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The evaluation as a supporting tool to research and innovation in EU policy: from design to impact assessment

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Abstract

The paper illustrates lessons learned from authors' evaluation experiences within the European Structural and Investment Funds (ESIF) framework. The paper sets out the different focus of the evaluation in the policy cycle, describes implementation challenges and options of financial instruments instead of or in combination with grants, and builds on the main findings of a few impact studies conducted in various regional and national contexts.

Evaluation is not just a technical exercise, rather it can be a supporting tool to research and innovation policy insofar as it: (1) evolves and develops with the policy cycle (from design to review); (2) adopts a benchmarking orientation for judgements and recommendations to compare the case under assessment with others; (3) combines theory-based and counterfactual impact evaluation approaches; (4) ensures the integration of various types of data including big, open and georeferenced data.

Introduction

The paper aims at discussing the use of evaluation tools and findings to improve effectiveness, efficiency and impact of EU (European Union) innovation and research policies. It illustrates the lessons learned from the authors' evaluation and study experiences in various EU policy contexts and geographical areas during the current and previous programming periods, at regional, national and European level.

The first session describes the EU Research and Innovation (R&I) policy framework for the European Structural and Investment Funds (ESIF), with a specific reference to European Regional Development Fund (ERDF) programmes[1]. The session also explains the role (and potential contribution) of evaluation in policy design (ex-ante), implementation (in itinere), review (ex-post).

The second session presents the main lessons learned from the support given in the policy cycle design phase.

The third section illustrates implementation challenges and options, with a specific focus on the development and application of financial instruments instead of or in combination with grants.

The fourth section addresses the challenges of impact and ex-post evaluations.

The final section provides conclusive remarks.

[1] ESIF encompass European Regional Development Fund (ERDF), Cohesion Fund (CF), European Social Fund (ESF), European Agricultural Fund for Rural Development (EAFRD), European Maritime and Fisheries Fund (EMFF).

1. Evaluation of research and innovation in the ESIF framework

1.1 INNOVATION AND RESEARCH IN THE ESIF FRAMEWORK

R&I activities are expected to improve EU competitiveness on the internal and external markets, increase long-term growth rates and secure high living standard for EU citizens in the future. However, many other benefits can be expected such as reduction of structural unemployment, stronger local development and cohesion, increased human capital, and specialisation in promising sectors and domains, inter alia, social economy, ICT, green-economy, blue-economy, bio-economy.

Since the Lisbon Agenda, R&I has ranked high in the EU policy agenda. The EU 2020 strategy for growth and jobs promotes the three priorities of smart, sustainable and inclusive growth, and identifies specific headline targets and flagship initiatives for R&I[2]. The smart growth priority is the most relevant for R&I policy. EU smart growth headline targets aim to achieve 75% of people aged 20-64 in employment and 3% of the EU GDP invested in R&D by 2020. Flagship initiatives for smart growth encompass 'Innovation Union', 'Youth on the Move' and 'A Digital Agenda for Europe'. Other flagship initiatives can be somehow relevant for R&I: sustainable growth initiatives as 'Resource efficient Europe' and 'An industrial policy for the globalisation era'; inclusive growth ones 'An Agenda for new skills and jobs' and 'European platform against poverty'.

In 2014-2020 programming period, the main EU policy tools investing in research and innovation are the EU Research Framework programme (Horizon 2020), the Europe's programme for small and medium-sized enterprises (COSME), and the ESIF programmes. In ESIF programmes, the contribution to R&I is mainly related to the resources allocated to thematic objective (TO) 1 'strengthening research, technological development and innovation', but also TO 3 'enhancing the competitiveness of SMEs', TO 4 'supporting the shift towards a low-carbon economy in all sectors' and TO 6 'preserving and protecting the environment and promoting resource efficiency' as defined in art. 9 of EU Reg. 1303/2013 (hereafter CPR).

[2] https://ec.europa.eu/info/business-economy-euro/economic-and-fiscal-policy-coordination/eu-economic-governance-monitoring-prevention-correction/european-semester/framework/europe-2020-strategy_en

The European Commission's (EC) proposal of a Multi annual Financial Framework confirms the relevance of R&I for the post-2020 period and dedicates to R&I the first of the five policy objectives 'A smarter Europe by promoting innovative and smart economic transformation'.

1.2 EVALUATION SUPPORTING ESIF PROGRAMME IMPLEMENTATION AND SPECIFIC CHALLENGES

The effort made at EU and Member State (MS) level has been remarkable to spur investments in R&I. Therefore, expectations of concrete results and sustainable impacts are very high. In this regard, the specific role of evaluations is to assess to what extent invested resources have actually brought about a change. Evaluation accompanies policy design, implementation and review in order to improve the quality of the programme as well as appraise its effectiveness, efficiency and impact as stated in art. 54 (1) of the CPR. In the 2014-2020 ESIF regulatory framework, evaluators of ESIF programmes have to ensure :

- Functional independence for the formulation of unbiased judgements;
- Technical capacity with the use of appropriate techniques and methods;
- Thematic expertise on various fields of intervention as well as context-specific knowledge.

In the specific field of R&I, in the *policy design* phase, evaluators can support public administrations and authorities in the definition of the strategic framework. In particular, evaluators can provide support in the design of the Smart Specialisation Strategy (S3) and in the ex-ante programme evaluation, as respectively defined in Annex XI and art. 55 of the CPR.

After the programme approval, once the policy design phase is over, programme authorities have to conduct interim programme evaluations and, if the case, ad hoc ex-ante assessments for the introduction of financial instruments (e.g. loans, equity, guarantees or similar) in alternative to or in combination with grants. While art. 56 of the CPR defines the framework of interim evaluations (to be conducted by programme authorities during the programming period), the ex-ante assessment of financial instruments follows art. 37 of the CPR. The ex-ante assessment can be updated if market conditions change over time.

According to art. 57 of the CPR, the EC conducts directly ex-post evaluations. However, some Partnership Agreements (as defined in art. 14 of the CPR), as the Italian one, recommend programme authorities to conduct ad hoc studies evaluating interventions over time and, if the case, applying the typical approach of ex-post evaluations, which focus on relevance,

sustainability, impact, effectiveness and efficiency, and identify good practices and lessons learned for the future.

Figure 1 Main evaluation activities in the ESIF framework

1.3 OBJECTIVE OF THE PAPER

The paper describes the authors' lessons learned in different evaluation contexts across Europe, for the five steps of the evaluation process in the specific policy field of R&I: structuring, observation, analysis, judgement, capitalisation.

A-Structuring. It is the first step, implying the definition of the object, scope and time horizon of the analysis considering the relevant policy framework. Evaluators have to define evaluation foci, i.e. criteria and questions, often in cooperation with the programme stakeholders involved in the evaluation exercise.

