption that the results were used and diffused, there is a clear lack of monitoring diffusion and uptake of results. Several sources mentioned that the programme as such did not actively support dissemination of results or knowledge transfer activities. There were no active mechanisms and it was by and large in the hands of the project officer (PO). Lack of dissemination support as well as a lack of dissemination strategy at proposal stage was mentioned as a critical point by several reports. It was suggested that proposers need to put more emphasis and thought on ex-post activities. On the PO side, the ICT theme indicated that dissemination of results beyond the scientific/academic perspective should be fostered and a monitoring of 'real outcomes' in the medium-long run should be a task of the EC. Direct knowledge dissemination to industry players or societal actors was not a structural focus. Activities depended on whether this was thought of within the project or fostered through the PO. From the various participants' surveys, industry or society was rarely among the key addressees for dissemination activities. The majority of the participants remained by and large in their research perspective and diffused their results within the scientific communities. The various assessments suggest that this limitation is often seen as unfortunate and a wider diffusion with 'real' effects wanted.

In terms of **training** effects, the projects trained doctoral students and post-docs and as such, the programme had significant (estimated) effects. Overall possibly thousands of doctoral and post-docs were involved in the research projects and thus new capacities were created. There are also a number of projects whose output are training activities such as summer schools, study visits, teacher training programmes or PhD meetings. Also science education has been an important aspect: out of a sample of 119 SSH projects, 45% have generated science education materials like kits, websites, explanatory booklets, DVDs, etc., 31% of these projects have reported working with students and/or school pupils in activities such as: open days, participation in science festivals and events, prizes/competitions or joint projects.

5 Callaert, J. et al. (2015): Analysis of patenting activities of FP7 NMP projects. Tender RTD-NMP-2013-patents.

Whether or not **outputs have led to innovation** can only be seen on a case by case basis – and if individual projects reported this. Evidence from an individual case provided the Health theme, describing the commercialisation of a new superbug antibiotic compound that was developed in a project by a small Swiss biotech company and then licensed to a large Swiss pharmaceutical company in a major deal. .[6] .

The registered IPR can only be used as a proxy since patents are not innovations per se but they may lead to new products and services. Many patents do not have a commercial value. According to several participants' surveys, a limited share of industry participants expected to put new products on the market, but a much higher share focussed on process innovations and incremental product innovations. For the public organisations, innovation was rather a marginal by-product, if any. The various participant surveys suggest that innovative products are an expected output for a small share of medium-sized, innovative SMEs.

Based on the technology readiness level (TRL), several themes reported a stronger innovation dimension in the Programme. In energy for example, it was found that compared to FP6, where most projects finished at TRL6 (technology demonstrated in relevant environment), projects supported under FP7 have finished at higher TRL levels (typically TRL 7-8 (system prototype demonstration in operational environment - system complete and qualified). The demonstration projects in the second half of the programme have started at TRL level 6 (where FP6 typically ended), and have improved the TRL level of the technology on average by 2.5 steps. In specific fields such as Nanosciences and Nanotechnologies and New Materials, it was mentioned that there is room for increased emphasis on higher TRL levels.

Another potential effect of PF projects are spin-offs. The Health theme estimated that by the end of FP7 90 start-ups were created. This may be higher than in other themes which are less knowledge-intensive and prone to start a new business than in the (here only white) biotechnology sector. Other estimates were not provided.

Only a very limited number of projects (about 1% in some themes) mention standardization as a goal or that they contributed to standardization. In terms of legislation, again, individual project results were used as information basis for new legislation at EU-level. However, there is no systematic monitoring about the impact of projects on legislation.

Positive **leverage effects** of the programme were in general limited to the JTIs but also a number of support actions were also funded to develop strategic European research agendas. However, according to survey participants in the Energy theme the impact on filling knowledge gaps between Member States and avoiding overlaps between research at the national and European level has been rated rather low. This suggests that there is still room for improvement for coordination between national and EU research agendas in order to avoid overlaps.

Evaluation aspect 4 – Longer-term and wider economic, social and environmental impacts

The main caveat with research is that the **impacts of research** projects often materialise only 5 to 10 years after the end of the project. They also depend on many

[6] http://www.genengnews.com/gen-news-highlights/roche-in-547m-deal-to-co-develop-polyphor-s-superbug-fighting-pol7080/81249062/ the agreement is worth €490m.

other external factors, e.g. market and regulatory development, business decisions, the length of technological development in a given sector, etc. that are outside the reach of the FP. Rarely, there are attributable direct expected impacts, the majority of impacts may be indirect or blurred over time. Also unintended positive and negative impacts can be widespread in particular in a long-term perspective.

Impacts can be manifold and differ by type of organisation. Industrial partners may have benefits such as: increase in turnover, market share, work force, profits, general competitiveness, or contract income. Non-profit partners may benefit of network effects of transnational collaboration, improved R&D-capabilities, improved awareness of the importance of R&D, improved collaboration in the value chain and an improved overall strategy. These are mostly direct, expected impacts, which are also mentioned by survey participants.

