



Executive summary

The third Evaluation Report is the fifth and last deliverable under the contract "**Implementation of the Evaluation Plan of the Competitiveness Operational Programme 2014-2020, Lot 1: Evaluation of the COP interventions in the field of research, development and innovation**" concluded between the Ministry of Investments and European Projects and the association formed by the National Institute for Scientific Research in Labour and Social Protection (Leader) and S.C. ERNST&YOUNG SRL (Associate), contract carried out within the project "**Implementation of the Evaluation Plan of the Competitiveness Operational Programme 2014-2020**". The report presents the findings of the third evaluation exercise carried out between November 2022 and August 2023 on the interventions financed by COP 2014-2020 aimed at research, technological development and innovation (RDI) in support of economic competitiveness and business development.

Interventions dedicated to research, technological development and innovation contribute directly to the implementation of the National Strategy for Research, Development and Innovation 2014-2020 and support the Partnership Agreement 2014-2020, in particular by contributing directly to the achievement of the objective - Development of research, technological development and innovation.

The specific objectives of COP for research, technological development and innovation, which are also the evaluation themes (ET) of this report, are:

- Increasing scientific capacity in the areas of smart specialisation and health (evaluation theme ET1)
- Increasing involvement in EU research (evaluation theme ET2)
- Increasing private investment in RDI (evaluation theme ET3)
- Increasing the transfer of knowledge, technology and personnel with RDI skills between public and private research (evaluation theme ET4)

The evaluation methodology used a broad set of tools and types of analysis. The counterfactual impact evaluation carried out added value to the findings and conclusions drawn, representing an important exercise at national level, in view of the complex methodology applied to highlight the impact of the Operational Programme, but also its sustainability.

The results obtained in the current evaluation report were based on the theory of change reconstructed in the second evaluation report. The reconstructed theory of change was based on an approach that looked more closely at how interventions contribute to direct, immediate, intermediate and long-term outcomes. At the same time, the revised methodology in this third evaluation exercise incorporated the exploration of heterogeneous causal impacts for evaluation theme 3 and empirical testing of the difference-in-differences method at the regional level for all four evaluation themes. In estimating the heterogeneous causal impacts, different characteristics were taken into account such as the sector of activity of the company (Agriculture, Industry, Construction, Services), the size of the company (micro, small and medium enterprises), the type of instrument (C and D project, innovative technology project depending on the year of intervention), as well as the area of smart specialisation (Bioeconomy; Information and Communication Technology, Space and Security; Energy, Environment and Climate Change; Eco-nanotechnology and Advanced Materials; Health).

In order to avoid the presence of spillover effects and treatment contaminations (the treatment effect may also spread to untreated units) which may be important and affect the conclusions of the counterfactual assessment, the regional counterfactual assessment was implemented, where, using geographically aggregated data at the level of outcome indicators and support intensities, it explores what part of the change in the relevant outcome indicator is likely to be caused by the COP interventions under



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investigation and what part is instead caused by spontaneous change. At the same time, the cumulative impact of the intensity of the COP interventions specific to the different objectives on the indicators under analysis was estimated as part of this evaluation exercise.

The horizontal limitations of the evaluation are related to the low number of projects completed by March 2023, the date when the MySMIS database information was submitted. Although the date by which the information was collected is close to the end of the programme implementation period, the number of completed projects is still quite high, i.e. 231 projects completed by the end of March compared to 450 signed contracts. In the case of projects that had problems in implementation, the period was extended by additional acts.

In order to analyse the distribution of project results by region and by smart specialisation area, information extracted from MySMIS for projects contracted before March 2023 was used. This resulted in some **limitations**, due to the fact that the programme indicators declared at project level are validated at the end of the projects, and the MySMIS database provided to the evaluation team did not contain complete information for all ongoing projects. The validation of the data used was done by comparison with the information contained in the 2022 COP Annual Implementation Report and in the programme documents consulted.

Overall, **COP has responded to the needs and challenges related to the low level of economic competitiveness at national level, ensuring the relevance of the programme to the economic and RDI context in the period 2014-2020**, despite negative trends in the relevant indicators on the evolution and performance of the RDI system. The **impact of the interventions has been generally positive**, and the investments made have in some cases contributed to halting the decline in the indicators and in other cases to maintaining or slightly increasing them.

