ROMANIA

Reimbursable Advisory Services Agreement on Evaluation of European Structural and Investment Funds Interventions in Information Technology and Communications (P174331)

Output 3

Interim evaluation report with ongoing assessments of selected ESIF-funded projects approved after June 30, 2020

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Ministerul Investițiilor și Proiectelor Europene

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Executive Summary

This report presents an interim evaluation of Priority Axis 2 of the Competitiveness Operational Programme 2014–2020 (COP) in Romania focused on projects in the Information Technology and Communications (IT&C) sector. Priority Axis 2 aimed to a) increase the deployment of high-speed broadband, including in underserved areas, b) increase the contribution of the IT&C sector to the gross domestic product (GDP), c) increase the use of e-government services, and d) increase internet use by disadvantaged communities. This evaluation report measures the initial progress made against each of these objectives.

The findings of the evaluation primarily update progress made under Priority Axis 2 between March 31, 2021, and December 31, 2021, and spans projects approved throughout the programming period. The evaluation is limited by implementation progress and must be interpreted as representing early results. Due to the stage of implementation during which most projects were studied, the results and conclusions as presented in this interim report must be considered preliminary and subject to changes with implementation progress and passage of time. As of December 31, 2021, 302 of 485 projects were under implementation, amounting to 85.34 percent of total funds committed under Priority Axis 2. Only 110 projects amounting to 11.42 percent of the total funds have been finalized. The remaining projects – amounting to 3.24 percent of the total financing – have been cancelled. Several beneficiaries requested for extensions in 2021, owing to delays caused by restrictions due to the COVID-19 pandemic in Romania, which is one of the reasons for the low proportion of finalized projects (as a share of total number of projects and financing) in 2021.

Progress is being made on all specific objectives but at varying rates. Interventions pertaining to digitalization of small- and medium-sized enterprises (SMEs) showed the most progress in terms of completion, with all projects under the first call for proposals in 2017 having been finalized or cancelled. Relative to the target of 45 total products or services being developed by SMEs, 153 had been developed by December 2021. Similarly, robust progress was observed on the development of big data platforms and e-government services, with projects nearing completion and scheduled to be transferred to the public authorities by the end of 2022. Progress to extend high-speed NGN/NGA networks, however, was relatively slower, due to the length of permitting processes and delays due to COVID-19 restrictions. Expansion of broadband networks in underserved areas had also seen completion of construction works in most localities. Of the seven lots, Lot 1 has been in operation, Lots 2, 3, and 5 were accepted as complete, and Lots 4, 6, and 7 were in various stages of acceptance. New projects were approved under Investment Priority 2.3 on e-education (distribution of tablets) and telemedicine in 2021 but were too early in implementation to register significant progress.

While an assessment of efficiency through a full cost-effectiveness analysis was not feasible in this interim evaluation report due to the partial completion of projects, an assessment of completed projects under Investment Priority 2.2 suggests that the average net present value of

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digitalization support to small and medium sized enterprises is relatively low, at approximately 40,000 RON (EUR 8,000) per product or service developed. Relative to the market price of comparable services, this cost was assessed to be competitive and well within range. However, wide heterogeneity exists in products and services supported under the program, providing flexibility to SMEs' varying needs.

Finally, the evaluation assesses the impact of interventions under Investment Priority 2.2 using difference-in-differences methodology comparing firms awarded grants in the first round in 2017 against firms awarded grants in subsequent rounds, updating the analysis conducted in Output 2. Panel data models accounting for county- and year fixed effects suggest a statistical increase in the number of employees hired by the firm, but not against other outcome variables such as turnover or net profits. Case studies conducted to assess impact under Investment Priority 2.3 (e-government services) suggest that the projects may streamline processes and data critical to the day-to-day business of key public entities such as the Competition Council and the National Trade Registry, but that there exists a risk to sustainability of these data platforms due to limited technical capacity for operational maintenance at this stage. This suggests the need for complementary investments in human resources and financing for operations, maintenance, and technological upgradation in future years.

Overall, the evaluation registers some preliminary progress towards Axis objectives, but implementation remains in early stages to permit a full assessment. To the extent feasible, the long-term impact of these interventions, as well as other funded projects will be considered in Output 4: the Final Evaluation Report.

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Abbreviations

Note: The names of Romanian institutions are given in English translation.

ADR	Authority for the Digitalization of Romania
ANIS	Employers' Association of the Software and Services Industry
ANCOM	National Authority for Management and Regulation of Communications
BI	Business Intelligence
CEA	cost-effectiveness analysis
CIO	Chief Information Officer
COP	Competitiveness Operational Programme
COP-MA	Competitiveness Operational Programme Managing Authority
COVID-19	Coronavirus Disease 2019 caused by the novel coronavirus SARS-CoV-2
DESI	Digital Economy and Society Index
ERDF	European Regional Development Fund
EPAS	Electronic Public Acquisitions System
ESIF	European Structural and Investment Funds
EU	European Union
GDP	gross domestic product
IBRD	International Bank for Reconstruction and Development
ICT	information and communication technologies
ICTD	information and communication technologies for development
IP	investment priority
IPP	Institute for Public Policies
IT	information technology
IT&C	information technology and communications
ITU	International Telecommunications Union
JOUE	Official Journal of the EU

MIEP	Ministry of Investments and European Projects
MySMIS	electronic exchange database for data sharing between beneficiaries and the Managing Authority
NAFA	National Agency for Fiscal Administration
NAPP	National Agency for Public Procurement
NCSC	National Council for Solving Contestations
NGA	next-generation access
NGN	next generation network
NIS	National Institute of Statistics
NTRO	National Trade Registry Office
NUTS	Nomenclature of Territorial Units for Statistics
OIPSI	The Intermediary Body for the Promotion of the Informational Society
PA	Partnership Agreement
RAD	Romanian Authority for Digitalization
RAS	Reimbursable Advisory Services
SME	small and medium-sized enterprise
TI	Transparency International
TVR	Romanian National Television
WB	World Bank

Introduction

This report presents the interim results of an evaluation of Priority Axis 2 of the Competitiveness Operational Programme (COP) in Romania. Priority Axis 2 of the COP comprises projects related to the Information Technology and Communications (IT&C) sector.

The report is the third of four outputs delivered by the World Bank under the Reimbursable Advisory Services (RAS) Agreement on the Evaluation of European Structural and Investment Fund Interventions in Information Technology and Communications signed with the Ministry of European Investments and Projects (formerly the Ministry of European Funds) on June 30, 2020. Under this RAS Agreement, the World Bank is delivering the following outputs:

- Output 1: Inception report, delivered on August 31, 2020. The Inception Report set the framework for subsequent analytical work and outlined the methodology and work plan.
- Output 2: An assessment report summarizing the findings of the initial evaluations, along with lessons learned and key recommendations for the 2021–2027 programming period, delivered in October 2021.
- Output 3: Interim evaluation report with ongoing assessments of selected projects funded by European Structural and Investment Fund (ESIF) approved until December 31, 2021, to be delivered by May 31, 2022.
- Output 4: A final evaluation report of selected completed projects and a consolidation of previous outputs including recommendations for the design and implementation of the Operational program for Smart Growth, Digitalization and Financial Instruments during the 2021–2027 programming period to be delivered by September 30, 2023

This Interim Evaluation Report evaluates projects' progress until December 31, 2021.

The rest of this report is structured as follows:

- Chapter 1 presents the evaluation objectives, scope, structure of Priority Axis 2, the theory of change guiding the evaluation, methodology, as well as a summary of the status of projects under Priority Axis 2
- Chapter 2 presents key sectoral trends and policy developments amid the COVID-19 pandemic.
- Chapters 3, 4, and 5 assess the effectiveness, efficiency, and impact of funded interventions, respectively.
- Chapter 6 concludes the report with key lessons learned and recommendations for the next programming period.

1. Introduction

Evaluation Objectives and Scope

This evaluation aims to support the Ministry of Investments and European Projects in assessing the effectiveness, efficiency, impact, and sustainability of the use of European Structural and Investment Funds (ESIF) in the IT&C sector by identifying factors contributing to the success or failure of the implementation for the period 2014–2020 and drawing key lessons relevant to the 2021–2027 programming period.

The evaluation comprises all Priority Axis 2 projects under the Competitiveness Operational Programme (COP) in the 2014–2020 Programming Period. The scope of the evaluation is defined by ESIF regulations. This evaluation covers effectiveness, efficiency, impact, and sustainability of funded interventions under the programme. The evaluation is conducted at the programme and project levels and does not provide recommendations at the level of the Partnership Agreement.

The overall evaluation addresses the following criteria and questions:

Effectiveness
- To what extent were the interventions carried out according to expectations, produce the desired change (achieve specific objectives) and must be further funded?
- What factors influence the effects of interventions and how?

Efficiency
- How efficient were COP project selection and implementation processes?
- How efficient were COP projects relative to relevant outcomes?

Impact
- What is the observed progress in meeting the stated objectives in targeted sectors, territories, and population groups since the beginning of the interventions (gross effects)?
- To what extent may the observed progress be attributed to the funded interventions (net effects)?
- What are the unintended effects of funded interventions, positive or negative, if any?
- Are there any effects of funded interventions beyond the targeted territory, sectors, or groups (spill-over effects)?

Sustainability
- To what extent are the effects of the interventions sustainable for a longer period?

This report focuses on Questions 1-7, with an aim to update progress made from March 31, 2021, until the report cut-off date, December 31, 2021. Given the number of projects still under implementation, the question of sustainability of funded interventions could not be fully addressed in this report and shall be explored in greater detail as part of Output 4: the Final Evaluation Report (September 2023).

Structure of Priority Axis 2

Priority Axis 2 of the Competitiveness Operational Programme is designed to achieve four specific objectives (SO):

1. Increasing Access to Broadband
2. Increasing Economic Competitiveness
3. Increasing the Use of E-government Systems and Services
4. Increasing Internet Use for Education, Health, and Culture

To achieve these specific objectives, the programme identified three investment priorities, with several actions towards specific objectives under each priority (Figure 1).