B-Observation. It is the second step, defining the data collection tools and organising data collection activities. The main challenges are related to:

- the availability and quality of data from secondary sources, e.g. monitoring system, administrative and statistical sources;
- the quality of data from primary sources, collected directly by the evaluators from beneficiaries and programme target groups.

For the first type of source, the main challenges are the possibility to actually use the data and combine them. Monitoring system do not cover all the data needs, statistical data are more appropriate for context analysis than programme performance assessment, and administrative data are not always capable to ensure the coverage of beneficiaries and non-beneficiaries. For instance, the Regional Innovation Scoreboard (RIS) is a valuable source to compare the territorial innovation performance and pattern ensuring benchmarking and multidimensional approach. However, programmes usually do not consider RIS indicators to frame the supported interventions, which makes the use of this source much more difficult. In other terms, it is difficult to assess the capacity of programmes to bring about a change through Regional Innovation Scoreboard indicators, which are, however, very helpful to carry out a situation analysis.

An alternative option to secondary sources is the direct collection of primary data (e.g. data from surveys), which can be, however, subject to poor quality, risk of low stakeholders' willingness to participate, in particular in the case of non-beneficiaries, which are necessary

to build a comparison / control group within counterfactual impact evaluation (CIE). Data from registers can be also used but they are usually subject to the risk of incompleteness, because they usually build on enterprise balance sheets and on a limited set of variables.

C-Analysis. It is the third step. It is good practice to combine qualitative and quantitative methods in order to assess appropriately the intangible effects (e.g. behavioural or organizational effects) and hard / tangible effects (e.g. investments and job increase). The main challenges arise during the combination of methods in impact evaluations, when the evaluator is expected to estimate the contribution of supported interventions to the development of the area disentangling the contribution of external factors. Two main approaches are usually chosen. Theory-based impact evaluations *investigate how* and *why the changed occurred* and, therefore, assess whether the assumptions of the programme and projects intervention logic hold true and have been useful to meet successfully the targets. Counterfactual impact evaluations aim at estimating *to what extent* the programme has contributed to the change, i.e. the net effects.

D-Judgement. This is the crucial step of the evaluation process. It provides conclusions about the main evaluation criteria and questions, based on evaluators' view and evaluation findings. Moreover, evaluators are expected to give suggestions on future implementation and recommend new solutions customised to the programme context and framework. The main challenges regard:

- The combination of technical competences to use methods and the capacity to provide appropriate suggestions for the specific programme situation and policy cycle phase (policy design, implementation and ex-post);
- The capacity to preserve independence in the formulation of unbiased judgements.

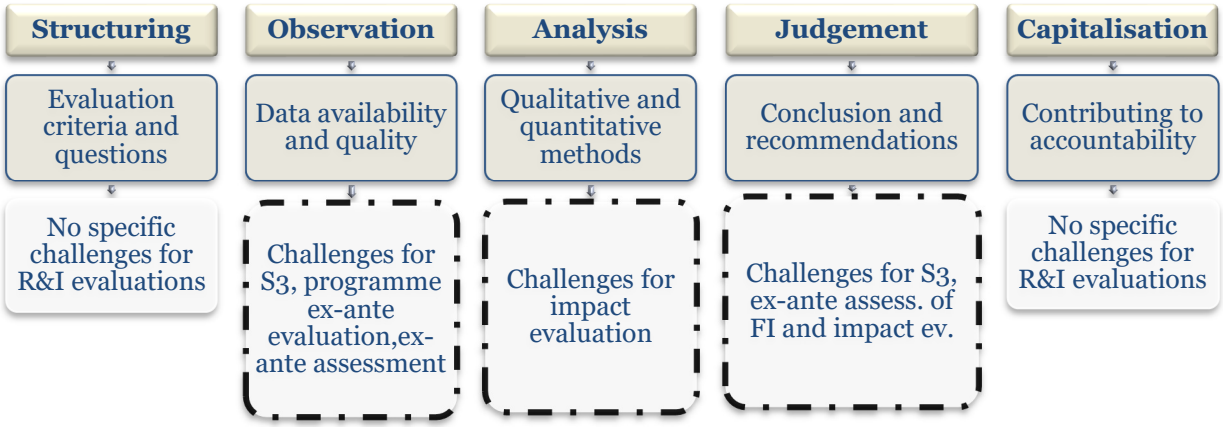
E-Capitalisation. This is the final phase of the evaluation process, promotes public dissemination of the findings and contributes to the appropriation of findings and learning process.

The paper describes the specific challenges of observation, analysis and judgment phase for evaluations of R&I interventions. Challenges related to structuring and capitalisation are not treated because they are not specific to R&I evaluations.

Section 2 describes challenges and lessons learned regarding the evaluation steps of observation and judgement with a specific reference to technical support to S3 and programme ex-ante evaluation. Section 3 describes lessons learned regarding the ex-ante assessment of financial instruments. Section 4 illustrates the lessons learned on the use of qualitative and quantitative methods in particular for the ex-post assessment of impact,

which is one of the main foci of ex-post evaluations.

Figure 2 Key evaluation steps and challenges



2. Evaluation in the policy design phase

This section first describes what S3 and programme ex-ante evaluation stand for in the ESIF framework, then highlights the main challenges and lessons learned from author's experiences.

2.1 SMART SPECIALISATION STRATEGY AND PROGRAMME EX-ANTE EVALUATION IN THE ESIF FRAMEWORK

S3 represents an ex-ante conditionality to financing R&I interventions under TO 1 according to Annex XI of the CPR. Annex IV of the proposed post-2020 Common Provision Regulation confirms the requirement of S3 as the enabling condition 'Good governance of national or regional smart specialisation strategy'[3]. S3 sets priorities in order to build competitive advantage by developing and matching research and innovation regional / national strengths to address emerging opportunities and market developments in a coherent manner, while avoiding duplication and fragmentation of efforts. S3 defines R&I policy framework and is expected to promote some of the following structural changes: transition from a sector to a new one, modernisation of the existing specialisation with technological upgrades, diversification, radical foundation of a new domain[4].