The results of the current evaluation have to a large extent confirmed those obtained in the previous evaluation exercises in 2020 and 2022 respectively, in some cases detailing new aspects. These results underlined that the change envisaged at the time of the programme design has occurred to a good extent, with the interventions being correctly targeted to the identified needs. We believe that the **positive effects obtained would have been more significant if certain contextual factors had been more favourable** (the intensity of funding for the RDI system would have been as planned, the legislative and institutional framework would have been more stable and predictable, economic developments would not have been negatively affected by the COVID-19 crisis and the war crisis in Ukraine).

The evolution of the indicators of the RDI sector, related to the objectives of the interventions in the period 2014-2022, showed general trends of either decrease for most of them or insignificant increase, with some cyclical variations by sub-periods. The period 2014-2021 was mainly characterised by a very small increase (by 0.09 percentage points) in private R&D expenditure, against a background of chronic underfunding of the public RDI sector, negative developments in the number of innovative companies and the number of employees in these companies. In 2021, the share of private RD expenditure in GDP was only 0.24% of Romania's target of 1% of GDP set by the National Strategy for Research, Development and Innovation for 2020, placing us last in the European Union. An important contextual factor that has slowed down the implementation of projects and the achievement of results is the economic and social impact of the COVID-19 pandemic and the chronic underfunding of the sector.

The actual execution of expenditure from the funds in regional profile is unbalanced, with the Bucharest-Ifov region contributing almost two thirds of the total expenditure from the CD activity. On the other hand, the most significant increases compared to 2014 were recorded in the West region and the smallest in the North-East region. The need for continued implementation of the activities foreseen in the Programme was also based on strategic developments at national and European level. The strategic framework at EU level on RDI follows the long-term strategic development vision, mainly related to the consolidation of a European Research Area (ERA). At national level, however, the one-year delay in the adoption of the National Strategy for Research, Development and Innovation for the period 2014-2020, as well as the eight-month delay in the adoption of the National Plan for Research, Development and Innovation for the



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period 2015-2020, also negatively influenced the implementation of the interventions in the COP, delaying their start. Moreover, the existing institutional framework in the field of RDI is moving away from its character of effective governance, with frequent institutional changes generating dissipation of accountability and delays in the adoption of the legislative framework.

Despite changes in tax legislation to increase the attractiveness of RDI activities, the evaluation reveals that the legislative and institutional framework needs to be modernised to be better adapted to the strategic objectives of increasing scientific capacities, better strategic programming and planning, favourable conditions and supporting financial instruments to stimulate the participation of private firms in RDI activity and to increase the attractiveness of RDI careers.

At present, the delay of almost 2 years in adopting a new strategic framework and a new national RDI plan is also creating dysfunctions for the future in accessing funds and implementing the future programme, although the new strategy implies a new governance framework that is much more adapted to the new competitiveness requirements. However, there is no clear timetable for implementation and no mechanisms to ensure compliance. Planning of financial resources and especially compliance with planning is affected by uncertainty and unpredictability.

Overall, **the research infrastructures in our country have shown a development trend** during the period of implementation of the COP 2014-2022 and the **number of public-private co-publications and international scientific co-publications per million inhabitants has increased**, and the Programme has made an important contribution from this perspective. However, **Romania remains well below the European average** in terms of developments during 2014-2021.

Interventions to increase scientific capacity in the areas of smart specialisation and health have proven **successful, supporting the hiring of new researchers and increasing the number of researchers working in improved research infrastructures**. The implementation of the projects has contributed to the increased performance of the beneficiaries in: obtaining new/improved products, processes, technologies, producing publications and articles, improving R&D collaborations. These effects have led to improved transfer of R&D results to the economy/society, as well as knowledge spill-over effects to other R&D companies and organisations. At the level of the relevant/project sectors/markets, the JOP interventions on scientific capacity building in the areas of smart specialisation and health have contributed, along with other equally important factors, to the emergence of additional economic activities and the strengthening of the RDI system. The COP interventions have also had a net positive impact on the competitiveness of the supported research organisations. Thus, at the level of beneficiary companies and research institutes, there has been a net positive effect of COP on turnover, profit and average number of employees. At the regional level, the intensity of the COP interventions on scientific capacity building in the areas of smart specialisation and health had a direct effect on the number of international scientific co-publications, total R&D expenditure and the number of people with higher education employed in science and technology. With regard to the expected overall impact, the support of COP on increasing scientific capacity in the areas of smart specialisation and health has contributed, has made an important contribution to improving internal competitiveness and economic growth in the project areas, i.e. to increasing the levels of public and private RD investment in the project areas.