Investment Priority 2.1: Expanding broadband and deploying high-speed networks, and supporting the adoption of emerging technologies and networks for the digital economy; digital inclusion, online culture, and e-health

> Action 2.1.1 Improve broadband infrastructure and internet access

Investment Priority 2.2. Development of ICT products and services, e-commerce, and ICT demand

> Action 2.2.1 Support the growth of the added value generated by the ICT sector and innovation in the field

> Action 2.2.2 Support the use of ICT for business development

Investment Priority 2.3. Strengthening ICT applications for e-government, e-learning

> Action 2.3.1 Strengthen and ensure the interoperability of IT systems dedicated to e-government services type 2.0 focused on events in the lives of citizens and businesses, the development of government cloud computing and social media communication, open data and big data

> Action 2.3.2 Ensure cybersecurity of ICT systems and of IT networks

> Action 2.3.3 Improve digital content and systemic ICT infrastructure in the field of e-education, e-inclusion, e-health, and e-culture

Figure 1: Investment Priorities and Specific Objectives of COP Priority Axis 2

SO 2.1: Increasing Access to Broadband	SO 2.2: Increasing economic competitiveness	SO 2.3: Increasing use of e-government services	SO 2.4: Increasing Internet Use for Education, Health, and Culture	
Investments in rural broadband (Ro-NET) and deploying high-speed networks(NGN/NGA) (IP 2.1)	Development of ICT products and services, e-commerce, and ICT demand (IP 2.2)	Strengthening interoperability, cybersecurity, and development of big data platforms for government (IP 2.3/Action 2.3.1 and Action 2.3.2)	Investments in digital content and ICTs in the field of e-education, e-inclusion, e-health, and e-culture (IP 2.3/Action 2.3.3)	Investments in rural broadband (Ro-NET) and deploying high-speed networks(NGN/NGA) (IP 2.1)

Source: Authors' elucidation from the COP

Theory of Change

The evaluation was conducted following the theory of change developed for the evaluation and presented in Deliverable 2.

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Figure 2: Theory of Change

Issues
- Low penetration of high-speed broadband infrastructure
- Large disparities between rural and urban areas in access to broadband
- Lack of adequate support to entrepreneurship in the IT&C sector
- Lack of adoption of e-government services
- Lack of interoperability within government systems
- Low levels of Internet usage, especially among rural/less-developed regions

Interventions/Actions
- Improving broadband infrastructure and internet access by rollout of rural broadband and expanding next generation access networks (Action 2.1.1)
- Supporting the use of ICTs in industries/businesses (Action 2.2.2)
- Ensure cyber security government systems and computer networks (Action 2.3.2)
- Improving digital content and systemic ICT infrastructure in the field of e-education, e-inclusion, e-health and e-culture(Action 2.3.3)

Outputs
- Households provided with NGA broadband coverage and fixed rural broadband access of at least 30 Mbps
- Innovative ICT products and services developed by the IT sector
- e-government services implemented to digitize life events
- Public systems deployed using big data technologies
- E-learning, e-health, e-culture products and platforms developed
- Interoperable and cybersecure public digital platforms

Outcome
- Increase in households covered by next generation access technologies
- Increased Internet usage especially in disadvantaged communities
- Increased engagement in e-commerce
- Increased use of e-government services by citizens

Long-term Outcomes
- Increased social and economic growth and development
- Increased national and regional integration
- Increased country competitiveness
- Creation of new jobs, improved services
- Increased access to services
- Lower within-country disparities in internet access and use
- Greater Gross Value Add of the ICT sector

Critical assumptions:

1. Strong government commitment to utilize EU funds under PA2 in the implementation period
2. Private sector willingness to engage in developing new innovative ICT products/services
3. Private sector willingness to roll out NGN networks
4. Interest of citizens, especially disadvantaged communities, to use the Internet
5. Readiness within government to support common standards for cybersecurity and interoperable public digital platforms

Source: Evaluation team.

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Instrumente Structurale
2014-2020

Methodology

The methodology for this interim evaluation report closely follows the approach and methods used for Output 2 and was outlined in Output 1: the Inception Report. The evaluation uses both primary and secondary data and a mix of qualitative and quantitative methods. The report draws on information provided in consultations with the Managing Authority for the COP as well as the Intermediary Body for the Promotion of the Information Society (OIPSI). It utilizes public data from secondary sources, such as the National Authority for Management and Regulation of Communications (ANCOM), Eurostat, and National Institute of Statistics (NIS). Further, primary data were collected via a beneficiary survey fielded online to all beneficiaries under Priority Axis 2 in January-February 2022, and which received 153 responses, as well as through interviews with stakeholders and surveys of COP PA2 beneficiaries. The full list of interviewees, as well as the instruments, are available in the Annexes to this Report.

A review of the portfolio of funded projects and relevant project documentation was also conducted. The evaluation further utilized telecommunications rollout data and microdata on firms obtained from the National Authority for Management and Regulation of Communications (ANCOM) and the National Trade Registry respectively. While projects across all three investment priorities were examined using a theory-based approach, a counterfactual evaluation closely following the methods used in Output 2 was conducted for completed projects under Investment Priority 2.2. The evaluation used two types of *triangulation* to identify any inconsistencies between the preliminary data resulted from desk review and the data from key informants: 1/ *methods triangulation*, both qualitative and quantitative data was used to explain complementary aspects of the same subject; and 2/ *data sources triangulation*, which involved examining the consistency of different data sources within the same methods.

The sections below briefly describe the details of surveys and interviews conducted as part of the evaluation, as well as the data obtained for the purposes of the counterfactual evaluation.

Survey of Beneficiaries

A survey was administered to all COP PA2 beneficiaries via an online form between January-February 2022 in both Romanian and English. The deadline for completing the questionnaire was February 20, 2022, and reminders were sent in late January and in mid-February. The survey was sent to 1107 unique email addresses received 153 responses, response rate of 15.7 percent. This response rate, while in the average range for online surveys, is influenced by several factors, including survey fatigue, competing demands on time, and early stages of implementation of several projects amid COVID-19. Due to these surveys being fielded during the COVID-19 pandemic, the response rates are much lower than traditional response rates to telephonic surveys, and lesser than response rates to face-to-face surveys.

The survey questionnaire included closed and open-ended questions. Closed questions asked stakeholders to rank their satisfaction with the processes utilized by the COP authorities; open questions asked about participants' experiences, key challenges, and results during

implementation. The survey was used to document intended and unintended consequences, with some questions focusing on lessons for the next programming period based on beneficiaries' experiences.

As noted in the previous output, the survey alone has some inherent *limitations*. First and foremost, it is not representative. The risk of non-representativeness is partially mitigated by in-depth interviews and case studies, which allow for more nuanced discussions with beneficiaries and other stakeholders.

In-depth Interviews

In-depth interviews were conducted for the purposes of developing detailed case studies and for validating results of the counterfactual evaluation under IP 2.2. During January–March 2022, the team identified and reached out to 3 beneficiaries (public entities), each implementing a project under PA2. Further, interviews with Transparency International, who monitored one of the projects, and a key contractor implementing the 3 e-government project case studies covered in this report, were conducted to inform the evaluation. In July-August 2022, the team identified an additional 6 interviewees, which were selected through a random draw stratified for each Call under IP 2.2. These interviews were used to corroborate the findings of the counterfactual evaluation, and followed a semi-structured format with the key objective to uncover some of the mechanisms that may explain the results of the counterfactual, provide additional hypotheses for testing, and triangulate existing results. The interviews spanned both completed projects and projects under various stages of implementation.

Case studies

Case studies were developed using desk research, in-depth interviews, and secondary data shared by beneficiaries. A total of three out of the total of nine e-government projects financed through COP were developed, including those with the Ministry of Culture, the implementation of a Big Data platform to boost the Competition Council's analytical capacities and the digitalization of databases and platforms for the National Trade Registry. The selection of these projects was determined by considerations related to availability of data based on the implementation calendar, as the three projects were nearing completion. A qualitative analysis was conducted along key project phases such as project design, implementation, results, risks to sustainability, and lessons learned. The main limitation remained that all projects were either recently closed or still under implementation, therefore some of the long-run results could not be observed at the time when this analysis was conducted.

Counterfactual evaluation

The counterfactual evaluation updates the results of the difference-in-differences (DiD) analysis presented in Output 2, with no changes to the main or alternative specifications to enable comparability. Projects under Investment Priority 2.2 were approved in three phases, with three calls made in 2017, 2019, and 2020. The criterion used for the calls was similar

across the three calls, permitting comparison of beneficiaries. The effect of grants awarded in 2017 on beneficiaries was assessed using a DiD approach. The outcomes of firms that received the aid in 2017 (all completed by 2021) were evaluated against firms that were approved in 2019 and 2020. The counterfactual firms – which were firms approved in 2019 and 2020 in subsequent calls – were chosen to be as similar as possible to the 2017 beneficiaries along all dimensions but the treatment: the firms that were most likely to have applied and received the aid.

To capture the direct effects on beneficiaries, the following dependent variables (results indicators) were defined: (i) employment levels; (ii) turnover levels; (iii) profits, (iv) investment level (fixed assets and operating revenues), and (v) R&D expenditures.

The following data were used for the counterfactual evaluation:

Information provided by COP Managing Authority

- List of beneficiaries
- List of rejected applicants
- Year of approval of beneficiaries
- Amount of aid received by beneficiary
- Information about the aid granting process – i.e., how beneficiary firms were selected, and how other applicants were rejected
- Scoring/selection data

Firm-level data from National Trade Registry Organization (NTRO)

- Number of employees
- Turnover
- Labour cost
- Capital stock
- Operating expenses
- R&D expenditures
- Geographic location of the firm
- Information on sector classification

Current Status of the Projects under Priority Axis 2

As of December 31, 2021, a total of 485 projects were approved and contracted under Priority Axis 2 of the Competitiveness Operational Programme (2014-2020). 293 projects, initially approved under Priority Axis 2, have been moved to Priority Axis 4 for contracting. **192 projects** were approved and began contracting between April 1, 2021, and December 31, 2021. Table 1 provides the allocation of funds by investment priority and specific objectives until December 31, 2021. As Figure 2 shows, the maximum ESIF funding was allocated to e-government projects (IP 2.3), followed closely by support to the digitization of SMEs (IP 2.2). By total funding, however, projects under IP 2.2 are larger, owing to the larger proportion of beneficiary contributions.