S3 are new types of industrial policy. First, they build on an interactive process of 'entrepreneurial discovery' where market forces (e.g. local stakeholders) discover and produce information and contribute to identifying domains of specialisation and future investments. Secondly, S3 should prioritise choices ensuring critical mass, combining place-based strengths and capabilities and diversifying within a specialisation (relatedness and embeddedness[5]). Thirdly, smart specialisation should reinforce internal connectivity (in particular between business actors and with the academia) and external connectivity in order to ensure a real capacity to benefit from external knowledge and technology flows. Finally,

[3] COM(2018) 375 final 'Annexes to the Proposal for a regulation of the European Parliament and of the Council laying down common provisions on the European Regional Development Fund, the European Social Fund Plus, the Cohesion Fund, and the European Maritime and Fisheries Fund and financial rules for those and for the Asylum and Migration Fund, the Internal Security Fund and the Border Management and Visa Instrument'.
[4] European Commission (2012), 'Guide to Research and Innovation Strategies for Smart Specialisations (RIS 3)' http://s3platform.jrc.ec.europa.eu/s3-guide .
[5] See D'Adda et alii (2018).

smart specialisation is more than a sectoral policy and promotes integration among existing sectors and programmes, using different funds.

S3 document is defined and organised in six steps. The first is the analysis of context and potential for innovation, showing what are the development needs and emerging technology, export and production trends, entrepreneurial and industrial dynamics summarised in a SWOT. The second is the definition of a sound governance structure, which should be based on participation, inclusion and ownership of the quadruple helix stakeholders. The traditional triple helix promoting the interaction of academia, public authorities and business community should include innovation users to make the strategy aligned with consumer needs. The third step is the elaboration of a long-term vision of the territorial development, while the fourth is the identification of priorities, with clear, concrete and achievable objectives. The fifth step defines the policy mix and action plan, the sixth the monitoring and evaluation mechanisms.

According to art. 55 of the CPR, evaluators have to conduct *ex-ante evaluation* of the programme prior to its approval. The ex-ante evaluation has the following foci. First, it examines programme relevance, ie the programme capacity to address territorial development needs. Second, it focuses on programme coherence, through the examination of the coherence between inputs and outputs (internal coherence) and complementarity with other policy tools (external coherence). Third, the ex-ante evaluation assesses the adequacy of human resources and administrative capacity for management of the programme; simplification initiatives, and the measures for sustainable development, equal opportunities and accessibility for persons with disabilities. Moreover, the ex-ante evaluation provides technical support to the set-up of monitoring and evaluation systems, assess their relevance, clarity and policy-responsiveness and verify whether the quantified target values for indicators are realistic. Finally, where appropriate, the ex-ante evaluation refers to the findings of the strategic environmental assessment (SEA) as defined in Directive 2001/42/EC of the European Parliament and of the Council.

Although programme ex-ante evaluations are not formally foreseen in the post-2020 EC regulation proposal, programme authorities will be required to identify development challenges based on evidences, prioritise effective interventions and set-up functioning monitoring and evaluation systems with their own resources and skills and /or with dedicated support from the programme technical assistance budget.

2.2 EVALUATION CHALLENGES IN THE POLICY DESIGN PHASE

Overall, evaluation activities encounter the following challenges regarding the steps of observation and judgement.

a) *Observation*. One of the key challenges is ensuring an effective consultation of stakeholders, respecting the partnership principle and the market rules[6]. This challenge regards information and data collection. In the specific case of S3, the relevance of the challenge is due to the risk that entrepreneurial discovery process promotes 'induced' specialisation rather than a bottom-up choice of priorities and interventions. This can be due to the presence of specific privileged positions and to the capacity of some stakeholders to influence the decision process, bringing hyper specialisation and diminishing returns (OECD, 2013).

b) *Judgement*. Two main challenges regard in particular the programme ex-ante evaluation.

- b.1) *Strategic setting is usually based on weak identification of needs*. Identifying the relevant needs might be due to the fact that it is not always easy to know how to measure the needs and future potentials. This is usually the case in cross-border regions, where similar needs can be conflicting, overlapping or coherent across the border and where statistics are not always available on cross-border flows, infrastructure and endowments. Moreover, needs identification should bring to a prioritisation, hence to the definition of priorities and actions to be implemented. Therefore, a sound methodology for needs identification is crucial to ensure an effective policy mix.
- b.2) *Setting up an effective monitoring and evaluation system*. The definition of the indicators' set requires technical skills, which are not always available in public administrations and evaluation is usually conducted by external experts. Therefore, monitoring and evaluation procedures should be carefully defined because they represent useful tools to steer the S3 and programme strategy during its implementation towards the desired direction and to inform stakeholders about the actual implementation.

[6] European Commission (2014), The European code of conduct on partnership in the framework of the ESIF. The Code clarifies the type of partners and the approach for involving them in policy design, implementation and evaluation and details the concept of partnership principle stated in art. 5 of the CPR. Art. 16 of the Code regards the involvement of partners in the evaluation.

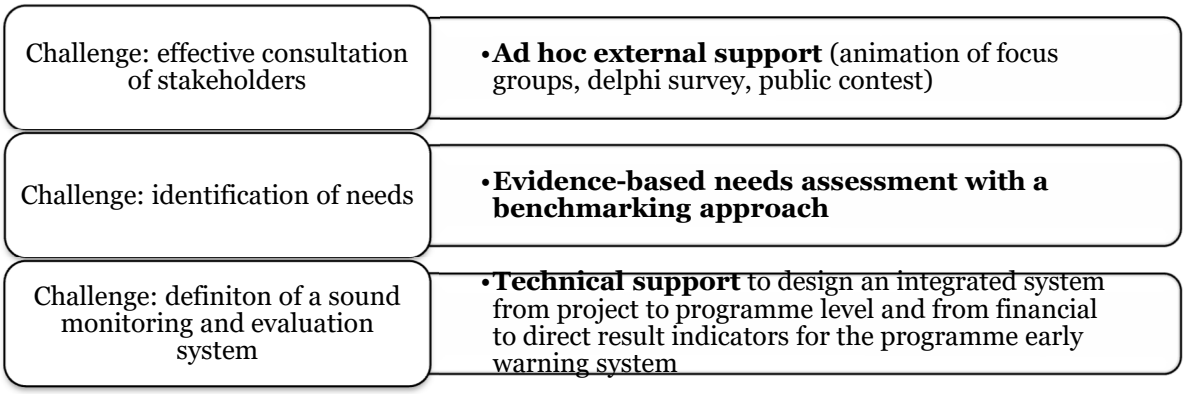
2.3 LESSONS LEARNED ON THE ROLE OF EXTERNAL EXPERTS / EVALUATORS

The aforementioned challenges are not always taken into account in the policy design phase because the identification of needs is sometimes considered as a formal activity. The set-up of monitoring and evaluation is usually considered appropriate for experts with a limited usefulness for the programme. On the contrary, the authors' experiences show that these challenges are very relevant for the management and success of public interventions. A sound methodological approach for the identification of the needs identification, priority setting and the definition of monitoring and evaluation procedures contribute to making policy more impactful and effective. In this respect, evaluators can contribute by:

- *Ensuring an external support to the process of stakeholders' consultation* . As a matter of fact, evaluators, without being part of the core set of the future beneficiaries' representatives, fund-managers and decision-makers, can provide an independent external view. Concretely, evaluators can support the programme authorities to structure the discussion in order to find out the most promising priorities for the objectives set by decision-makers within the framework required by the regulatory framework in force. Moreover, evaluators can facilitate the discussion by moderating debates and focus groups, setting-up ad hoc tools for consultation (e.g. delphi survey) and launching public contests to collect the citizens' view on policy interventions.
- *Providing evidence-based analysis to underpin the strategic setting*. The market assessment and situation analysis conducted by skilled external expert can ensure an evidence-based view to identify development potentials against benchmarks. This can make the S3 and programmes a unique (not standardised) document, reflecting specific needs of the context and underpinning appropriate interventions to develop the specific regional potentials.
- *Assessing the quality and the integration of monitoring and evaluation tools and procedures*. Evaluators can support programme authorities in the design and implementation of monitoring and evaluation. For the design, the evaluators verify to what extent the system is able to meet the monitoring and evaluation challenges in terms of data availability, data quality assessment procedures, attribution of responsibilities, quality of information collected through indicators. The most relevant added value of the support to the design of an effective monitoring and evaluation system is the integration from project to programme level and vice versa. Notably, in the 2014-2020, ERDF programmes include financial, output and result indicators. While financial and output indicators at programme level represent the

sum of the project values, result indicators measure the change in the programme area, rather than the contribution of programme operations[7]. Therefore, the programme monitoring system does not allow a clear understanding of programme contribution to the change and any information about programme impact. It is up to the programme evaluation to disentangle programme contribution to the change with ad hoc procedures and tools even beyond the programme monitoring system. In this regard, the evaluators have to show the appropriate capacity to extract useful information from the monitoring system and integrate with additional data collection activities in order to support the impact evaluation. An appropriate design of an integrated programme monitoring and evaluation system builds on the structured data collection on qualitative and quantitative effects (project results). Clarifying the types of qualitative and quantitative effects of operations is not only useful to support evaluation activities but it also helps define more effective and impactful theory of changes of programme interventions and make the paradigm of result orientation 'operational'. Moreover, considering the current proposal of post-2020 regulatory framework, this approach will be very useful in the design of future programmes, because of the introduction of programme direct result indicators (instead of programme result indicators), measuring the direct effects rather than the overall change in the programme area.

Figure 3 Challenges in the policy design phase and the contribution of the external evaluator



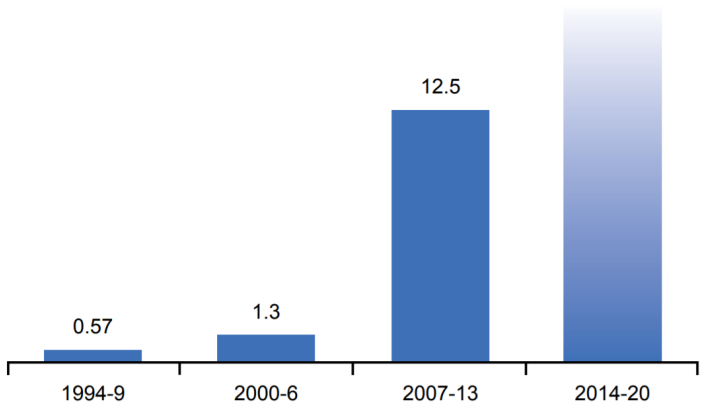
[7] Programme indicators encompass financial indicators measuring programme resources invested, output indicators measuring the direct products of programme intervention, result indicators measuring the change in the programme context including both programme and external factors' contribution to the change. Programme monitoring system does not foresee any impact indicators because impact (which is defined as the programme contribution to the result/change) is estimated by the impact evaluation. The following graph illustrate the standard logical framework.

3. Lessons learned from the ex-ante assessment of financial instruments

3.1 FINANCIAL INSTRUMENTS IN THE ESIF FRAMEWORK

ESIF can take the form of grants, repayable assistance and financial instruments. Financial instruments can be equity or quasi-equity investments, loans or guarantees, or other risk-sharing instruments, and may, where appropriate, be combined with grants [8]. The use of financial instruments has registered a continuous growth over the last 3 decades. After being introduced in the 1994-2000 programming period, financial instruments have increased in popularity and importance in the financial landscape of the European Union, with the most substantial increase being reached in the 2007-2013 programming period, as shown in Figure 4.

Figure 4 Programme contributions to financial instruments (EUR billion)



Source: fi-compass, 'A sustainable way of achieving EU economic and social objectives', 2015.

The current legal framework foresees a compulsory ex-ante assessment that precedes the implementation of the financial instrument. In addition to the ex-ante assessment, financial instruments have to be evaluated during their implementation and at the end to show impact, added value to grants, effectiveness and efficiency.

[8] See Title IV of the CPR.

Financial instruments funded by the ESIF should be deployed to address specific market needs in a cost-effective manner, in complete accordance with the objectives of the operational programmes (OP)[9], and without crowding out private finance in that respective market.

According to the CPR, the ex-ante assessment is a separate analysis from the ex-ante evaluation of the OP, and according to art. 37 of the CPR, ESI Funds can be used to support financial instruments under one or more programmes and to contribute to different specific objectives under a priority. Even if it may be performed in stages, the ex-ante assessment must be completed prior to the managing authority making any programme contributions to a financial instrument.

The ex-ante assessment examines the existence and scale of market failures in the access to finance and recommend if and to what extent a financial instrument is suitable. In addition to the market failures, it must also identify the type of financial instruments to be implemented, the most suitable governance model, the optimal duration of the financial instrument and the monitoring system to ensure that the objectives are achieved. According to art. 37 of the CPR, the ex-ante assessment should also cover other institutional and financial features of financial instruments regarding the added value of the intervention, State aid implications, measures to minimise market distortions, lessons learned from previous experiences, expected public and private resources to be raised, the need for preferential remuneration to private investors. In certain instances, the analysis could lead to the conclusion that a financial instrument is not a suitable solution and that the market failure would be better addressed through other forms of support, such as grants.