Potential impacts from a theme-level perspective are by and large unevenly distributed: a few projects have a very high potential impact dominating the overall estimations while the potential impact of most projects is rather small. It has already been recommended in an analysis of previous FPs that it is unrealistic to expect from each project significant impacts, thus "*Perceive the individual FP R&D project for what it really is: a single research instance among many for a participating organization. Do not expect huge impacts from individual projects either on innovation or on the 'behaviour' of the participating organizations*"[7]

Behavioural effects are estimated to be limited. FP7 projects affect the behaviour of participants possibly concerning their roles: coordinating participants tend to remain in this role. This is not directly a result of the research project rather than the size and experience of the participant. COOPERATION created new collaboration opportunities for a large number of new participants. It also provided opportunities for gaining momentum for a number of participants that were already participating in previous FPs. The SNA analyses of NMP and ICT suggests that there is a large set of core participants, knowing each other by and large and participation in the programme is not primarily associated with additional network effects. Several themes pointed out that for successful, societal-relevant innovations, new types of participants are crucial, namely various civil society organisations that can leverage societal acceptance[8].

It is too early to assess if research results in key sectors lead to technical advance. Innovation outcomes were neither expected for most participants nor among the main reasons for participating in FP7. ICT for example – a key sector if we consider the high share of funding in the FPs - did not necessarily lead to commercial innovations. The mid-term evaluation (Bravo et al 2010) pointed out several weaknesses. The final evaluation is more cautious and points out that pre-competitive research as dominating in the first phase of the theme and competitiveness aspects were only introduced in 2010, with the introduction of PPPs and change in content of topics. In terms of scientific outcomes (publications and conference proceedings) the ICT theme is rather satisfied with the achieved results.

[7] cf. Fisher, R.; Polt, W., Vonortas, N. (2009): The impact of publicly funded research on innovation: An analysis of European FPs for R&D. ProInno Europe Paper Nr. 7, p. 84

[8] Results of the network analysis of individual types of actors (such as the CSOs) were not available for this assessment.

Since almost two thirds of the participants participated only once, the longer-term sustainable research capacity of the majority of the participants may not be strongly affected. However, there are a number of individual participants that participated in more than 100 projects, the European large umbrella organisations can often count more than 1.000 participations. Also a number of universities participate almost 1.000 times and a few companies in small but expensive research fields like aeronautics have multiple participation. Thus, for them, the multiple participations provide also a lot of money (individually between €100million -€1.5bn) that enables them to keep or increase the number of employed researchers. For the University of Cambridge for example, the top receiver within the group of universities, 37% of its income from research grants and contracts comes from other bodies than the councils and UK-based charities – such as FP funding.[9] The CNRS reports that 18.6% of its research contracts is EU funding.[10] This suggests that the FP funding is an important source of funding for a larger number of research performing organisations. This could suggest that in the best way it complements national funding and in the worst way subsidises lacking national funding.

Many themes point out the internal training effects of FP7 research projects that trained thousands of doctoral students and post docs. Participation in FP-funded research tends to have positive career effects for academic researchers since very often, their first publications are based on an FP project. We have seen in an FP5 evaluation (Technopolis 2010)[11], that young researchers and female researchers benefitted most since they opted (successfully) for high impact journals for their publication and were successful in obtaining citations. The NCP survey supports a positive role of the FP7 for stimulating the participation of younger/non-established researchers. This is however not limited to the COOPERATION thematic priority but may be indicating the role of the PEOPLE thematic priority.

While certainly FP projects trained new researchers and thus contributed to the scientific capacity for future generations, it is not clear if these newly created positions are temporary, or whether the researchers obtain open-ended contracts. Evidence in the MS suggests that the increase of competitive third party funding leads to higher shares of temporary positions, a lack of long-term career prospects, and a decrease of the attractiveness of academic professions.[12]

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9 University of Cambridge, Annual report, reports and financial statements 2014.

10 CNRS annual Activity Report 2013

11 Technopolis (2010): The Impact of Framework Programme supported Social Sciences and Humanities Research. DG-RTD

12 The share of temporary contracts among the junior levels is estimated to be 27% in France, 28% in the UK, and 68% in Germany. Academic assistants in Germany account for 86% of the academic personnel. This group experienced an increase in temporary contracts (from 79% in 2000 to 90% in 2010), an increase in part- time employment (from 38% to 45%) and an increase in third- party funding (from 36% to 43%). Policy circles are concerned regarding the attractiveness of academic professions. It is felt that the German system may not be attractive enough for excellent researchers due to the long periods of professional uncertainty, the high proportion of temporary positions and the lower levels of pay compared with other (research- related) professions for highly qualified graduates. (Bundesbericht wissenschaftlicher Nachwuchs, BMBF 2013). GERD by source of funds suggests for a number of countries' university sector that the source 'abroad' has increased substantially over the years and for some countries, the share was around 20-30% in 2013 (IE 22%, LT 23%, FI 27%, SE 28%, DK 31%) (Eurostat), suggesting that third-party funding from abroad – and that is by and large the EU's FP funding, is a substantial funding mode.

The **share of women in FP7** research is rather high yet, the shares of women by theme varies markedly and these differences show also in terms of role: in Health or KBBE, around 55% of the PhD students, 41-48% of experienced researchers, 31-33% of the work package leaders and 30-35% of the scientific coordinators were women. Overall, from the data on the contact person for scientific aspects, 20% of the coordinators and 21% of the participants contact persons were female. In SSH, the number of female participation is the highest with 40% and in Transport and Space the lowest with 14-16%.