Proiect finanțat din FEDR prin POAT 2014-2020

Table 1: Allocation of Funds by Investment Priority and Specific Objectives (Total and EU Contributions)

Investment Priority	Specific Objective	Action	Project	Total Allocation (million EUR)	Total Allocation (million RON)	ESIF Allocation (million EUR)	ESIF Allocation (million RON)	Total Budget (million EUR)	Total Budget (million RON)	ESIF Contribution (million EUR)	ESIF Contribution (million RON)
2.1	2.1	2.1.1	Ro-NET and NGN/NGA	118	582	100	495	118	582	100	495
2.2	2.2	2.2.1	ICT Products/Services	89	440	75	371	60	296	50	247
2.2	2.2	2.2.1	ICT Products/Services					29	144	25	124
2.2	2.2	2.2.1	ICT Products/Services					14	68	11	57
2.3	2.3	2.3.1	Government Cloud	138	684	117	578	138	684	117	578
2.3	2.3	2.3.1	Big Data Projects	47	235	40	198	47	235	40	198
2.3	2.3	2.3.1	Non-major projects	6	32	5	26	6	32	5	26
2.3	2.4	2.3.2	Cybersecurity	36	176	30	148	36	176	30	148
2.3	2.4	2.3.3	E-culture	11	54	9	45	12	59	10	49
2.3	2.4	2.3.3	E-education	110	544	93	460	202	999	170	841
2.3	2.4	2.3.3	E-health	16	79	13	64	16	79	13	64
2.3	2.4	2.3.3	E-inclusion	Reallocated to Action 2.2.1							
2.2	2.2	2.2.2	Not launched	20	99	17	84	0		0	
Total				**591**	**2,926**	**499**	**2,469**	**678**	**3,355**	**571**	**2,827**

Source: COP-MA

Figure 3: Financing Allocations by Specific Objectives
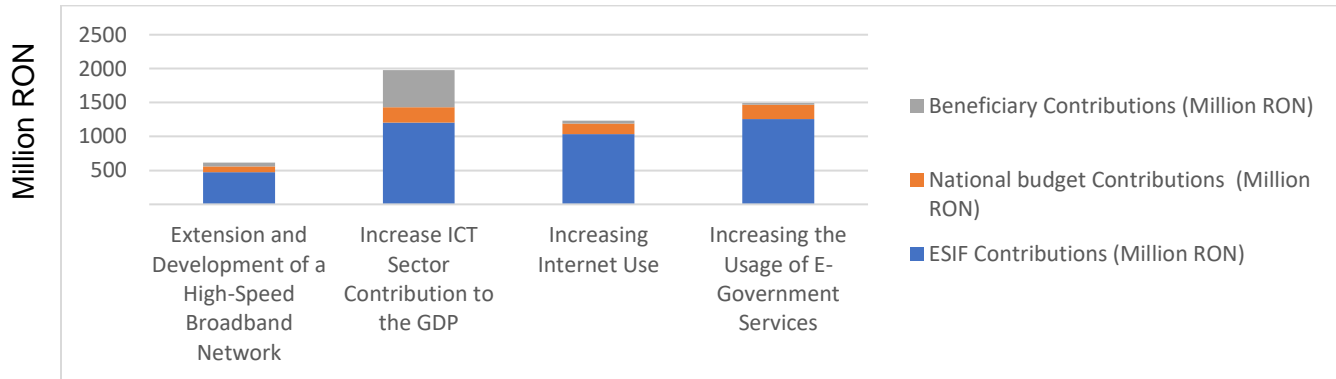
Source: Evaluation team's calculations using MySMIS data.

Implementation Status: Of the 485 approved projects, 302 were under implementation as of December 31, 2021, whereas 119 had been finalized. 30 projects had been cancelled. **10 projects** were finalized between March 31, 2021, and December 31, 2021, and 1 project was cancelled. The implementation status of projects limits the present evaluation. Projects completed as of December 31, 2021, amount to 11.42 percent of the total approved financing, while 85.34 percent of funds were committed to projects still under implementation, and projects worth 3.24 percent of the total share of financing have been cancelled (Figure 4).

All projects contracted in 2017 under Investment priority 2.2 (action 2.2.1) have been completed. 51 percent of the overall financing under the COP is committed to projects with public beneficiaries, and these projects are expected to be completed during 2023. Due to the nature of the projects contracted – large e-government platforms – the largest disbursements are likely to occur in 2022-23.

Figure 4: Financing Allocations by Implementation Status
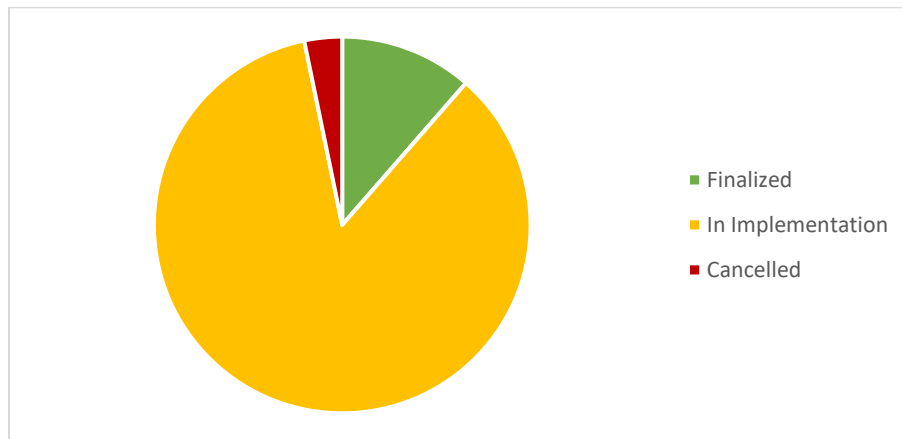
Source: Original calculations using data from the COP Managing Authority.

Projects that started implementation after the cut-off date of Output 2. A total of 192 projects commenced implementation between March 31, 2021, and December 31, 2021. Of these, most projects commenced implementation in between July and September 2021. 170 of 192 projects that commenced implementation were awarded to public beneficiaries. Most beneficiaries were communes that received funding to purchase laptops, tablets, and other equipment to facilitate remote learning during COVID-19 pandemic (Table 2).

Table 2: Projects that commenced implementation, by quarter

2021	192
Qtr1	0
Qtr2	87
Qtr3	101
Qtr4	4

Source: Original calculations using data from the COP Managing Authority.

Finalized projects. 11 projects were finalized in 2021 (Figure 5), fewer than the number of projects finalized in 2019 and 2020 (Figure 5). Consultations with stakeholders indicate that the reason for low completion rate in 2021 is that most projects approved in 2017 were completed in 2019 and 2020. However, projects that were scheduled to close in 2021 were delayed owing to the pandemic and requested extension due to the restrictions imposed by the pandemic on business continuity. As a result, fewer projects were completed in 2021.

An additional 248 projects under implementation are expected to close in 2022, and the remaining 54 projects in 2023.

Proiect finanțat din FEDR prin POAT 2014-2020

Figure 5: Number of Finalized Projects by Investment Priority by Year
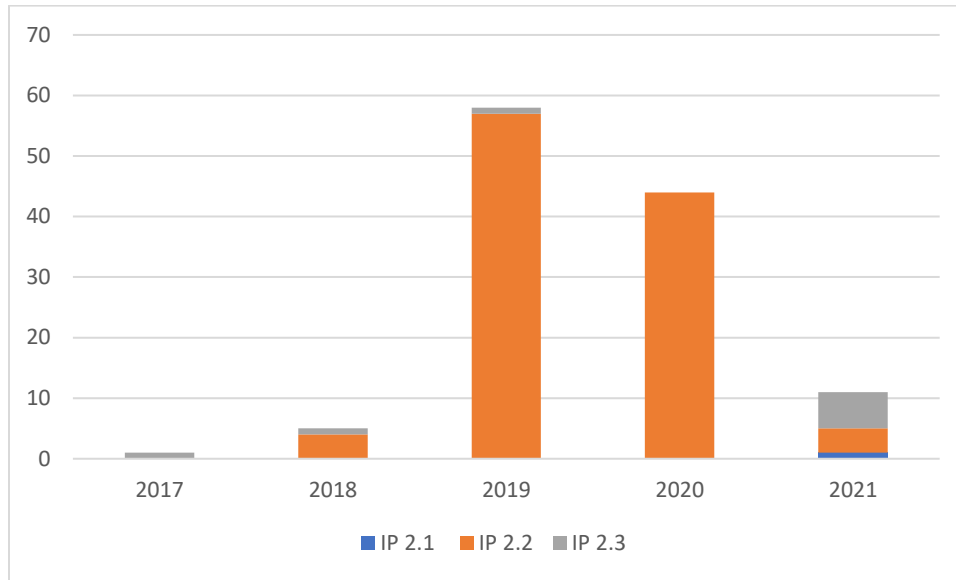
Source: Original calculations using data from the COP Managing Authority.

NUTS2 regional level statistics. Nord Vest region has the highest number of approved projects (77), whereas the Vest region has the lowest (27) (Figure 6). In terms of financing, the biggest share is allocated to national level projects (51.73 percent), and the lowest share is allocated to the Vest region, in line with the lower number of approved projects under the program (Figure 7).