3.2 CHALLENGES TO FINANCIAL INSTRUMENTS

The main challenges of the ex-ante assessment of financial instruments regard the steps of observation and judgement of the evaluation.

a) *Observation*. For the market assessment, a variety of data sources should be taken into account to quantify the existing financial gaps. From existing studies on supporting research and innovation to strategic documents and programmes, as well as thematic and sector-specific analyses can provide information on the supply and demand for finance and possible suboptimal investment situations. Through the desk

[9] Operational programmes (OP) are policy tools financed by ESIF funds. CPR refers to OP in Part Three or Part Four. In the EAFRD Regulation OP is called rural development programme.

analysis it is possible to map the macroeconomic environment, the legal framework relevant for R&I and financial instruments, existing indicators and further information on best practices. Interactions with both the demand side, and the supply side representatives is needed to quantify the financing gaps. For the demand side, surveys can be used to identify the potential final recipients, their sources of funding, the type of financial product required, and success rate in covering their financing needs. Alternatively, for the supply side, bilateral interviews with the main providers of specialised financing can be conducted, to approximate the existing amount of finance available on the market and future projections. Also, the assessment should discern among the potential market gap and the viable market gap for repayable instruments, in addition to short-term and long-term financing needs, in order to design a targeted intervention logic. One of the key challenges is to conduct market analyses at regional or sectoral level, since data is usually available at national level only (as in the case of the European Central Bank SAFE survey). When data is available at lower than national level, it has rarely been collected over time and elaborated. This complicates the analysis underpinning the ex-ante assessment. Observation: lack of data few analyses on the impact and also how to analyse the funding gap is not standardised.

b) *Judgement*. The main challenges regard

- b.1) *Definition of the investment strategy*. The investment strategy examines options for implementation arrangements, financial products, final recipients (e.g. enterprises) targeted and envisaged combination with grant support as appropriate. Therefore, the definition of the investment strategy is a not a mere exercise of estimating potential effects, benefits and disbenefits[10]. The investment strategy should be designed to address the specific market failures of R&I interventions, which regard, *inter alia*, asymmetric information, risk aversion, lack of specific competences and skills, externalities, transaction costs. R&I projects can support risky investments as the development of start-ups, experimental proof of concepts, validation and testing of technologies[11]. The asymmetric information between the credit and banking sector and businesses can reduce R&I investments. Enterprises can be reluctant to reveal

[10] In this regard, the OP Managing Authority signs the Funding Agreement with the body implementing the FI based on Annex IV of the CPR based on ex-ante assessment.

[11] Horizon 2020 categorises the technological readiness levels (TRL) as follows: TRL 1 concerns basic principles observed, TRL 2 technology concept formulated, TRL 3 experimental proof of concept, TRL 4 indicates a technology validated in a laboratory, TRL 5 technology validated in relevant environment, TRL 6 technology demonstrated in the relevant environment, TRL 7 a system prototype demonstration, TRL 8 a system complete and qualified and TRL 9 an actual system proven in an operational environment.

their project ideas because of the risks of low appropriability of the knowledge and the need of development early stage ideas with external financial partners. Specific technical assistance or grant can be combined with ESIF financial instruments to support project elaboration, reduce transaction costs and increase the propensity to invest in R&I. The lack of specific operators of ad hoc financial products (e.g. venture capitalists) can hinder the development of innovative projects because of the lack of appropriate financial support. The involvement of regional and national public financial intermediaries as well as appropriate consultation phase with private stakeholders can facilitate and stimulate the financial eco-system for R&I. The strategy should also build on other previous experiences and therefore on the success and failures of other measures supported by grants and financial instruments with grants to highlight the added value of the proposed options. However, at the same time, the strategy should be rather flexible in order to be applicable over the full period of the financial instrument implementation unless market conditions change and then it is updated according to art. 37 of the CPR.

- b.2) *Setting up an effective monitoring, reporting and evaluation system*. The ex-ante assessment has to provide a thorough accountability system supporting the Managing Authorities of the OP during FI implementation with appropriate monitoring tools (e.g. indicators and procedures), reporting standards for the FI implementation based on art. 46 of the CPR, definition of evaluation foci / topics. Monitoring, reporting and evaluation procedures should be carefully defined because they represent useful tools to steer the S3 and programme strategy implemented through FI during its implementation towards the desired direction, to inform stakeholders about the actual implementation and to increase accountability. In spite of regulatory requirements, monitoring, reporting and evaluation are usually considered less important, because of the time pressure and the need to define an appropriate investment strategy and select the appropriate financial products.

3.3 LESSONS LEARNED FROM EX-ANTE ASSESSMENTS

The main challenges regard data availability to quantify the financial gap, the definition of the investment strategy and of the monitoring, reporting and evaluation system.

For the estimate of the financial gap, various approaches can be adopted to adapt the EIF and EC methods to the lack of regional data for SAFE survey[12]. However, beyond the technical and statistical adjustments, the experience of the ex-ante assessment highlights the relevance of *the consultation of the private sector*. Close contact with the private sector provides access to expertise and links with key stakeholders, prior to the start of the instrument, and useful information to make the financial instrument more attractive for local financial ecosystem. Where it is not possible to quantify precisely the gap, the case for a suboptimal investment situation can be pursued through proof of the financial market's unwillingness to finance projects that are already under development, by showing that significant financial support is required in a certain investment area, and that by deploying financial instruments, a sizable part of the existing gap could be bridged.

For the definition of the investment strategy, the review of previous experiences as well as of off-the-shelf instruments is crucial to show the real added value of financial instruments and clarify potential benefits and streamline its implementation.

Despite a clear market failure being identified, the suitability of financial instruments can be limited due to a lack of private investments in the sector and a clear preference for grants. However, it is worth noting that *grants are not the best response to development needs of enterprises* and to promote innovative behaviours and investments. For instance, the description of limitations of grants can show the opportunities from the introduction of financial instruments. This description could be based on the literature review and on other previous studies.

Grant schemes can fail (or be less effective and impactful) due to credit crunch and credit market failures as in the case of the support given to micro enterprises by the intervention

[12] See Guidelines for SME Access to Finance Market Assessments (EIF, 2014) and 'Ex-ante assessment of the EU SME Initiative' (European Commission, 2013). Further details on the approach used by the authors to adapt the previous methods are provided in Annex IV of the Update of the ex-ante assessment of the ERDF Programme of Marche Region for Priority Axis 3. See http://www.regione.marche.it/Entra-in-Regione/Fondi-Europei/FESR/Programma-Operativo-Por-FESR#Relazioni-di-Attuazione-e-Valutazioni

4.3 'Support for the Development of Micro enterprises' of the ERDF Romanian Programme[13]. In the case of this intervention, for the first call (about EUR 20 million), around one third of the beneficiaries of selected projects decided to give up the contribution because, inter alia, it was difficult to get a loan to anticipate part of the investments. Therefore, credit market conditions, the ongoing financial crisis and the poor financial situation of beneficiaries worked as additional 'selection criteria', making it difficult for micro enterprises to use public resources and to finalise their projects, even after being awarded of the grant. In the following (the second) call of the intervention 4.3 (amounting to about EUR 190 million), it was decided to increase the grant coverage of eligible costs up to 100% instead of the 30% from the first call, in an attempt to make the measure more attractive. However, the adoption of financial instruments in combination with grants could have been useful to increase the number of micro enterprises supported, to address the specific market failure, to launch a countercyclical intervention and to ensure a stronger sustainability of the investments and micro enterprise activities[14].