Taking into account the evolution of Horizon 2020 in terms of the number of participations, i.e. eligible projects, **Romania's participation in European research has increased in the period 2014-2023** compared to 2007-2013. Although **Romania's performance in Horizon 2020 is below the European average** in terms of success rate by about 2 percentage points, the **capacity of Romanian applicants has increased**. While in 2021, only 14% of eligible projects received funding, in 2023 it was found that 33% of eligible projects received funding. There is also an increase in the amount of EU financial contribution compared to the analysis in the last report.

An important factor that has led to the **increase in Romanian participation in the Horizon 2020 Programme** is the interventions funded by COP. This conclusion is also confirmed by the regional profile analysis, according to which, at regional level, the intensity of the interventions of COP on increasing



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Romanian participation in Horizon 2020 had a **direct effect** on the number of participants as well as on the funding received under Horizon 2020.

Examples have been identified which demonstrate that COP has contributed to strengthening the RD capacity of beneficiary organisations. With the aid of COP, support centres have been set up, leading to increased knowledge and participation in European programmes. **With the support of foreign researchers and with the help of the state-of-the-art equipment purchased**, the necessary prerequisites have been created to **strengthen the RD capacity** of beneficiary organisations, to develop or strengthen partnerships at national or international level and to develop centres of excellence. The employment of young researchers and their involvement in new research projects is another net effect of the COP support dedicated to increasing Romanian participation in Horizon 2020.

However, the **contribution of COP on increasing innovation capacity is limited**. The results of the analysis in this report reiterate that public policy priorities are set for the long term, while changes in competitive sectors are frequent and create a high pressure to innovate in the short term, based on technological progress. Thus, there is a risk that investment priorities are not aligned with the changing needs of these sectors.

Interventions to increase private investment in RDI have had **positive effects on RD firms**. The counterfactual analysis indicates a positive impact on the increase of private expenditure on RDI one year after the intervention (in the short term), but in the medium term (two, three and four years after the intervention), the effect of the intervention is negative. The results are also preserved in the heterogeneous causal effect by categories of firms: micro-enterprises, firms in the services sector or in the ICT, space and security smart specialisation area.

As regards the effect of the COP interventions on the profitability of the supported firms, the analysis undertaken showed that the **effect on turnover is positive and sustainable**. The same type of effect was also obtained on different categories of firms, considering 2017 as the pre-intervention year. This shows an increase in turnover two, three and four years after the intervention for micro-enterprises, for firms funded by the Type C Project intervention and for firms in the ICT, space and security smart specialisation area. In the case of firms with pre-intervention in 2019, a positive effect on turnover was found for small firms, as well as for those in the ICT, Space and Security smart specialisation area.

Operating income was influenced in the direction of growth in the first three years of intervention, including some categories of firms. For firms with pre-intervention in 2017, the categories of firms for which operating revenues were higher among funded firms than among non-funded firms are: micro enterprises, firms in Services and Industry, those in Information and Communication Technology, Space and Security and firms funded by the Project Type C intervention. For firms with pre-intervention in 2019, the categories of firms with positive impacts both one and two years after the intervention were: small firms and those in the ICT, space and security smart specialisation area.

Net profit increased in the first two years of intervention, as well as **in the fourth year**. By categories of firms, positive results were obtained for: small and micro firms, firms in Services and Industry, firms in Information and Communication Technology, Space and Security, firms funded by Type C Projects (however, these positive effects were not realised for each post-intervention year for each of these categories). The only category for which the effect on net profit was positive in all post-intervention years was Industry. For the set of firms with pre-intervention in 2019, the categories of firms with positive effects on net profit were: small firms, those in Services as well as those classified under ICT, Space and Security.

The number of employees did not increase significantly as a result of the interventions of COP (Common Operational Programme), and their impact was visible only in the first year immediately after their implementation. For firms that had 2019 as the pre-intervention year, the categories of firms for which there were positive effects on the average number of employees were: firms in Services, firms in ICT, Space and Security, Health, and Eco-Nanotechnology and Advanced Materials.



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The results in regional profile showed that interventions to increase private investment in RDI led to an **increase in demand for trademarks**, a relevant indicator of innovation in the services sector, and in gross domestic expenditure on research and development (GERD), the business enterprise sector.

In fact, **although modest overall, the increases in capital expenditure were almost exclusively due to programme interventions**. Beneficiaries consider that, in the absence of the support provided by the COP for increased private investment in RDI, the implementation of project activities would not have been carried out at all, or would have been carried out partially or late.