Figure 6: Number of Allocated Projects by Region

Proiect finanțat din FEDR prin POAT 2014-2020
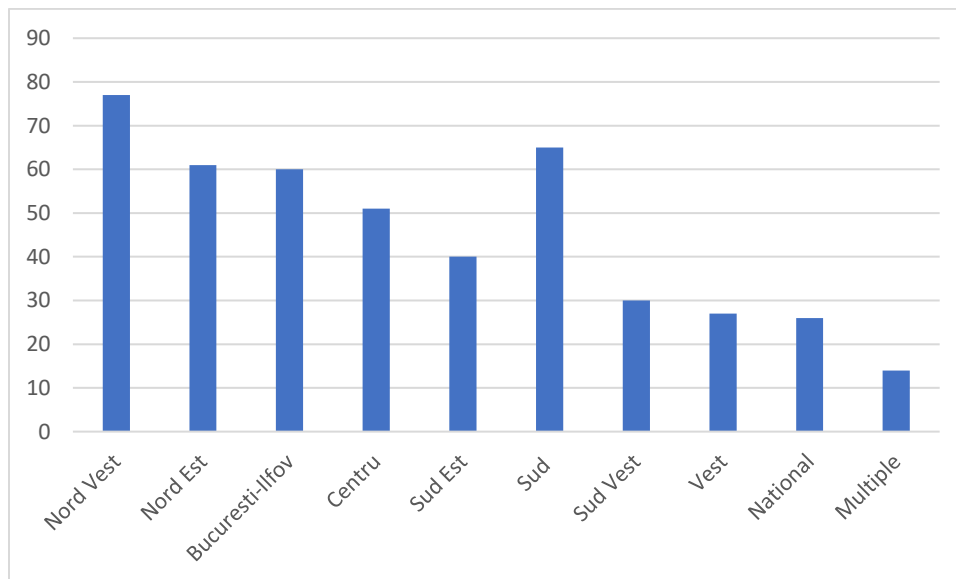
Source: Original calculations using data from the COP Managing Authority.

Figure 7: Share of Total Financing by Region
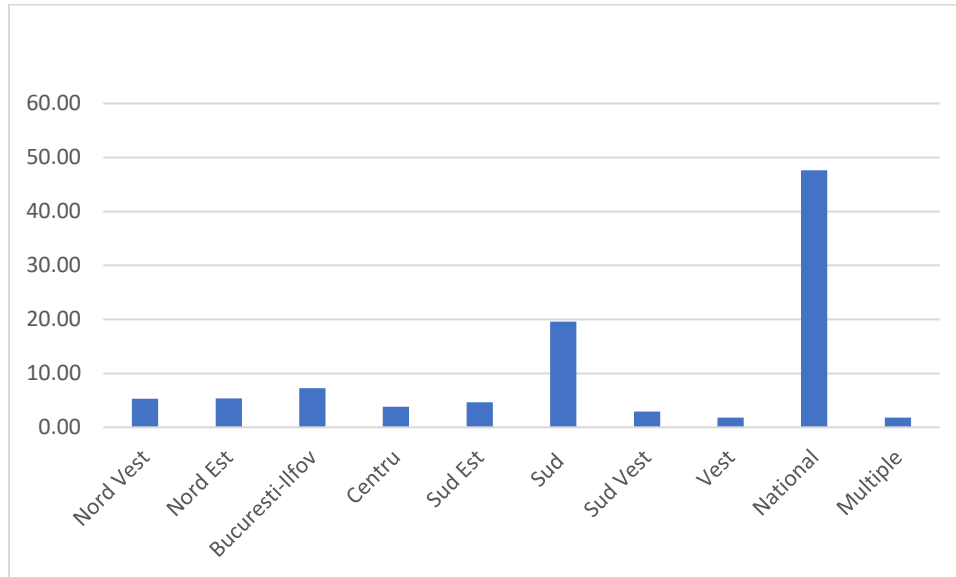
Source: Original calculations using data from the COP Managing Authority.

Disbursement status. Disbursement status of projects remains poor, even for projects approved in earlier years. The figures below show total disbursement status for projects approved since 2016 (Table 3, Figure 7). As can be observed, the highest disbursements have occurred for projects approved in 2018, primarily under Investment Priority 2.2, as those projects have all been completed. The low reimbursement rate for remaining projects is partially due to project design, as large contracts have been designed to be reimbursed after the full software/system is handed over by the contractor to the beneficiary. This design, while not a legal requirement, indicates the current nature of implementation of most projects under the COP studied for the evaluation. The implications of this type of project design for sustainability of these interventions is discussed in detail within the case studies in Chapter 5.

Overall, disbursements pale against approval allocations across investment priorities and years, with payment rates amounting to less than 50 percent of ESIF allocation across 2019, 2020, and 2021. As noted previously, two reasons drive the low disbursement status. First, projects were designed (especially under Investment Priority 2.3), to make the largest payments upon delivery of the final platform/software to the beneficiary. This has resulted in low disbursements against e-government projects, which interviews suggest are near completion. Second, several projects were extended in 2021 owing to delays caused by government restrictions due to the COVID-19 pandemic. These delays have led to slower implementation in 2021, thus delaying disbursements.

Table 3: Disbursement Status and Financial Allocations by Project Approval Year, (million RON)

Project Approval Year	Total Project Value	EU Allocation	EU Disbursements	National Budget Allocation	National Budget Disbursements
2016	295	202	141	36	
2018	509	416	263	72	26
2019	1,837	1,370	248	246	37
2020	1,222	748	308	125	45
2021	1,013	722	28	92	4

Source: Data shared by the COP-MA, January 2022

Figure 8: Disbursements by Project Approval Year (million RON)

Source: Data shared by the COP-MA, January 2022

Proiect finanțat din FEDR prin POAT 2014-2020
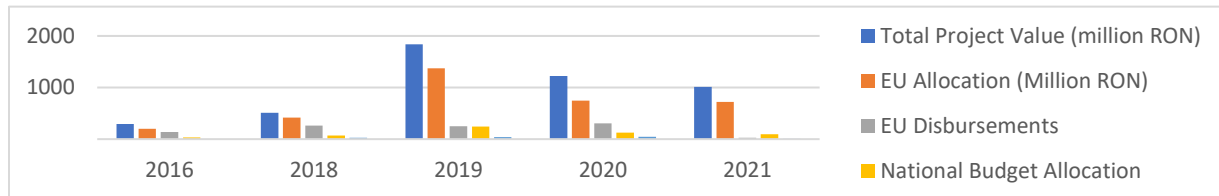
2. Sector Developments amid the COVID-19 Pandemic (2020-2021)

This chapter focuses on the effects of COVID-19 on the information technology and communications sector (IT&C), which is the core of Priority Axis 2 of the Competitiveness Operational Programme (COP), in the context of broader macroeconomic trends in Romania. It seeks to provide context for the future chapters that assess progress made by projects financed by the COP. The chapter is organized as follows. First, the chapter analyses broader macroeconomic trends and the dynamics of information and communication technology (ICT) access and use – both by households, and by firms – using the latest Eurostat database (March 2022), supplemented by data from the Business Pulse Surveys conducted by the World Bank in 2020-2021, and the Enterprise Surveys in 2019. Second, the chapter covers key market changes within the sector – both for telecommunications, and for information technology and services. The chapter concludes with a summary of key policies, programmes, and institutional changes enacted in 2020-2021.

Macroeconomic Trends

While Romania's 3.9 percent decline in economic output in 2020 was less severe than the EU average, small firms were disproportionately affected. Firms across manufacturing and services experienced a decline of 33 percent in annual sales in 2020 and 17 percent in mid-2021 (when compared to 2019). Over 50 percent of companies did not receive any public financing support (WB Pulse Firm Survey, 2020 and 2021), primarily due to the lack of awareness and cumbersome application procedures. World Bank Pulse surveys found a disproportionate effect on smaller firms, which had relatively limited access to public funds, and which were slower to adopt digital technologies (World Bank, 2021).

In 2021, Romania's economy rebounded at 5.9 percent, but recession risks remain high (World Bank, 2022). The quality and sustainability of growth, which occurred despite the COVID-19 pandemic and accompanying supply chain disruptions, remains to be examined in the medium term. The recovery, as in previous cases, was fuelled by an increase in private consumption that registered a 7 percent growth year-on-year. However, annual inflation accelerated to 8.4 percent in January 2022, reflecting inflationary pressures and a rise in energy prices. Slower productivity dynamics and the quality and quantity of labour and capital remain a concern in view of broader goals to enhance competitiveness.

Adoption of digital technologies significantly expanded during the pandemic, but unevenly across sectors and regions. 90 percent of Romanian firms responding to the Business Pulse Surveys reported using digital technologies, and more than 50 percent increased the use of digital technologies or started using them. The ICT sector contributed 13.4 percent in 2021 to the overall economic growth year-on-year, in part due to increased needs for remote work. However, challenges remain: the growth of the ICT sector is limited to large urban centres and driven by the location of outsourcing centres of multinational corporations. These trends have the potential

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to contribute to widening disparities in private sector development, as well as poverty, across regions and between urban and rural areas.

ICT Use by Households and Firms

ICT use by households increased during the pandemic but trailed EU averages. In 2021, 89 percent had internet access at home – reflecting a 5-percentage point jump from 2019 – but this was lower than the EU average of 92 percent. Most of these households (88 percent in 2021) had broadband access, slightly lower than the EU average of 90 percent. Key reasons for not using the internet remained the lack of skills to use the internet (cited by 51 percent of non-users in 2019) and the lack of relevant content (cited by 40 percent). Costs – for data and equipment – were less of a concern for non-users.

Regional disparities persisted in households' internet access, even amid the pandemic. While 94 percent of households in Bucharest-Ilfov had internet access at home, only 85 percent in Sud Est did (Figure 8). However, Sud Est also registered a significant six-percentage point improvement in household internet access during the pandemic, as only 79 percent of households had access in 2019. Similar increases in internet access were also observed in Nord Est, Sud-Muntenia, and Centru regions.