The qualitative value added of financial instruments for R&I has led to the introduction of new instruments (accelerators, seed funds, technology transfers), and stimulated entrepreneurship and the innovative sectors following the expansion of the range of financial products and schemes. The definition of the investment strategy should be on the thorough review of off-the shelf instruments, as described in EU Reg. 964/2014. These are State-aid compliant, can be flexibly adopted and already have a harmonised funding agreement. However, they can be inappropriate to the context market failure and investment needs. The review of the off-the-shelf instruments can help: verify the existence of a suitable instrument at EU level that could be replicated for the OP, find inspiration to tailor ad hoc financial instruments, with regards to type of investments, duration of the support, combination with grants, State aid rules, advantages for SMEs, administrative procedures regarding the selection of financial intermediaries.

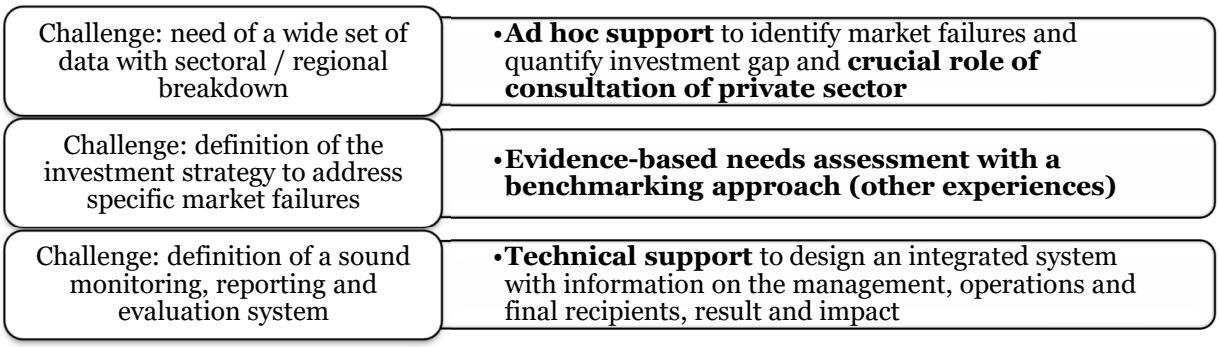
Lastly, the evaluation of the results and performance is reliant on a comprehensive reporting system that delivers exact and reliable data, which goes beyond the reporting requirements foreseen by the legal framework. Therefore, the ex-ante assessment should clarify the informational needs in order to meet regulatory and accountability requirements. Regulatory requirements refer to art.46 of the CPR 'Report on implementation of financial instruments'

[13] SC ACZ Consulting SRL/ t33 SRL/IRIS SRL, The impact evaluation of the KAI 4.3. Support for the development of microenterprises, 2014. See also https://www.ewaluacja.gov.pl/media/48826/V4plus4_strona.pdf

[14] Microenterprises represented in 2011-2012 more than 85% of the Romanian enterprises, 21% of the employment and were severely hit by the economic crisis with a decrease by 16% in the number from 2008 to 2012.

while accountability needs are specific to each situation. In particular, the financial instrument should foresee a system to collect detailed information about disbursed programme contribution, final recipients, type of final recipients, performance of the management, territorial and micro effects (results and impacts), combination with other forms of support and added value to grants. These information needs should be clarified and defined as soon as possible in order to provide enough information through the definition of the funding agreement between the managing authority and the fund manager and of the programme monitoring system.

Figure 5 Challenges in the implementation phase and the contribution of the external evaluator



4. Lessons learned from impact evaluation of ERDF programmes

4.1 CHALLENGES OF IMPACT EVALUATION

EC Guidance on monitoring and evaluation activities illustrates the set of programme indicators, the standard programme logical framework and explains the two approaches to impact evaluations. The two general approaches to impact evaluation are: theory-based impact evaluation and counterfactual impact evaluation. The first aims at verifying the assumptions of the programme's logical framework and 'how' and 'why' the intervention works. The second measures the net effect, estimating 'how much' the programme has contributed to changing the context. The first approach usually builds on qualitative techniques for the observation and requires context-specific and programme-specific knowledge. The second requires the ad hoc construction of a database and the application of statistical and econometric models. The two approaches provide different types of judgement. The theory-based approach shows to which extent the assumptions of the logic chain behind programme interventions work and explains the actual emerging theory of change. The counterfactual approach measures the net effects of the programme. It is the contribution of the programme interventions to the change in the context once the contribution of external factors has been removed.

Figure 6 Comparison between TBIE and CIE approaches

	Theory-based approach	Counterfactual approach
Structuring	Why and how the intervention works	How much (to what extent) does the intervention work
Observation	On-field analysis and case study approach	Database construction
Analysis	Specific skills for context-specific and programme-specific knowledge, usually based on qualitative techniques	Statistical and counterfactual analysis
Judgement	Showing to what extent the assumptions of the logic chain behind programme interventions work	Measuring net effects; Explaining the difference between net and gross effects

4.2 LESSONS LEARNED FROM THE APPLICATION OF A THEORY-BASED IMPACT EVALUATION APPROACH

The authors' experiences regard the use of theory-based approach and combination of counterfactual impact with theory-based approach. A theory-based approach is preferred in a complex programming context, when experimental (or quasi-experimental) analysis (counterfactual) is not possible and factors and stakeholders which determine the results from the intervention are numerous. A basic assumption is that public policy follows a logical path to achieve long-term objectives. Each step can be reconstructed with its related inputs, outputs and results. It is possible to analyse the underlying assumptions of the policy instrument contributing to the observed policy outcomes and, at the same time, to assess the role of external factors[15].

In the Evalsed guidance on evaluation, the EC defines theory of change (ToC) 'as a way to describe the set of assumptions that explain both the mini-steps that lead to a desired long-term goal and the connections between policy or programme activities and results that occur at each step of the way[16]'. The ToC approach is very useful in the impact evaluation of financial instruments, which are complex policy tools, with numerous implementations steps, and which intervene in a multi-dimensional economic, financial and policy contexts, with a lot of intermediates and actors involved in determining the policy achievements.