The Group of Experts in the Environment theme made some estimates of the **potential economic and societal impact** of the programme. The projects surveyed can generate around €1.5 billion of sales and €7.5 billion of energy and raw materials savings over their innovation lifetime (typically 20 years). More importantly, FP7-Environment as a whole could generate around €7-20 billion of sales and €30-100 billion in terms of resource savings.

While in particular SSH and Environment focussed on policy-relevant challenges in their various WPs, their policy relevance and thus direct impact on society is not monitored. SSH did not lead to tangible product innovations and also in the Environment theme innovation was not a main driver, these themes have mainly **indirectly contributed** to improve the quality of life. Other themes with direct outputs and marketable innovations may have contributed more widely, yet, this is linked to a necessary better understanding of what happens after the FP project, which is however not monitored but possibly addressed through individual studies. Many projects have made relevant efforts to reach out to policy makers and other relevant stakeholders but only in a few cases, the direct impact can be 'proved' such as in the SSH project 'CAP-IRE' - Assessing the multiple Impacts of the Common Agricultural Policies (CAP) on Rural Economies. After continuous contacts with DG Agriculture and Rural Development, the project results have been used to develop the post 2013 CAP. The evaluation documents released in November 2011 by the EC explicitly mention the CAP-IRE project results. Thus, a clear sign that the project results had a direct influence on the development of the revised CAP.

A benefit of FP7 identified by several assessment reports was the inclusion of civil society organisations (CSOs) that bring in a highly needed user perspective, in particular when it comes to addressing societal challenges. This group brings into a predominantly research network a rather different set of qualities which can enrich the research, optimize outputs, and trigger wider societal benefits. While the inclusion of differing organisations such as CSOs are initially seen as a possible hampering factor (since they have different agendas from research organisations or companies), several themes have acknowledged that the inclusion of CSOs adds a new quality to the research and helps achieving innovation and their commercialisation on the market. The end user perspective was lacking in the first half of FP7 but the drive towards innovation may also have driven the inclusion of new actors and thus, a positive overall network effect.

At the same time, given the overall participant structure, it cannot be concluded that FP7 was a wide platform for citizens and third sector organisations. Policy makers were addressed in a number of dissemination activities, as well as other research organisations and to a lesser extent industry. The latter however was involved (about 25% participation share) and thus helped enabling the innovation objective.

Since there are very diverse needs, expectations and values linked to research and innovation, it is difficult to meet them all. Recent Eurobarometer surveys suggest that citizens have different priorities than the current funding of FP7 priorities suggest. In terms of themes, 'health and medical care' is the main preoccupation, followed by 'protection of the environment' and 'energy supply, and 'availability of quality food'.[13] Other themes such as 'space' are much less prioritized. According to a special Eurobarometer on Space, citizens acknowledge that space research is important and can contribute to the general knowledge, but when it comes to the question if the EU should invest further in space exploration, 33% of the citizens share the opinion that there are more pressing issues.[14] In other fields the benefits and expected impacts from science and technological innovation are expected to be very high such as Health, Transport and transport infrastructure, or Energy. In these fields research is expected to have a greater impact than behavioural change of people.

According to the NCP survey, 53% of the respondents rate the importance of FP7 for shaping national/regional research and innovation policies as high or very high while only 2.8% rate it as very low. This result is rather consistent to the analysis of ERAWATCH country profiles and the analysis of thematic priorities. They are by and large matching national priorities; in some MS there is even a 1:1 priority setting such as Lithuania.[15] In terms of programmes, the national ones tend to be less bounded by scientific and technological fields: for ICT for example it is common to address material sciences as much as nanotechnologies, or energy is often linked to environment. In this more open and interdisciplinary respect, the national programmes seem to be already where H2020 is heading to.

Evaluation aspect 5 - European added value

A significant part of EU research investment is in projects for the collective public good that would not be conducted/financed by the private sector alone and can be done more coherently and economically by several countries collaborating than by one single country.

The *added value of a project* heavily depends on the uptake of research results. In several cases it was noted that the potential of added value would be high provided the results were followed up. However, in many cases such evidence was lacking or very limited. For a number of projects, the European added value is rather low – this concerns the large majority of individual projects with low impact (as estimated by the PO). There is clearly a difference between the added value of individual participants and European added-value.

For the individual participant, FP funding is a complementary source for a lack of or decreasing national funding or an added source for a research project that would be more difficult to fund within national programmes. The benefits or value added for the participant vary by type of participant and by the ex-ante expectations. For about three quarter of the participating SMEs, the outputs and effects obtained through the EU funding could not have been achieved with national or regional programme funding. 60% also agree that the FP7 funding compensates for the lack of alternative funding (van Elk et al 2014).

[13] Special Eurobarometer 419, Public perceptions of science, research and innovation. (2014)

[14] Special Eurobarometer 403, European's attitudes to space activities. (2014)

[15] see for example the list of priorities for Lithuania in the ERAWATCH online profile, http://erawatch.jrc.ec.europa.eu

These individual benefits may or may not lead to European added value. Since the individual project's result may or may not have effects such as produce a new product or service, or resulting publications are or are not read within the scientific communities or policy makers, the impact of an individual project may indeed be low and its contribution to European challenges may simply be evaporating. However, the real European added value may be found in structuring and coordination effects linked to the thematic priorities as well as funding instruments.