Figure 9: Households with Internet Access at Home, by NUTS 2 Region (2021)

Legend
- ≥ **85** to 86
- ≥ 86 to 87
- ≥ 87 to 89
- ≥ 89 to 91
- ≥ 91 to 92
- ≥ 92 to **94**
- Data not available
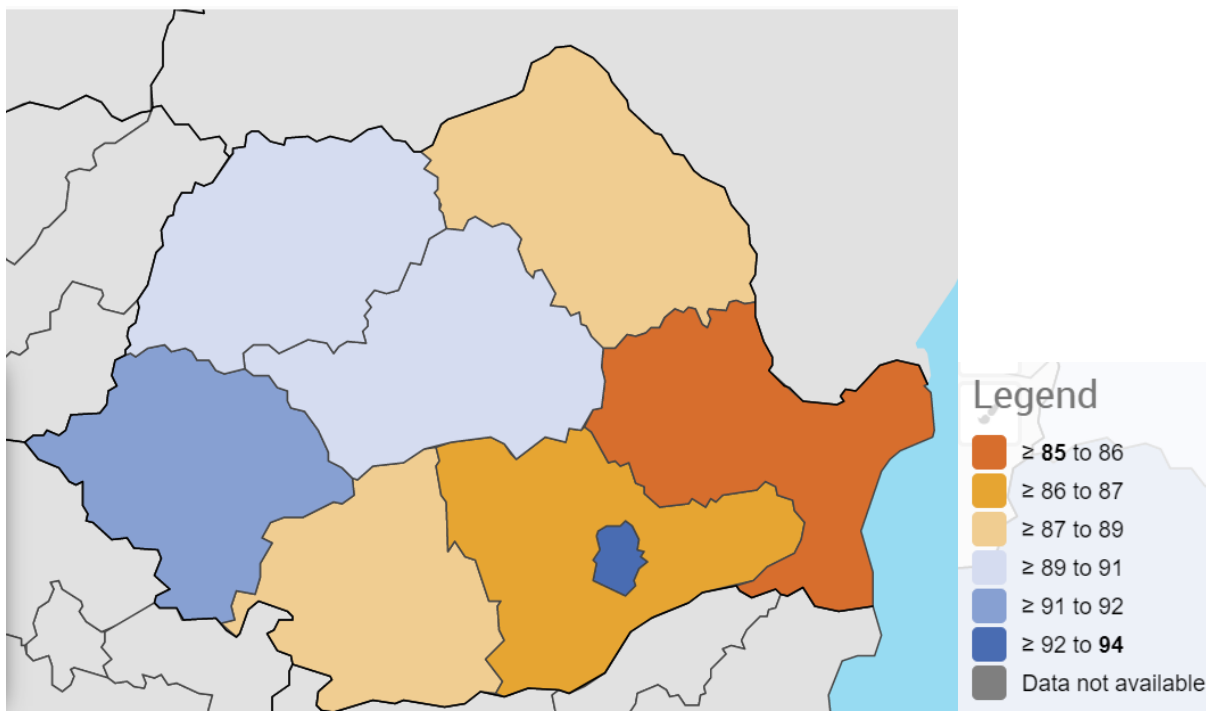
Source: Eurostat.

While daily internet use has seen a marked increase during the pandemic, use for purposes such as civic engagement, remote working, banking, and selling goods and services online remains

very low relative to EU averages. The percentage of daily internet users in Romania jumped from 57 percent in 2019 to 69 percent in 2021, one of the largest percentage point increases in the EU. At the same time, even in 2021, only 3 percent of users reported using the internet for online consultations or voting, compared to 8 percent EU average, and 5 percent reported using the internet to find and apply for jobs, which is also low compared to the EU average of 13 percent. While the percentage of users of online banking almost doubled from 8 percent in 2019 to 15 percent in 2021, Romania still ranked near the bottom among EU countries in access to internet banking services, the EU average being 58 percent. Similarly, relatively fewer Romanians used the internet for accessing health information amid the pandemic with only 40 percent of users having done so, relative to the EU average of 58 percent. Only 5 percent of individuals used the internet to sell goods and services online, relative to the EU average of 18 percent (Eurostat, 2022).

Despite a slight increase during the pandemic, Romania lags the EU in take-up of digital public services, even in 2021. A mere 15 percent of individuals used the internet to interact with public authorities in 2021, the lowest in the EU (Figure 9). Only 11 percent of individuals used the websites of public authorities to access information, and only 9 percent used them to download or submit official forms; again, ranking last in the EU (Eurostat, 2022). These statistics did not change significantly during the pandemic, despite greater use of the internet overall. Regional differences also persisted, with users in Bucharest-Ilfov using digital public services at nearly twice the national average and registering a steady increase in the last five years.

Figure 10: Percentage of Individuals Who Used the Internet for Interaction with Public Authorities, by NUTS 2 Region
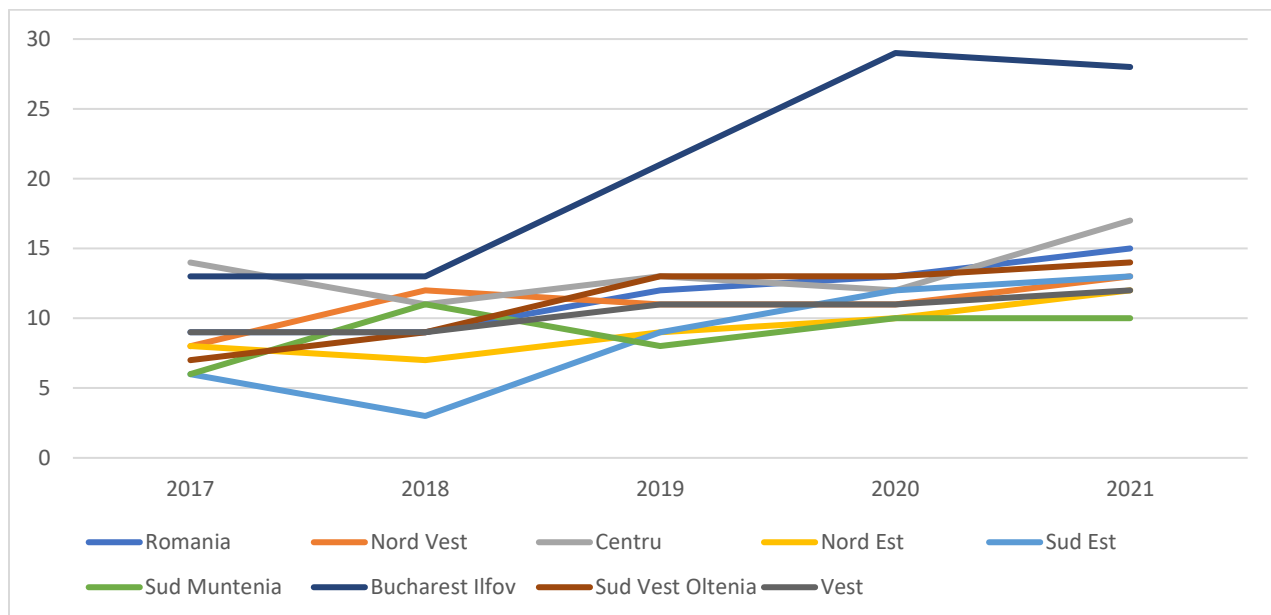
Source: Eurostat.

Romanian firms made some progress on digitization following the COVID-19 pandemic, but overall uptake of digital solutions in enterprises remains low. According to the World Bank

Business Pulse surveys, 30.98 percent of firms reported increasing their use of digital platforms and services in June 2020 relative to 2019, and 9.9 percent of firms reported using their digital platforms to make online sales. In 2021, 82 percent of enterprises had broadband access, lower than the EU average of 96 percent. Nearly 38 percent of Romanians stated using the internet to make a goods or service purchase in 2021, a 15-percentage point rise since 2019. The greatest uptake of e-commerce during the pandemic was in Bucharest-Ilfov, with more than half of users making online purchases; Sud Est ranked last, with just over 30 percent in 2021 (Figure 10).

Figure 11: Percentage of Individuals Who Ordered Goods or Services over the Internet for Private Use
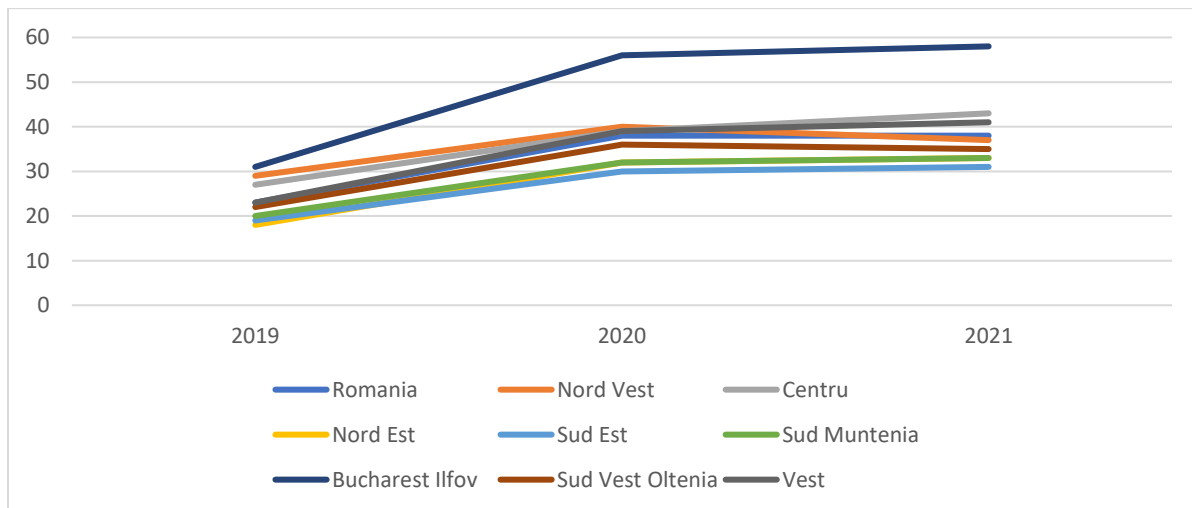
Source: Eurostat.