In the ex-post evaluation of 2007-2013 programmes on the use of financial instruments carried out by the EC in 2016, 9 cases studies were carried out[17]. Theories of change (ToCs) were developed for different types of firms (start-ups, mainstream SMEs, social enterprises, high-growth firms) and types of financial instruments (loans, guarantees, equity). The case studies followed the methodological steps of a theory-based evaluation design, first mapping out the conceptual model of intervention that underpinned the OP logic of intervention as expressed at the outset of the 2007-2013 programming period. The ToC at the level is analysed through the following basic evaluation criteria of:

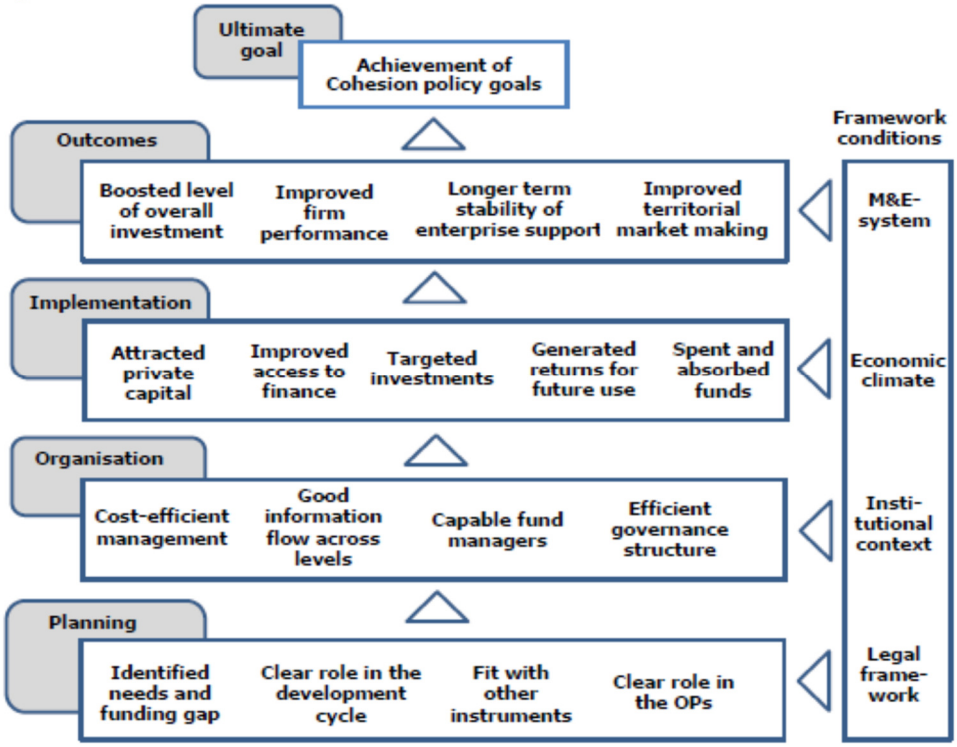
- 'plausibility', i.e. *'Does the logic of the outcomes pathway make sense*?';
- 'feasibility', i.e. '*Can the initiative realistically achieve the long-term outcomes and impact?*'; and

[15] See Mayne J. (2015), https://www.researchgate.net/publication/279533296_Useful_Theory_of_Change_Models.
[16] European Commission (2013).
[17] T33 experts were leading the EC ex-post evaluation.

- 'testability', i.e. '*Are indicators solid and measurable and will they yield sufficient information to evaluate the success of the initiative*?'.

In a second step, the case studies illustrated the implementation of the instruments over the period providing a narrative of the 'performance story', giving concrete information on how the theory worked out in reality and what the main outcomes are. Conclusions were provided in terms of effectiveness, efficiency and utility of the financial instruments with a discussion on the impacts observed in terms of contribution of the instrument in the changes observed in the specific economic and regional industrial context. The workflow of the evaluation design is shown in the following figure.

Figure 7 Overall ToC model of financial instruments



Source: EC Ex-post evaluation report[18]

The following results arose from the ex-post evaluation of financial instruments in ERDF programmes.

- The use of financial instruments reflects the need to address the limited access to finance for SMEs.
- In some regional contexts, financial instruments can be more sustainable over time (with refunding mechanism) than grants (as 'one shot solution'), generate better quality projects (based on business plan evaluation), and be more cost-effective

[18] See the Wishlade et alii (2017), EC Ex-post evaluation report 'Financial Instruments for enterprise support' https://ec.europa.eu/regional_policy/sources/docgener/evaluation/pdf/expost2013/wp3_final_en.pdf

(avoiding overfinancing and calibrating the support to individual reimbursement capacity).

- In the 2007-13 programming period, the rationale for financial instruments was often based on pragmatic considerations, not referring to a 'theory' in general, i.e.: to prevent decommitment[19], taking opportunity of the availability of EU funding, related to the development of local financial markets or in response to the financial crisis.
- Fund size is very diverse and depends on the geographical scope, financial products and objectives pursued. Loans are the most used form of financial instruments (50% of all funds in the countries reviewed) before guarantees; while equity funds target more innovative firms.
- The implementation of financial instruments is characterized by a high diversity in governance and funding agreements (involving holdings funds or varied types of financial intermediaries).
- The quality of monitoring and evaluation systems was poor in general; with no real quality control of data monitoring by managing authorities. Evaluation provided very limited evidence on the effectiveness of the support for enterprises, in terms of jobs created or increase in turnover.
- Contribution of financial instruments to local economy was mainly due to the leverage of public money by private funding sources (in some case with a multiplier 20), the support given in terms of working capital rather than fixed investment (which allows for more flexibility in the use of public money) as well as the development of management capacities of local public and private players.

[19] The purpose of decommitment is to encourage financial discipline in the Member States' implementation of their OPs. It was part of the legal framework in the 2007-2013 period and is still present in the 2014-2020 period.

4.3 LESSONS LEARNED FROM THE APPLICATION OF A COMBINED APPROACH

From the authors' experience, the evaluation design should, whenever possible, combine both theory-based and counterfactual approaches, which are usually separate in literature and in practice.

The combined approach usually produces more interesting results. It allows:

- describing a complete picture of the innovation policy framework and of the 'theory (-ies) of change(s)' underpinning the OP and the interventions under assessment;
- showing qualitative and behavioural effects;
- estimating net quantitative effects.

The combined approach has been applied in the evaluation of the R&I interventions of 2007-2013 ERDF OP of Marche Region[20]. The evaluation identifies four theories of change: *(T.1) Strengthening technological transfer; (T.2) Increasing capitalisation in traditional sectors as a tool to support innovation; (T.3) Investing in the innovation and research system; (T.4) Supporting the transition towards a 'collaborative/open innovation' industrial organisation in the Marche Region*. All the theories have been matched with the needs of enterprises in the Marche region and with the specific types of interventions under assessment. The analysis allows prioritizing theories of change. T.1 is the most important theory for all the interventions and to address the main needs, for at least the following reasons. The industrial model of Marche region is specialised in traditional sectors, with low technological and capital intensity, composed of micro and small firms, mainly organised in districts and productive networks. Technological transfer represents the best way to sustain R&D-driven innovation in the existing regional context. Furthermore, technological transfer is also an opportunity to establish new networks for innovation at the regional level both in traditional and high-tech sectors[21].