In NMP for example, about 78% of participants have stated that they have a comparable national funding programme in their country. The advantage of the NMP programme is not financial endowment, but international networks and bigger consortia while additional network effects are limited – the field is apparently already well connected as the dedicated study on social network analysis (SNA) suggests. The positive network effect of international collaboration which seems to have been one of the major aspects of added value for the participants for FP5 and FP6 seems to decrease. Obviously, this is linked to the stability of project consortia over time. In themes that are characterised with a high share of new participants, the network effect can objectively be positive (ie., there are new linkages). It has already been concluded in FP6 that the positive effect of collaboration are the highest for first time participants – with continuous participation we can still see positive effects but with an overall decreasing value.

In terms of the added value of scientific publications and patents, FP7 may not be remarkable at the micro-level but in terms of overall impact in achieving excellence, fostering international collaboration and structuring national-level research policies, its overall impact seems to be high. According to the NCP survey, FP7 had a high impact on achieving scientific excellence (82% respondents agree or strongly agree while 4% disagree). Out of the overall FP7 publication output, about 46% are published in high impact journals.[16] For the COOPERATION programme, the share is slightly higher with 49%. There is a wide spread between themes from Space (16%) to Health (56%). This overall picture may vary also by MS. For a number of researchers from scientifically less active countries or with a lower scientific impact, the potential to co-publish with recognised partners would mean a rise of their own reputation. Clearly, this is a known co-publishing effect but if this can be seen also with the FP7 would require further analysis. The limited share of participants from EU-13 countries however suggests a limited research cohesion effect.

There are certainly a large number of projects and results (e.g.. publications, databases) which would not have been achieved without the FP7 funding or any similar coordinating mechanism. This concerns research that is by and large empirical in nature and addresses a number of countries. Also many projects benefitted from the size and opportunities to test and use various methods and approaches. Again, it is more unlikely that this type of research is supported by all individual MS (for example due to a lack of critical mass, or the need to pool resources) and thus the European added value is given.

FP7 does not seem to have created a lot of new linkages but seems to be a continuation of FP6 with the mixed-blessing effect of stabilisation but also exclusion. Pooling of resources is not a main feature of the COOPERATION programme, yet, the joint technology platforms and other instruments such as ERA-NETS aim, and are to a good extent successful in pooling resources, and leveraging private funding.

[16] High impact journals are the top 10% of journals within each Scimago sub-field.

Leverage effects can be seen in particular through the partnership instruments and through the direct contributions of the participants. Given the economic crisis in the early phase of FP7, private and public investment in R&D decreased in most MS. Thus, the direct leverage effect is limited to a few dedicated areas where the EU role of coordination is very actively pursued (such as the JTIs).

While there are no hard supporting facts that the S&T capabilities were improved thanks to FP7, there are facts about pan-European cooperation. Within COOPERATION thematic priorities, there was a strong and intense collaboration among a core of the EU15 MS. However, all MS were involved in these FP7 thematic priorities. One may also note the more global outreach – the inclusion of a very large number of non-European countries has opened up new research networks for many participants. This is often seen as an important form of science and technology transfer and in fact, if EU participants teamed up with more advanced partners from third countries, we can assume that the S&T capabilities within Europe improved.

Knowledge generation through COOPERATION projects may have been more on the tacit than explicit side – given the relative low number of publications, yet, survey respondents cite knowledge creation as one of the benefits from participating.

There is certainly competition for funding as can be seen from the number of applicants and the success rates for being funded.

Evaluation aspect 6 – Conclusions

While the overarching reasons and objectives for public European funding of research and innovation are plausible and a number of achievements were made, it seems that the overall effects of networked parts could be further realized with improved coordination.

While overall, the public intervention (i.e., funding) of research can be justified for several themes, has by now a lot in common with the criticized European Common Agriculture Policy. For many beneficiaries, the Framework Programme funding mechanism represents a long-term subsidy, expected by the beneficiaries and supported by well-organised lobbying. The **funding of specific themes is institutionalized** and while this provides stability to the ones designing the work programmes and the ones receiving the funding, this institutionalization is also hampering significant changes.

The Cooperation Specific Programme followed the idea of ‘spreading excellence’ and ‘further completing the ERA’ and stressing the international collaboration and focused on mainly one research performing actor, namely universities, which is striving for ‘scientific excellence’ as measured through publications. the various aspects of “excellence” could be better communicated in order to encourage different organisations to bring in competences – such as research, innovation, diffusion, or communication.

Improvements could be achieved if different accomplishments were taken into account and recognised – possibly varying by type of participant. A drive towards innovative, risky research and applied, oriented research may need also different evaluation skills. While it is common to rely on past performance, e.g., projects or lists of publications that demonstrate the scientific capacities of proposers, young companies, entrepreneurs and young researchers that are more likely to develop innovative and risky projects, tend to not have a proven record. Thus, it may be a useful to provide smaller scale opportunities for newcomers (possibly without the perfect research record) with non-mainstream ideas and encourage more heterogeneous and mixed consortia (in terms of type of organisation, country origin, scientific or technological background).