Key Trends and Challenges for the IT&C Sector

The IT&C sector has remained a valuable contributor to GDP in Romania. The Romanian IT market was estimated at US$6.4 billion in 2019 and has seen an impressive growth amid the COVID-19 pandemic. The IT&C services sector fostered a 9 percent yearly growth rate in revenue for large companies, with 73 percent of the revenue being generated by companies with foreign capital (Invest Romania, 2021). Software and IT services firms in Bucharest, Cluj-Napoca, Timisoara, Iasi, and Brașov account for 86 percent of domestic software industry turnover.

The sector benefits from high-speed connectivity in the country. Full 5G coverage is available in Bucharest, and average speeds in Romania exceed EU averages at 215.3 Mbps. This is one of the reasons the country is the only EU member among the top-20 suppliers on English-speaking labour platforms[1].

However, skills shortages remain a major barrier in firms' operating environment – in 2019, 30 percent of both medium and large firms reported it as the top business constraint (compared to 19 percent of small firms). At a sectoral level, skills shortage was reported by 40 percent of firms

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[1] Oxford iLabour Project 2020. https://ilabour.oii.ox.ac.uk/online-labour-index/

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in the services sector, which, while lower than 51 percent reporting skills shortage in the industrial sector, is still high (NBR, 2019). The pandemic may have led to a further deterioration of the quality of labour —equitable access to quality education was reported to be a key challenge during the pandemic—lowering future availability of skills in the labour market.

In 2019, nearly a third of Romanians lacked basic digital skills. In combination with Romania's age structure and outmigration, this is a challenge, as it limits the availability of labour resources for the IT&C sector, and the economy overall. Women and youth labour force participation is among the lowest in the EU. The working age population (20-64 years) of Romania is estimated to decrease by approximately 7.5 percent by 2025 compared to 2019, and by another 3 percent between 2025 and 2030[2]. The lack of targeted and coordinated efforts to improve digital competencies in schools also poses a challenge, as does the weak investment by firms in enhancing their workers' digital skills[3].

Key Policies, Programmes, and Institutional Changes of Relevance to the IT&C Sector

Romania embarked on an ambitious digital transformation program with the support of the European Commission, dedicating significant resources from multiple and complementary programs, such as the Recovery and Resilience Plan and the Cohesion Funds for 2021-2027, to accelerating its transition to a digital society. Romania's National Recovery and Resilience Plan (NRRP) allocated 20.5% of the total EUR 29,182 million financial allocation for Romania to supporting the country's efforts in meeting digital objectives. Interventions for ICT are concentrated in the Component 7, Digital Transformation, (EUR 1,817 million) of the NRRP, but also are present as a cross-cutting issue in all other 14 components of the plan. The Digital Transformation component prioritizes public services digitalization, improved connectivity, increasing digital skills, and cybersecurity and resilient digital infrastructures

The Digital Transformation pillar focuses on the development and improvement of e-government and digital public services systems, including, governmental cloud, electronic ID cards for 8.5 million people, skilling/up-skilling/re-skilling for 30,000 civil servants and 100,000 citizens, and cybersecurity enhancements for the public sector. The second largest allocation contributing to digital objectives is under Component 15, Education, of NRRP, with EUR 1,129.5 million, of which the main investment in digitalization amounts to EUR 478 million for procurement of IT hardware for schools. Digitalization of SMEs is a key focus under Component 9, Support for Private Sector and Research, Development & Innovation, under which EUR 2 558 million is allocated for the private sector; an investment of EUR 500 million is earmarked for an Aid-Scheme for the digitalization of SMEs, while some other sub-investments targeting digital transformation amount to a total of EUR 1,064 million from Component 9 are contributing to digital objectives. In addition, in line with NRRP commitments, the Authority for the Digitalization of Romania (ADR) unveiled in March 2022 a draft emergency ordinance preparing to operationalize the government cloud that

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[2] The 2021 Ageing Report - European Commission https://ec.europa.eu › economy-finance › ip148_en
[3] The Digital Economy and Society Index Country Guide for Romania, 2021

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will enable the transition to cloud-based public systems. The amount of EUR 374 million of the NRRP are allocated for building the cloud infrastructure, while the migration of applications is supported with an additional EUR 187 million.

Cybersecurity remains a key programmatic priority – for Romania and the region more broadly. Critical sectors such as transport, energy, health, and finance have become increasingly reliant on digital technologies for their operation. While digitalization has supported critical operations, especially amid the COVID-19 pandemic, it has also exposed economies to cyber threats. In 2021, the EU regulation to establish the European Cybersecurity Competence Centre (ECCC) in Bucharest was published. The Competence Centre is tasked with funding to coordinate cybersecurity research, is expected to help secure the EU single digital market, and will provide grants to help implement parts of the Digital Europe and Horizon Europe programs.

New digital transition and cybersecurity commitments deepen and scale up engagement in areas already prioritized within Priority Axis 2 of the COP (2014-2020), and form a significant focus of the Smart Growth, Digitization and Financial Instruments Operational Program (POCIDIF) (2021-2027), while Priority 1 of each of the eight Regional Operational Programs 2021 – 2027 is dedicated to ensuring regional competitiveness through innovation and digitalization

3. Effectiveness

This chapter focuses on the progress made against key output and outcome indicators under Priority Axis 2 of the Competitiveness Operational Programme (COP). The two key questions this chapter seeks to answer are as follows:

1. To what extent were the interventions carried out according to expectations, produced the desired change (achieved specific objectives) and must be further funded?
2. What factors influence the effects of interventions and how?

The focus of the effectiveness assessment is primarily to update the analysis presented in Output 2, which assessed the status as of March 31, 2021. The chapter seeks to provide insights categorized by evaluation themes/specific objectives, namely a) access to broadband, b) improving economic competitiveness, c) improving the use of e-government services, and d) increasing internet use for education, health, and culture.

Increasing Access to Broadband

Two interventions contribute to this specific objective: The RoNet Project, and the Next Generation Network/Next Generation Access (NGN/NGA) projects. The RoNet project is implemented by the government. The current beneficiary of the project is the Ministry of Research, Innovation and Digitization (MCID) that took over the project by virtue of taking over communications portfolio of the Ministry of Transport, Infrastructure and Communications. NGN/NGA projects are implemented by small and medium-sized enterprises (SMEs). This section details progress made under these projects to achieve greater access to broadband in underserved areas and provide high-speed broadband for 160 527 households.

The RoNet Project continued to make implementation progress in 2021. As described in Output 2, Lot 1 is operational, and the closure of four more of the total of seven lots is imminent. The work has been completed for 695 localities, and reimbursement requests have been submitted for 691 of these localities. According to OIPSI, 88 localities were removed from the project because they did not fulfil necessary contractual and project obligations.

Implementation status by lot[4]:

Lot 1 - Operationalized.

Lot 2 - System acceptance certificate no. 327 / 12.05.2021.

Lot 3 - Certificate of final acceptance of system / network no. 594 / 21.10.2021.

Lot 4 - Working on final system acceptance.

Lot 5 - Certificate of final acceptance of system from 2019.

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[4] Data obtained from the Managing Authority in April 2022.

Lot 6 - Working on final system acceptance.

Lot 7 - Completed works, working on the reception and acceptance of 4 localities.

NGN/NGA projects contracted in 2019 have faced difficulties in implementation, which have only been exacerbated in 2021 by the COVID-19 pandemic.

Construction permits for 576 localities have been obtained. In 178 localities the works have already been completed (for 106 localities reimbursement requests were submitted), and in 325 localities construction is underway. One project in the Tulcea-Braila region, covering 4,321 households, was the first to be completed and is in the processes of being verified[5].

Processes around construction permits have been protracted, leading to delays in implementation. These permitting delays are not unique to the NGN/NGA projects, as noted in Output 2, in the case study on Ro-NET. The Intermediary Body has addressed the risks specific to construction permitting processes for NGN/NGA projects by organizing a meeting with beneficiaries to discuss the need to accelerate implementation and to agree on an extension of implementation deadlines based on beneficiaries' specific circumstances.

Increasing Economic Competitiveness

To increase economic competitiveness, interventions under Priority Axis 2 sought to support the development of ICT products and services that enabled the digitization of SMEs. As of 31 December 2021, 153 such products and services had been developed and verified. Additional 5 products were developed from January to March 2022.

Projects/interventions were solicited via three calls – in 2017, 2019, and 2020[6]. Figure 12 below provides disbursement rates of projects (both completed and under implementation) by call.

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[5] OIPSI, March 2022.
[6] Managing Authority, January 2022.

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Figure 12: Value of Projects under IP 2.2.1 by Call, Implementation and Disbursement (in million RON)
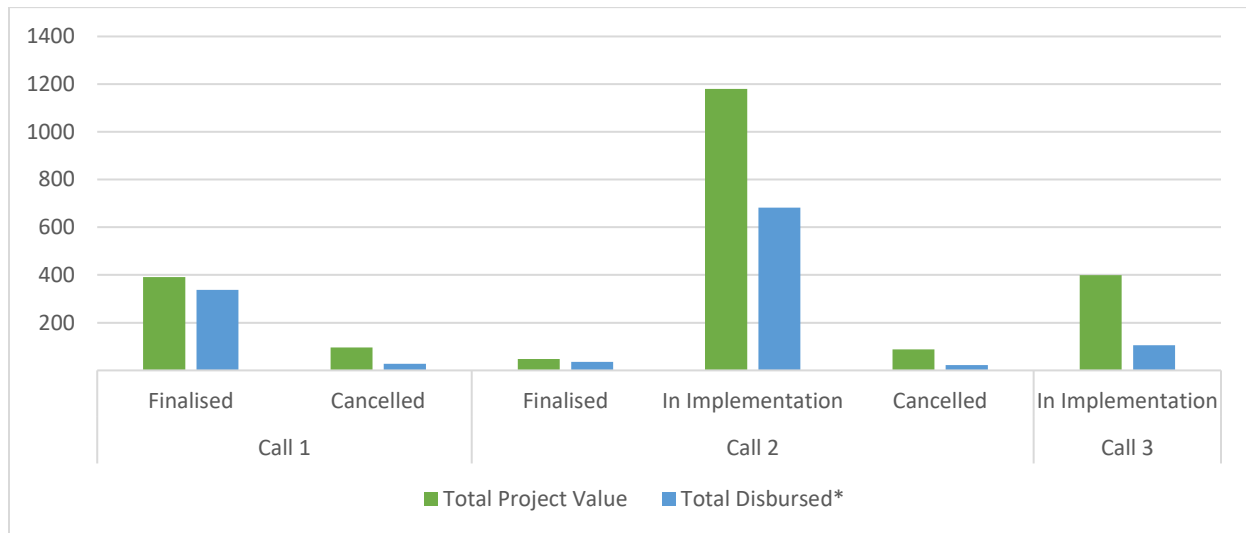
*Note: *Includes budgeted beneficiary contributions.*

Source: Evaluation Team's elaboration using data provided by the Managing Authority.