An analysis of the programme indicators shows that interventions to increase private investment in RDI have contributed significantly to an increase in the number of new researchers in supported entities, the number of supported start-ups, as well as an increase in private investment combined with public support for innovation or RD projects, indicators for which the 2023 target has been exceeded. Positive effects are also noted on the increase in patent applications resulting from projects and the number of public-private scientific co-publications. In terms of regional profile, the Bucharest-Ilfov region stands out with a significant contribution to the achievement of the indicators, and in terms of sectoral profile, the fields of information and communication technology, space and security stand out with significant weights for most indicators. Although the COP interventions *on increasing private investments in RDI* did not aim to support the evolution of the number of employees among the enterprises that received the interventions, it was observed that the Programme stimulated in the short term the increase of the profitability of enterprises with RDI activity and their chances of survival in the period 2018-2021.

In the case of *the COP interventions dedicated to increasing the transfer of knowledge, technology and personnel with RDI skills between the public research environment and the private sector*, analysing the evolution of the programme indicators, important contributions to the achievement of the targets for 2023 are observed, with **a very high impact being observed on the number of companies cooperating with research institutions**, an indicator for which the target was far exceeded. **COP has also contributed positively to the increase in the number of companies supported or receiving support for bringing new products to market**. Projects have also led to new patent applications and public-private co-publications.

The COP support has been essential in the field of RDI in Romania, the financial allocation for this area from the state budget being very small. This was also the determining cause for the implementation of some successful projects. Without this programme, the activities dedicated to research would have been insignificant compared to the market needs, so that both RD organisations and companies could benefit from successful funding.

Analysing the collaborative networks between participants, it can be seen that **the network of partnerships has expanded** compared to previous evaluations in terms of the number of nodes. However, the number of clusters (related components) has not reduced, generally illustrating a concentration around the same research organisations and the emergence of new firms that do not develop several partnerships simultaneously. Indicators measuring network connectivity do not show significant variations illustrating that the network has not become more efficient in terms of knowledge transfer.

At the level of the relevant sectors/markets/project targets, the COP's support for increasing the *transfer of knowledge, technology and personnel with RDI skills between the public research environment and the private sector* has contributed, along with other equally important factors, to increasing the number of innovative firms and the added value of competitive or growth potential sectors, as well as improving territorial distribution.

At a general level, the COP's support for increasing the *transfer of knowledge, technology and personnel with RDI skills between the public research environment and the private sector* has contributed, along with other equally important factors, to improving internal competitiveness and economic growth in the project areas, i.e. increasing the levels of public and private RD investment in the project areas. In conclusion, the COP support for increasing the *transfer of knowledge, technology and personnel with RDI*



skills between public research and the private sector is a likely cause that has necessarily contributed to the improvements observed.

The results of the gap-in-differences analysis in regional profile revealed direct effects of the COP interventions dedicated to *increasing the transfer of knowledge, technology and personnel with RDI skills between public research and private sector* on the number of public-private co-publications. This indicates a better integration and exchange of knowledge and experience between researchers in the two sectors, which contributes to improving scientific performance and advancing innovation.

Also, the results of the difference-in-difference analysis in regional profile revealed positive effects of the interventions of COP dedicated to several specific objectives on certain outcome indicators. Thus, it was found that **the cumulative intensity of the interventions of COP** on increasing scientific capacity in the fields of smart specialisation and health, on increasing Romanian participation in Horizon 2020, on increasing private investment in RDI or on increasing knowledge transfer, technology and personnel with RDI skills between public and private research had **a direct effect on total RD expenditure**, while the **cumulative intensity of the COP interventions** on increasing private investment in RDI or on increasing the transfer of knowledge, technology and personnel with RDI skills between public and private research had an **impact on increasing the number of patents**.

The effects have the potential to be sustainable, with beneficiary organisations aiming to continue and build new partnerships, develop new RD products and services, maintain the positive effects on the supported firms in terms of turnover, diversify production, increase competitiveness and private investment in RD. The **sustainability of the effects should be supported by future policies and programmes** supporting research-industry partnerships, predictability of funding, stability and predictability of the legal, institutional and fiscal framework, as well as global developments such as the advancement of digitisation and technology.

In terms of mechanisms, the most important specific factors that have supported the manifestation of effects are: the level of funding and the duration of project implementation, as well as the timing of reimbursement of payments, although this has posed difficulties for firms. On the other hand, the mechanisms that affected the effects were: the long time from contracting to actual implementation of projects, reporting and monitoring procedures, the required accompanying documents and indicators expected through projects (inconsistencies in the way of calculation during implementation) and the time and bureaucracy associated with procurement procedures.