While there are pros and cons for 'prescriptive' as well as 'bottom-up' projects, a more holistic approach to funding as envisaged in H2020 may provide opportunities to develop innovative project proposals. Several themes noted that in order to be closer to the market, it is important to have new stakeholders on board. NGOs, patient organisations as well as consumer protection organisations to name a few of the so-called civil society organisations can help rendering a clear research project into a societally impacting endeavour.

- It seems important that the themes clearly point out expectations: many projects will benefit from including CSOs and social scientists that can address societal issues that come along with technological achievements.

A sensible monitoring of objectives and assessment of new approaches requires the development of a limited set of performance indicators for each project, to be subsequently assessed upon project completion and preferably also beyond project completion.

While the majority of projects are 'classical' collaborative research projects, several thematic priorities have a higher likelihood to attracted industrial partners and to produce more industry-relevant outputs. Demonstration projects have been identified as a useful project type for industrial partners.

More relevance for innovation and commercialisation of project outcomes also requires more demanding calls: it seems that a large proportion of project coordinators do not know what happens to their project outputs after the end of the contract period. There is a clear need to request ex-ante thinking on how to bridge the gap between activities during the project and after project completion. Proposals would thus need much more to develop a strategy on the uptake of research results.

Having projects from concept to commercialisation may be difficult for many projects and it may not be the aim of commercial participants in particular when it concerns competitive future markets. If the uptake of innovation in form of commercialisation is better organised outside the project, other instruments are available or could be reinforced such as demand-side policies. Since the innovation process is complex and entailing a number of steps, demonstration and commercialisation can be organised with a different "phase 2"-type of project within the FP but also outside. Here, a link to regional funding and/or structural funding could be envisaged. A better coordination with uptaking instruments at regional level or with specific industry networks may help the projects to realise commercial outcomes and value added.

The measured output from COOPERATION is by and large bound to publications and patents, but also other outputs were created such as databases, and infrastructures; people were trained, and new knowledge was created and shared among the participants. These are all known positive effects.

Given the large structuring effect of FP7 on national programmes, instruments and priorities, FP7 COOPERATION and its policy shaping function for many organisations and associations, it may have wider, unintended effects – such as fostering short-term research contracts or a focus on number of publications.

Many expert reports and academic papers acknowledged that possibly the main problem of Europe's research and its transfer into tangible products and innovations is the general low risk level. A policy context that offers progressive funding modes for innovative research could be a game changer.

Personal statement of the author

FP7 has been a rather special programme since in the middle of its existence, its traditional objective of supporting research and its strategic objective to foster the European Research Area (ERA), was broadened to include innovation. This change was driven by the Europe 2020 strategy – a revision from the earlier Lisbon strategy – that provided innovation a much stronger position. This was further specified through the flagship of the “Innovation Union” (IU) – a broad concept that –similar to ERA- includes a number of instruments that were developed in order to reach its objectives but which equally required some reorientation and structural developments on existing EU instruments such as the FPs. For the latter we can thus notice a change from 2011 onwards in the Work programmes (WP) and in terms of instruments to support IU actions (e.g. requiring SME participation, supporting demonstration projects, developing further partnership-type of instruments). While Horizon 2020 (H2020) was thus planned to provide equal footing for research and innovation, the remaining three years of FP7 reflected the increasing importance of innovation, paving the way for Horizon 2020.

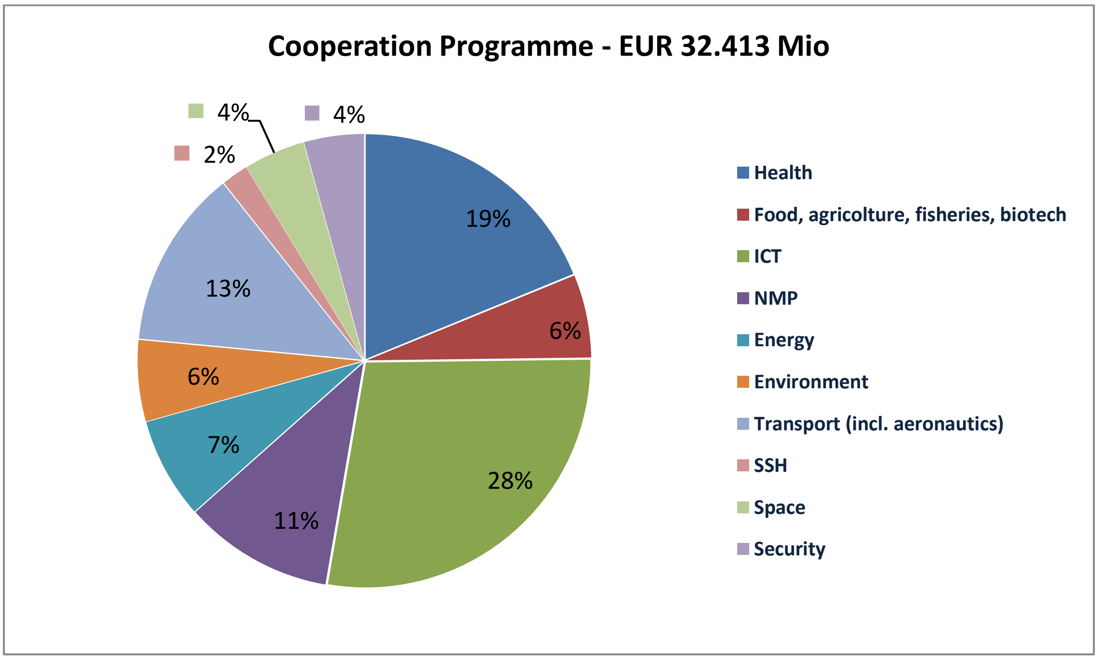
Another change to FP7 was introduced with the identification of the so-called Grand Challenges – aiming to direct various Community activities towards a limited number of social, economic, and environmental areas. While the policy makers aim to sell FP7 as paving the way of a new framework programme objective which under H2020 is to provide support in a seamless way from research ideas to commercialised products, background reports provide several arguments that this objective may be difficult to achieve – and it was for several thematic priorities difficult to address under FP7. Since FP7 started as a programme to support mainly the first phases of the innovation process (i.e., low TRL stages) – where basic and applied research dominate, it needs to be assessed taking the qualitative changes into account.