All projects in Call 1 (issued in 2017) have been either completed (104) or cancelled (24). A majority of projects granted funds in Call 2 – 71 out of 81 projects – remain in implementation, 5 having been finalized and 5 cancelled. All 16 projects in Call 3 are still in implementation phase.

Finalized projects predominantly belong to Bucharest-Ilfov region (39 of 109), whereas projects in implementation are spread across different regions in Romania, with the greatest number of projects in the Sud region (Figure 13).

Figure 13: Project Status by NUTS 2 Region
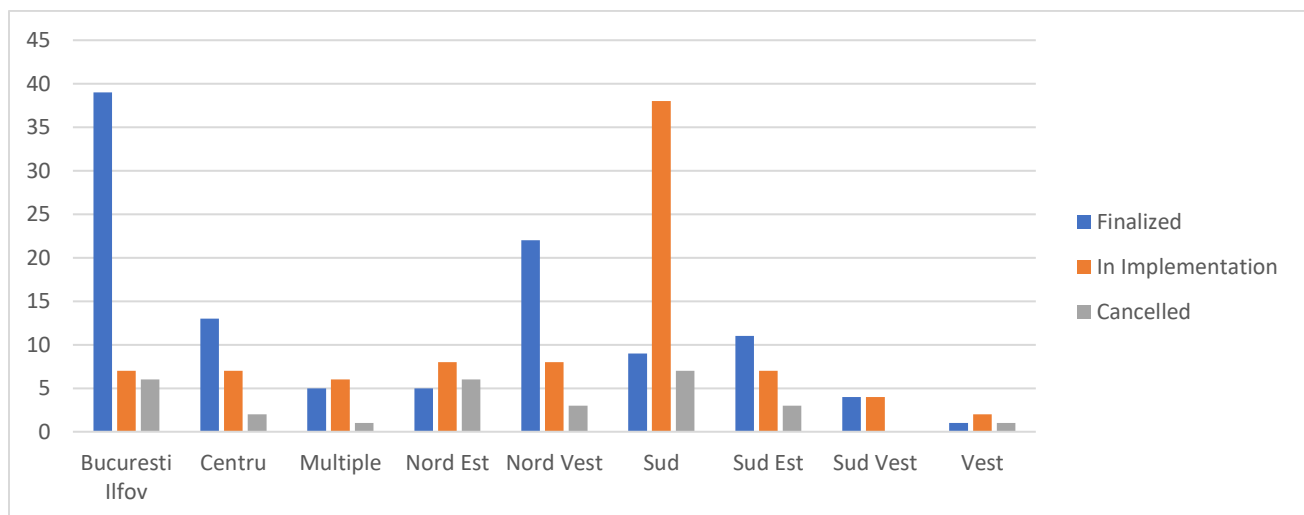
Source: Evaluation team's elaboration based on data from the COP-MA.

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Beneficiary survey suggests that the monitoring of the implementation progress and relationship with the Management Authority is satisfactory and contribute to the progress made under this objective. Of the 36 private firms that responded to the beneficiary survey, the majority stated that they were fully satisfied with the monitoring and verification processes by project officers and commended their availability for providing the information that beneficiaries needed (Figure 14). Survey responses also point to the value of consultant support in meeting monitoring and evaluation goals of the programme, which may have contributed to firms' ability to navigate processes and maintain strong and consistent engagement with the project officers.

Figure 14: Survey Question: On a Scale of 1-10, How Satisfied Were You with the Monitoring of Implementation Progress?
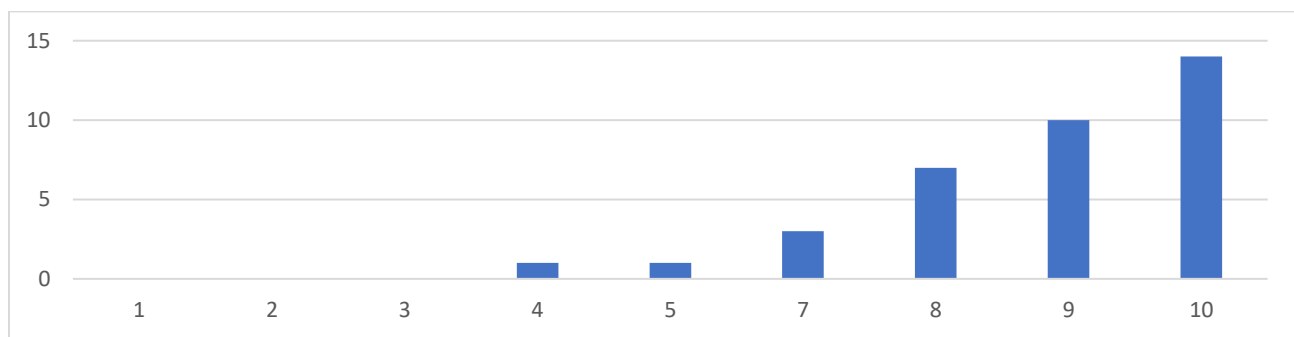
Source: Beneficiary survey carried out for this evaluation

While most projects were successfully implemented, beneficiary responses also highlighted various areas where changes to processes and requirements could enhance outcomes. Some SMEs supported under the project found the documentation burden of the program quite high. Especially amid COVID-19, beneficiaries of projects still in implementation reported various challenges in submitting reimbursement requests in accordance with the schedule of payment requests. The forms for projects that began to implement prior to COVID-19 pandemic required direct interaction of at least two people to provide hand-written signatures on paper. The current process only accepts electronic signatures from *legal representatives* of the SME, which are not all representatives in-charge of various procurement processes. One SME claimed needing to "organise monthly meetings in person exclusively for the purpose of them [other employees] placing [their] handwritten signatures on a paper that is then anyway electronically countersigned by the legal representative in order to be uploaded to the platform." Standardizing the process and communicating the requirements for reimbursement submissions better may therefore ease compliance for participants in future programs.

Some beneficiaries under Investment Priority 2.2 also noted challenges in hiring due to the limited-term nature of the employment contracts feasible under the funding envelope. Staffing challenges also included familiarising new employees with the European Structural and Investment Fund (ESIF) processes, in a tight labour market. Long procurement delays harmed the companies' ability to hire qualified candidates, suggesting the need for simplification of procurement processes. Only one firm claimed that the project timeline was affected by the

disruption of supply chains during the pandemic, leading to difficulties in receiving the hardware purchased through the project. Overall, supply chain disruptions were not a key factor affecting implementation of projects.

Increasing the Use of E-government Systems and Services

The work on e-government systems and services continued in 2021, with 2 additional projects approved. All 19 projects remain in various stages of implementation, with projects approved in 2016 having reached 68.63 percent of ESIF disbursements and projects approved in later years lagging considerably (Table 4). As case studies will highlight, while some projects have faced challenges due to the onset of COVID-19, others have adapted well to implementing systems and platforms. For instance, over 573 211 cultural resources have been digitized by April 2022, and platforms for the Competition Council and Trade Registry are in final stages of completion (see also case studies) . Due to most of them being in various stages of implementation (and testing of completed portions of the software/platforms), the beneficial outcomes of new e-government services – such as cost savings from online implementation and time savings from the use of digital public services – are yet to be observed and evaluated.

Table 4: E-government Projects: Value and Disbursements

Year	Number of Approved Projects	Total Project Value (Million RON)	% of Total Project Value disbursed from ESIF
2016	3	169	68.63
2018	4	277	29.98
2019	8	724	4.58
2020	2	178	24.76
2021	2	158	0.22

Source: Authors' calculations using data from COP-MA

Effectiveness of e-government projects is affected by rigid specifications that are part of the current procurement rules. Interviewed beneficiaries pointed out that having rigidly fixed specifications was detrimental to adapting and upgrading software and services procured. Given the dynamic nature of the sector, a more flexible approach to specification is required to ensure sustainability.

Procurement of software and IT services continued to be a challenge amid COVID-19: beneficiaries evaluated the labour market as tight and noted IT skills shortage. Further, beneficiaries stated concerns around sustainability of platforms after development, given that most were developed under contract with private corporations, with limited knowledge transfer after deployment.

Increased Internet Use for Education, Health, and Culture

Projects in furtherance of this specific objective saw the greatest number of approvals and commitments in 2021. 466 projects were signed for the purchase of tablets (out of which 1 was

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cancelled and 293 were transferred to Priority Axis 4). Further, 2 new projects were approved to support and scale up the use of digital systems and telemedicine within the healthcare system. However, all contracts for these projects were signed in 2021, amid the COVID-19 pandemic, and thus, their implementation remains in fairly early stages.

Beneficiaries in the areas of education, health and culture reported being challenged by the length of the procurement process and their relative lack of familiarity with the workings of the European funds. Some beneficiaries reported difficulties in procuring hardware (laptops and tablets) for education in time for the start of the school term, while others stated that they faced delays in processing the requisite documents due to the inherent complexity of the process. Given the early stages of implementation of all projects (except for E-Culture, which will be covered as a case study), effectiveness remains to be evaluated.