The findings of the evaluation led to the formulation of **recommendations addressed in particular to the Managing Authority of the Programme**, as well as to other institutions in the management system of European funds (intermediary bodies, other departments within the Ministry of Integration and European Projects) and to the **Ministry of Research, Innovation and Digitization**.

For the success of future interventions, it is essential to **strengthen the legislative and institutional framework in** order to be better adapted to the strategic objectives of increasing scientific capacities, to ensure **better strategic programming and planning of financial resources**, favourable conditions and supportive financial instruments to stimulate the participation of private firms in RDI activity and to increase the attractiveness of RDI careers.

The success of the Programme and of the funded interventions in the field of RDI is significantly influenced by the legislative and institutional context in which it is implemented. Thus, the evaluations highlighted the need to redesign the legislative framework to better adapt it to the strategic objectives, i.e. to support the implementation of the "Open Science" principles, which is absolutely necessary for Romania's participation in the creation of the European Research Area (ERA). It is also



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necessary to review the institutional framework in order to establish a governance that will ensure the necessary conditions for the development of RDI.

The evaluations have pointed out that it is necessary to **continue to allocate funds** for interventions aimed at **increasing RDI capacities** in order to reach the critical mass required for performance, to support the connection of a larger number of RDI organisations to national and international RDI networks, scientific literature and international databases, to **continue to allocate funds** for interventions aimed at **increasing Romanian participation in the Horizon 2020 Programme**, in order to strengthen research capacity and increase excellence in synergy with the actions of European programmes in the next programming period (i.e. Horizon Europe), continuing the implementation of programmes to stimulate **the increase of private investments in RDI**, with a focus on adapting these interventions to economic developments and avoiding the accentuation of existing inequalities between development regions, as well as continuing the implementation of programmes to stimulate the **establishment and development of collaborative relationships between research organisations and enterprises for knowledge transfer, technology and RDI personnel**, with a focus on adapting these interventions to economic developments, but also on supporting the dissemination of knowledge also in less developed regions and **stimulating the attraction of small firms that are very dynamic** and have the potential to exploit different market niches to **partnerships**.

At the same time, it is recommended to increase the intensity of funding for RDI in order to strengthen and stimulate moderately favourable developments in the private sector and to support the improvement of developments in the public sector, to **ensure the stability of the legislative and institutional framework relevant to** the strategic objectives undertaken, so that the implementation of projects is predictable, and to **ensure the provision of specialised human resources for the areas of smart specialisation**, as well as the **provision of the necessary funding sources for the updating of skills** and advanced specialisation of researchers working with the developed infrastructures.

The recommendations to improve the COP implementation strategy are mainly aimed at reducing the project evaluation and contracting periods so that projects are implemented as close as possible to the time of the funding applications. It is also recommended to ensure the financial and human resources necessary for evaluation and contracting in a continuous and predictable manner, to streamline institutional circuits and provide human resources, including specialised evaluators, to increase the maximum duration of project implementation in order to achieve the proposed objectives, to increase communication between funding bodies and beneficiary organisations, and to intensify information and advice sessions for beneficiaries who carry out public procurement. Another recommendation to improve the implementation strategy is to increase the institutional stability and predictability of the opening of competitions and evaluation - contracting - reimbursement deadlines.

The recommendations for improving monitoring procedures aim at reducing bureaucracy, simplifying the required accompanying documents, improving the MySMIS platform and using it to facilitate communication between programme beneficiaries and those carrying out technical and financial monitoring, improving the functions of the MySMIS platform, the accessibility of information, the mechanisms for validating information and making logical links between them can make the monitoring process more efficient, supplementing the quarterly monitoring reports of the IO Research with aspects related to the duration from the submission of funding applications to the contracting of projects, as well as the extension of project implementation periods, reducing the number of clarifications required for reimbursement requests, avoiding changes in the rules during project implementation or even between project submission and contracting, simplifying the reporting of activities.

Recommendations to improve the financial circuit of projects mainly aim at streamlining the process of reimbursement/disbursement of payments to beneficiaries and communication with beneficiaries on eligibility of expenditure, simplifying the legal procurement framework for SMEs, reducing the number of



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clarifications requested and their processing times. Also from a financial perspective, it is recommended to carry out market analyses with a view to setting up financial instruments or reinforcing existing ones at regional level, in order to facilitate access of beneficiary organisations to European funded projects, in particular SMEs, and to strengthen the capacity of beneficiaries, so as to have as many projects as possible submitted under the Operational Programme. Last but not least, facilitating access to bank loans to support co-financing and granting tax incentives to companies carrying out research and development could contribute to better implementation of such projects.