A number of evaluation questions and aspects the author was asked to analyse need to be seen under the lense that there were at least two objectives – scientific excellence and innovation which are not without conflict in particular, if the structure of the programme, its planning and implementation mode bears a long tradition for fostering research.

While each thematic priority under COOPERATION has its own stylized facts – this may concern types of research organisations or industry, size of projects, research orientation (basic or applied), outputs and wider effects, a synthesis unfortunately leaves out a number of relevant factors for individual thematic priorities and thus may also leave out individual findings which are important for an individual thematic priority.

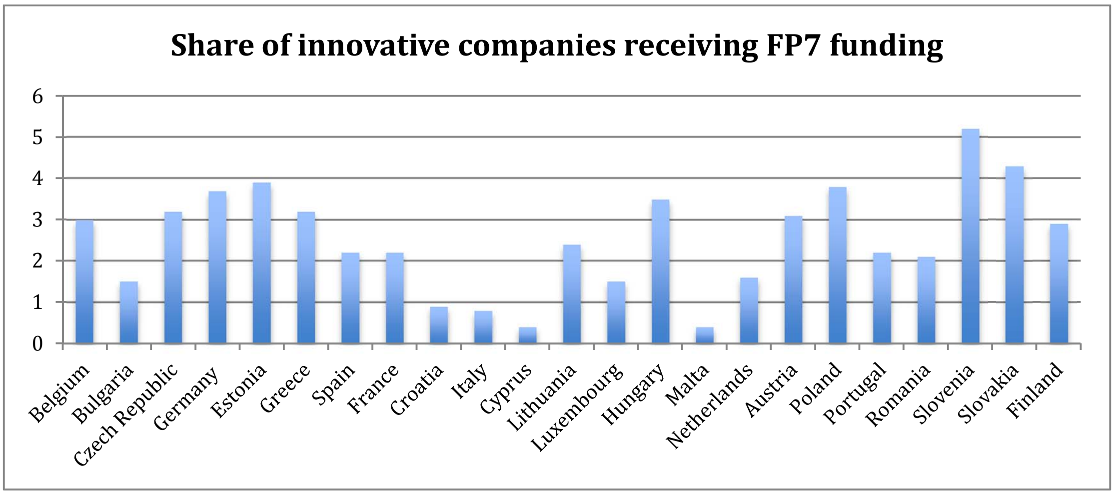
Annex

Figure 1 Cooperation budget allocation by theme



Source: DG-RTD, background paper of Dir I. Note: budgeted does not mean spent. In total €28 bn were spent.

Figure 2 Innovative companies receiving FP7 funding



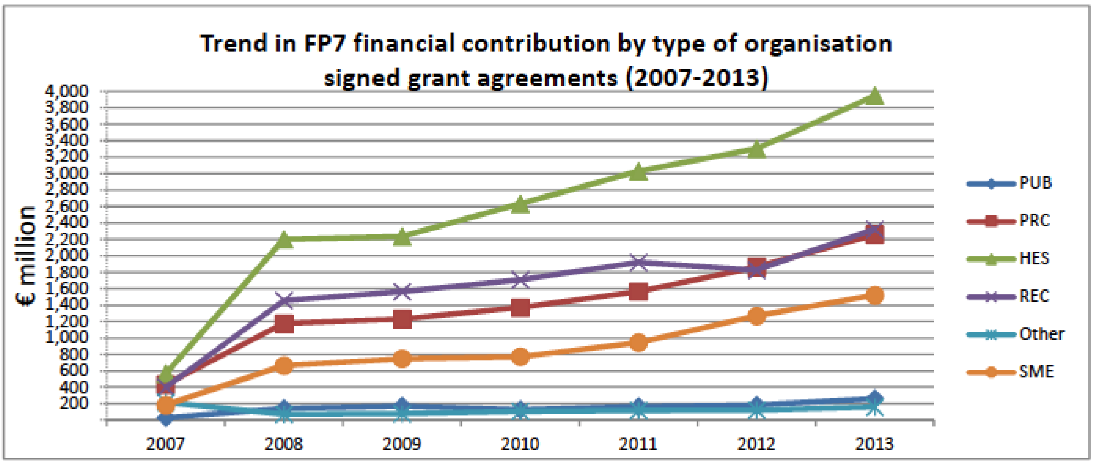
Source: Eurostat, CIS 2013, surveyed period 2011-2012. Note: Data for 5 MS is not available