[20] The evaluation was about the following interventions: 1.1.1.4.1 – Research financed in the framework of the law 598/94 art.11 'Ricerca'; 1.1.1.4.2 - Technological networks supporting networks for high tech productions; 1.1.1.4.3 - Technological transfer promoting technological transfer through high tech investments, training and recruitment of high skilled young workers; 1.2.1.5.1 - Business Innovation financed in the framework of the Law 598/94, the part related to business innovation; 1.2.1.5.2 - Fashion sector supporting innovation in the fashion sector; 1.2.1.7.1 - Technological investments financing the acquisition of new machinery; 1.3.1.7.1 - Spinoff: financing the transformation of a spinoff into a firm and the creation of start-ups.

[21] Gramillano A. (2012), 'A Combined Approach of Evaluation Tools for Regional Policy Innovation. – The Case of Marche Region', t33 papers and presented in Delft (Regional Studies Association Conference).

In terms of behavioural additionality, the evaluation shows that the active participation of universities increases the effectiveness of financed projects[22]. Universities play various roles in the innovation process such as: centres of technological transfer, suppliers of highly specialised workers, stable partners in innovative processes and start-up firms, in the case of spinoffs, a partner in research, where the enterprise became the research lab of the University.

Interventions with a more technologically oriented perspective perform better in promoting an upgrade of human capital and in building new networks for innovation. These networks are horizontal and innovate the vertical model of districts, underpinning the industrial organisation of the region, mainly based on productive complementarity. Horizontal networks are based on: knowledge and high-tech transfer, recruitment and training of young graduates and researchers, the presence of the University. Horizontal networks, being cross-sectoral, ensure the cooperation of businesses from different sectors and technological domains and usually promote the cross-fertilisation of traditional manufacturing sectors (e.g. shoe production, textile, mechanics) with new ICT and other key enabling technologies. These networks represent a preliminary step to the 2014-2020 smart specialisation strategy technological domains regarding: mechatronics, sustainable manufacturing, health and well-being, home automation (domotics)[23].

The same methodological approach of combination has been followed for other evaluations of specific interventions for SME development and innovation. Overall, the combined approach ensures the estimate of quantitative effects (e.g. net jobs creation, investments and turnover increase) and the illustration of behavioural changes (acceleration of existing ideas, creation of new ideas, increased quality of products, importance of financial conditions of beneficiaries).

The crucial pillars for making this approach successful are:

- The process of construction of the database. This should be based on evaluator's data collection, data from registry and information from the monitoring system. VAT code (or similar fiscal variable) should be used as a key variable to organise all the dataset in order to ensure appropriate merging of data from different sources. However, monitoring system are not always organised with VAT code, registers do not always provide information with this level of detail, making the distinction between

[22] See the evaluation of priority axis 1 interventions of ERDF Programme of Marche Region https://ec.europa.eu/regional_policy/en/policy/evaluations/member-states-2000/22.
[23] See for further details on the smart specialisation strategy of the Marche Region http://www.marcheinnovazione.it/sites/marcheinnovazione.it/files/strategia_per_la_ricerca_e_linnovazione_per_la_smart_specialisation_0.pdf.

beneficiaries and non-beneficiaries impossible and data aggregation very challenging. Moreover, the construction of the dataset should not be only under the evaluator's responsibility, rather it should be also designed in collaboration with programme authorities in order to include all the relevant variables and to build administrative capacity. In this regard, the database should be considered as a public good or at least as a training tool and be updated over time at the end of the evaluation activities.

- Quantitative analysis through counterfactual approach should be repeated over time to check the validity of the results and should be also focused on the sustainability assessment, verifying to what extent the quantitative effects (e.g. new jobs) are still kept a few years after the finalisation of the projects.
- Moreover, benchmarking and the extent possible counterfactual analysis should be carried out not only with a control group of non-beneficiaries but also with a comparison group of beneficiaries of other interventions. This comparison could be conducted with the following benchmarking criteria. First the analysis should compare the effects of the grant (or financial instrument) provided with different types of intervention to see which of them has performed better. Moreover, a benchmarking approach would be useful to analyse the specific features of the administrative and selection procedure of the interventions and verify whether a different scheme with different rules and criteria is likely to be more successful.

5. Conclusive remarks

The review of the direct experiences shows that evaluation can be a supporting tool to public administrations to make research and innovation interventions successful. However, some conditions are necessary as to make evaluation activities support the quality of the programme design, implementation and assess the effects of the interventions as required by art. 54 of the CPR.

First of all, evaluation should neither be seen as a formal and theoretical exercise nor as a technical assistance service replacing public administration activities. Rather, evaluation activities should provide an external view, build on both technical skills and context-specific knowledge, promote capacity building and develops throughout the whole policy cycle.

Secondly, the *timing of evaluation activities* is decisive to make evaluation useful for the public administrations to make informed decisions. Therefore, timing should be aligned with the policy cycle. If the ex-post evaluation takes place too late, its findings will not be considered to adjust the strategic and operational framework of the interventions. On the other hand, the ex-post evaluation is necessary to give a final estimate of the impact of the intervention as well as to examine the sustainability (durability of the effects).

Thirdly, the evaluator's support is going to be different overtime. In the policy-design phase, the evaluation provides an external support for the consultation of stakeholders, identification of needs and the definition of a sound monitoring and evaluation system. After policy design and programme approval, the evaluators' support is useful for the ex-ante assessment of financial instruments, notably for the consultation of the private sector, review of previous experiences with a benchmarking perspective, technical support to the design of an integrated monitoring, reporting and evaluation system. In the ex-post phase, in particular for the impact evaluation, the integration of both theory-based and counterfactual approaches should be the starting point for the evaluators' support. Furthermore, evaluators contribute to defining the database of the analysis, conducting benchmarking comparisons with other types of similar interventions to elaborate suggestions for the future and to compare different scheme in terms of effects / efficiency, and perform sustainability assessment of the durability of the effects a few years after the finalisation.

Overall, all the evaluation activities represent a strong accountability tool for the administration. They can ensure a more open and transparent discussion on the policy interventions, making them more adaptable to the development needs and closer to the

demands of the local ecosystem. Evaluation is useful to define an appropriate early warning system, which would enable programme authorities to monitor programme implementation, inspire informed decisions, draw lessons for the future and set up appropriate risk management systems.

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