Table 1 Applicants and requested funding by type of organisation

Type of organisation	Number of applicants	Requested EU contribution (in €m)
Higher or secondary education (HES)	45.285	10.996
Research organisations (REC)	28.650	8.814
Public body (excluding research and education) (PUB)	6.757	1.345
Other (OTH)	9.090	1.959
Private for profit (excluding education) (PRC)	36.408	10.827

Source: DG-RTD, FP7 Monitoring report (non-published)

Table 2 EU financial contribution (in € million) in the signed grant agreements for FP7 calls concluded in 2007 -2013 by type of organisation



Source: DG-RTD, FP7 Monitoring report

Table 3 Number of participations and EU contributions by Cooperation themes (%)

	Participations	**%**	**EU contribution (X 1,000 €)**	**%**
Health	11.124	13,94	4.754.226	18,42
KBBE	7.813	9,79	1.841.975	7,14
ICT	21.940	27,49	7.706.069	29,85
NMP	10.156	12,72	3.239.194	12,55
Energy	4.161	5,21	1.660.133	6,43
Environment (incl. Climate Change)	7.102	8,90	1.717.516	6,65
Transport (including Aeronautics)	8.969	11,24	2.279.309	8,83
SSH	2.708	3,39	570.557	2,21
Space	2.598	3,25	702.585	2,72
Security	3.068	3,84	1.028.413	3,98
General Activities	183	0,23	312.688	1,21
TOTAL COOPERATION	**79822**	**100**	**25.812.665**	**100**

Source: EC's Respir database. Extraction: 06/11/2014 (from Directorate I contribution)

Table 4 Key figures COOPERATION and FP7

		COOPERATION	Total FP7
Submitted proposals	Number of proposals	40.158	135.716
	Number of applicants	376.519	601.024
	Requested EC funding (EUR m)	132.974	217.600
	Number of applicants per submitted proposal	9,4	4,4
	EC contribution per proposal (EUR m)	3,31	1,6
	EC contribution per applicant (EUR m)	0,35	0,36
Retained proposals	Number of proposals	7.942	25.127
	Number of applicants	84.330	130.801
	Requested EC funding (EUR m)	29.442	41.659
	Number of applicants per submitted proposal	10,6	5,2
	EC contribution per proposal (EUR m)	3,71	1,66
	EC contribution per applicant (EUR m)	0,35	0,32
Success rate	Success rate (proposals)	20%	19%
	Success rate (applicants)	22%	22%
	Success rate (EC funding)	22%	19%
Signed grants	Number of signed grant agreements	7.779	25.053
	Number of grant holders	86.854	132.392
	Granted EC funding (in EUR m)	28.078	44.364
	Number of participants per grant	11,2	5,3
	EC contribution per grant (EUR million)	3,61	1,77
	EC contribution per grant holder (EUR m)	0,32	0,34

Source: EC: (2015): FP7 monitoring report

Table 5 Publications by FP7 Cooperation Theme

Theme	No. of processed projects	Percentage without reported publications	Number of publications	Publications by project	Pub. in High-Impact Journals	%
Health - HEALTH	384	14%	11193	29.1	6323	56%
Food, Agri. and Fisheries, and Biotech - KBBE	174	20%	2631	15.1	1117	42%
Nanosc, Nanotech., Materials and new Production Tech. - NMP	345	28%	4050	11.7	1973	49%
Energy - ENERGY	102	33%	715	7	304	43%
Environment (including Climate Change) - ENV	212	30%	2876	13.6	1265	44%
Transport (including Aeronautics) - TPT	274	61%	545	2	162	30%
Socio-economic sciences and Humanities - SSH	127	35%	655	5.2	154	24%
Space - SPA	102	46%	575	5.6	204	35%
Security - SEC	70	57%	229	3.2	36	16%
General Activities - GA	11	91%	252	22.9	57	23%
Joint Technology Initiatives	108	86%	49	0.5	22	45%
TOTAL COOPERATION	**1909**	**36%**	**23770**	**12.5**	**11617**	**49%**

Source: EC's Respir database. Extraction: 06/11/2014 (from Directorate I contribution)

Table 6 Number of recorded publications and projects and publications per project ratio

	Total publications	Nr projects	Publ per project
Energy	699	66	10,6
Environment (including Climate Change)	2798	143	19,6
General Activities	252	1	252,0
Health	10830	322	33,6
Food, Agriculture and Fisheries, and Biotechnology (KBBE)	2554	134	19,1
Joint Technology Initiatives (JTI CLEAN SKY)	28	13	2,2
Joint Technology Initiatives (JTI FCH)	20	1	20,0
Nanosciences, Nanotechnologies, Materials and new Production Technologies - NMP	3981	244	16,3
Security	229	30	7,6
Space	565	53	10,7
Socio-economic sciences and Humanities	655	83	7,9
Transport (Aeronautics and air transport)	263	43	6,1
Transport (Surface)	271	65	4,2
Transport (GALILEO)	6	1	6,0

Source: SESAME, DG-RTD (extraction 10/2014). Calculations: V. Peter

Table 7 Overview of scientific output as recorded in SESAME (10/2014)

Theme	Activity	Nr of publications	Share of publications within theme	Total number of publications by theme	Share of theme in total
Energy	Hydrogen and fuel cells	71	10,2	699	3,0
	Horizontal programme actions	121	17,3		
	Renewable electricity generation	210	30,0		
	Renewable fuel production	96	13,7		
	CO2 capture and storage technologies for zero emission power generation	137	19,6		
	Smart energy networks	23	3,3		
	Energy efficiency and savings	5	0,7		
	Knowledge for energy policy making	36	5,2		
Environment (including Climate Change)	Climate change, pollution, and risks	1607	57,4	2798	12,1
	Sustainable management of resources	542	19,4		
	Environmental technologies	385	13,8		
	Earth observation and assessment tools for sustainable development	258	9,2		
	Horizontal activities	6	0,2		
Food, Agriculture and Fisheries, and Biotechnology	Sustainable production and management of biological resources from land, forest, and aquatic environment	896	35,1	2554	11,0
	Fork to farm: Food (including seafood), health and well being	570	22,3		
	Life sciences, biotechnology and biochemistry for sustainable non-food products and processes	990	38,8		
	Other activities	98	3,8		
General Activities	ERANET	252	100,0	252	1,1
Health	Biotechnology, generic tools and medical technologies for human health	1667	15,4	10830	46,8
	Translating research for human health	8431	77,8		
	Optimising the delivery of healthcare to	389	3,6		

Theme	Activity	Nr of publications	Share of publications within theme	Total number of publications by theme	Share of theme in total
	European citizens				
	Other Actions across the Health Theme	343	3,2		
Joint Technology Initiatives (Annex IV-SP1)	JTI-CLEAN SKY (Aeronautics and Air Transport)	28	58,3	48	0,2
	JTI-FCH European Hydrogen and Fuel Cell Technology Platform)	20	41,7		
Nanosciences, Nanotechnologies, Materials and new Production Technologies - NMP	Nanosciences and Nanotechnologies	1262	31,7	3981	17,2
	Materials	1918	48,2		
	New production	371	9,3		
	Integration	427	10,7		
	Recovery Package: Public-Private Partnership (PPP) topics within NMP	3	0,1		
Security	Increasing the Security of citizens	42	18,3	229	1,0
	Increasing the Security of infrastructures and utilities	10	4,4		
	Intelligent surveillance and enhancing border security	3	1,3		
	Restoring security and safety in case of crisis	43	18,8		
	Security and society	67	29,3		
	Security systems integration, interconnectivity and Interoperability	64	27,9		
Space	Space-based applications at the service of the European Society	301	53,3	565	2,4
	Strengthening the foundations of Space science and technology	246	43,5		
	Cross-cutting activities	18	3,2		
SSH	Socio-economic sciences and Humanities	1	0,2	655	2,8
	Growth, employment and competitiveness in a knowledge society	181	27,6		
	Combining economic, social and environmental objectives in a European perspective	123	18,8		
	Major trends in society and their implications	95	14,5		
	Europe in the world	109	16,6		
	The Citizen in the European Union	63	9,6		
	Socio-economic and scientific indicators	64	9,8		
	Foresight activities	17	2,6		
	Horizontal actions	2	0,3		
Transport (including Aeronautics)	Aeronautics and air transport	263	50,6	520	2,2
	Support to the European global satellite navigation system (Galileo) and EGNOS	6	1,2		
	Sustainable surface transport (INCLUDING THE 'EUROPEAN GREEN CARS INITIATIVE')	232	44,6		
	HORIZONTAL ACTIVITIES for implementation of the TRANSPORT PROGRAMME	19	3,7		
	Grand	23131		23131	100,0

Source: RESPIR, Calculations: V.Peter

Table 8 Number of IPR and share by country (RESPIR database)

Country	Number of IPR	Share
DE	224	22,3
FR	121	12,0
IT	116	11,5
UK	114	11,3
ES	80	8,0
BE	58	5,8
NL	47	4,7
SE	47	4,7
FI	45	4,5
EL	29	2,9
AT	28	2,8
CH	20	2,0
NO	14	1,4
IE	13	1,3
DK	11	1,1
PT	11	1,1
PL	9	0,9
HU	4	0,4
IS	3	0,3
BR	2	0,2
CZ	2	0,2
IL	2	0,2
SK	2	0,2
TR	2	0,2
RS	1	0,1
SI	1	0,1

Source: RESPIR, Calculations: V.Peter

Table 9 Number of IPR by theme (RESPIR database)

Theme	Number of IPR
NMP	376
HEALTH	293
ENERGY	96
KBBE	92
Transport	70
ENV	21
Space	21
Security	20
JTI-CLEAN SKY	14
GA	3
Grand	1006

Source: RESPIR, Calculations: V.Peter