Status of Indicators under Priority Axis 2

Table 5: Indicators, targets, and their current status

Code	Indicator Name	Unit of Measurement	Investment Priority	Target	Status	Notes
CO10	ICT Infrastructure: Additional households with broadband access of at least 30 Mbps	Households	2.1	300,000	0	As of 31.12.2021, no financing contract was completed with the indicator CO10 (27 NGA + RoNET)
3S8	NGA broadband coverage / availability	Percent of households	2.1	80	87	Data as of 2020, EC
3S9	Gross value added generated by the ICT sector	Percent GDP	2.2	5	3.69	INS, 2020 - calculated according to the methodology approved at the COP level

3S11	Support for innovative ICT products and services	Products/services	2.2	45 (33 for less developed regions, and 12 for more developed regions)	153 (103 in less developed regions; 50 in more developed regions)	Reporting by OIPSI
3S43	IT systems developed / updated / extended in the field of e-health	IT systems	2.3	2 (1.5 for less developed regions, and 0.5 for more developed regions)	0	While both projects have been signed, they are still under implementation and thus this indicator is yet to see progress.
3S53	The capacity of telemedicine systems supported by the project	Patients/day	2.3	100	NA	NA
3S16	Security Audits Implemented	Security audits	2.3	300 (260 for less developed regions, and 40 for more	0	4 contracts aiming to conduct 549 security audits were signed. These projects are in implementation phase.

				develope d regions)		
3S17	Schools that use OER, WEB 2.0 in education	Schools	2.3	1,859 (1,617 for less develope d regions, and 242 for more develope d regions)	0	Projects in 2000 schools are in implementation phase, with the majority signed in 2021.
3S18	Medical practices and hospital units that use telemedicine systems	Medical units	2.3	139 (121 in less develope d regions, and 18 for more develope d regions)	0	18 contracts have been issued, with all projects in implementation phase.
3S19	Items of cultural heritage digitised	Cultural products	2.3	184,378 (160,496 in less develope d regions, and 23, 982 in more	577,391 (505,217 from less developed regions and 72,174 from more developed regions)	Project in implementation but to be closed in July 2022.

				develope d regions)		

Source: Evaluation team, in consultation with COP-MA, OIPSI, and beneficiaries

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4.   Efficiency

The two key questions that the efficiency analysis seeks to answer are as follows:

1. How efficient were COP project selection and implementation processes?
2. How efficient were COP projects relative to relevant outcomes?

Output 2 primarily dealt with efficiency of processes used for selection and implementation. Efficiency, however, encompasses a larger question of value generated by the outputs vis-à-vis inputs (investments) made by the COP PA2, and thus, the question of efficiency of products developed relative to outcomes (question 2 above) is critical to answer. Various methods of calculating efficiency exist, including cost-effectiveness analysis, benefit-cost analysis, and an estimation of the social return on investments. This evaluation report approaches this via a simple cost-per-output approach for products and services already delivered under IP2.2, given the advanced nature of their implementation.

Calculating the cost-effectiveness of a program can offer insights into the value for money generated for any given investment. Cost-effectiveness analysis (CEA) summarizes complex programs in terms of a simple ratio of costs to outcomes (which, in the case of COP PA 2 IP 2.2, is the number of products and services developed). CEA may not, by itself, provide sufficient information to inform all policy or investment decisions, but it can be a useful starting point to have a statistic that can help compare various policies. To calculate cost effectiveness, two pieces of data are essential: an estimate of the program's outcome and the cost of the program.

In the case IP 2.2 investments, a total of 153 ICT products/services have already been developed for the purpose of digitizing enterprises supported by COP, with an estimated minimum output of 240 products (assuming at least 1 product/service developed per project in implementation, and no cancellations) until completion in 2023. Using the total project value of investments by stipulated end year of each project (until 2023), as well as a discount rate of 5.4 percent[7], the net present value (NPV) of investments in IP 2.2 amounts to RON 9,510,689.99 (Table 6).

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[7] This is in line with European commission regulations on the use of discount and interest rates for state-aid interventions in Romania. https://ec.europa.eu/competition-policy/state-aid/legislation/reference-discount-rates-and-recovery-interest-rates/reference-and-discount-rates_en.

Table 6: Assumptions underlying the Cost-per-Product Analysis

	2017	2018	2019	2020	2021	2022	2023	**Products** (total number of products expected on IP 2.2 by 2023)
GDP (EUR million, current prices)	195947.2	205184.1	214374.6	200087.6	211277.5	215291.8	22411874	
GVA (Eurostat)	3.53	3.74	3.74	3.95	4.16	4.58	5.21	
GVA as a percent of GDP	6916.936	7673.885	8017.61	7903.46	8789.144	9860.363	1167659	
NPV (GVA)	1307.035							
								240
Costs (Total project value of IP 2.2 projects In RON)		13365083	2.66E+08	2.12E+08	44476267	8.37E+08	8.32E+08	

The cost-per-output/service developed, as a result, is RON 39,627.87. Given the diverse nature of products and services financed under the program (ERP, website development, supply chain platforms, etc.), this average figure may not be representative of the value for money for each product/service financed under the project. In this case, while the costs are expressed in comparable units (RON), economic effects of each output, for instance, such as time savings due to different outputs, is not possible to be obtained at this stage. However, relative to overall costs for implementation of major software (ERP, accounting)[8], 8000 EUR per product/service is highly competitive, and at market rates in Europe, especially for SMEs.

Incorporation of benefits and investment costs is central to cost-benefit analysis (CBA), which provides an estimate of value for money generated from investments in a programme. However, undertaking an evaluative CBA (evaluating something that has already occurred) requires granular high-quality and relevant data. As projects across all investment priorities are still under implementation, a full cost-benefit analysis is proposed for Output 4, which will undertake a detailed costing survey with beneficiaries to assess relevant costs, as well as a fuller understanding of benefits accrued. Based on beneficiary surveys and outcome indicators used for the evaluation, the benefits are quantified by the change in gross value added by the ICT sector (a key outcome of the programme), owing to greater productivity and efficiency due to digitalization support provided via the program.

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[8] Market research for the average cost of implementation of ERP software suggests ~9000$ (see: https://softwarepath.com/guides/erp-report) ; that for accounting software can range between US$5 and 5000 on a subscription basis (see: https://www.softwareadvice.com/resources/accounting-software-pricing-guide/).

5.   Impact

This chapter seeks to answer the following questions:

1. What is the observed progress in meeting the stated objectives in targeted sectors, territories, and population groups since the beginning of the interventions (gross effects)?
2. **To what extent may the observed progress be attributed to the funded interventions (net effects)?**
3. What are the unintended effects of funded interventions, positive or negative, if any?
4. Are there any effects of funded interventions beyond the targeted territory, sectors, or groups (spill-over effects)?

The observed progress in meeting the stated objectives (gross effects), classified by investment priority, is provided in Table 5: Indicators, targets, and their current status.

Owing to varying stages of completion of projects under Investment Priority 2.1 and the nature of projects under Investment Priority 2.3, the evaluation of net effects via counterfactual impact evaluations is restricted to projects under Investment Priority 2.2. The details of this counterfactual evaluation are provided in the next sections. Unintended effects and spillover effects were not able to be studied due to projects' progress as of the time of the analysis, and given the early stage of implementation of many projects.

Counterfactual Impact Evaluation for Investment Priority 2.2

Investment priority (IP) 2.2 funded digitalisation of small and medium-sized enterprises (SMEs) as well as development of innovative products and services to increase gross value added by the IT&C sector to GDP. *The counterfactual evaluation asks the question whether receiving programme funding had any significant effect on firms' profitability (direct effects)*. While indirect effects such as an increase of R&D expenditures and number of patents filed were also considered, the dataset had too many zeroes and missing values to permit good estimation. Therefore, the effects are measured by the following impact variables: change in firm size (number of employees), fixed assets expenditures, operating revenues, turnover, and net profits.

The treatment group included firms approved for funding in 2017, while the control group was chosen from among the firms that applied for and were approved for programme funding in subsequent rounds of funding applications under the same investment priority in 2019 and 2020. The method we used to gauge the effect of programme funding is to compare the beneficiary firms in the first call (the treatment group) with those approved later (the control group), to control for unobservable characteristics of firms. The team closely looked at the scoring data for each call and the weights for different criteria, as well as confirmed that the evaluation process and evaluation personnel were similar for all calls. We also ran controls for other variables that could

have affected the indicators of interest (firm age and firm location). Thus, our analysis is a close approximation of studying the causal impact of getting programme funding.

We performed a difference-in-differences (DiD) analysis using a dataset of microdata on all firms in Romania from 2007 to 2020 (about 13 million observations in total). The evaluation team merged data from the COP Managing Authority on beneficiaries awarded funding in 2017, 2019 and 2020.This data was mapped to data with financial and performance variables across all rounds, to obtain the dataset fo4r the evaluation.

We checked the validity of the DiD approach by testing for the parallel trends assumption in the 2007–2020 period (the universe for which data is available) and discussing why the stable unit treatment value assumption (SUTVA) holds. This section is updated for 2020.

Stable Unit Treatment Value Assumption

SUTVA requires that the response of a particular unit depends only on the treatment to which the unit was assigned, not the treatments of others around it. In this analysis, SUTVA is not violated as we do not have evidence of increased inter-firm interaction and collaboration because of the support made possible by the investment priority funding. The nature of funding is such that it directly benefits the firm in improving its processes and digitalization. There is no data on inter-firm activities and since firms in the same industry are competitors rather than collaborators, it is safe to assume SUTVA holds.

Parallel Trends Assumption

The parallel trends assumption requires that the untreated units provide the appropriate counterfactual of the trend that the treated units would have followed if they had not been treated – that is, that the two groups would have had parallel trends. If parallel trend assumption does not hold, the estimation of the causal effect will be biased. Although there is no statistical test for this assumption, visual inspection is useful when we have observations over many time points. It has also been proposed that the smaller the time period tested, the more likely the assumption is to hold. In this analysis we use one year as the time unit and compare the time trends of turnover, firm size, net profit, operating revenues, and fixed assets of treatment and control groups before and after the treatment (year 2017) to check for parallel trends. Figures 15 to 2019 show parallel trends in turnover, number of employees, net profit, operating revenues, fixed assets, and patent application respectively for treatment (green graph) and control (red graph) groups.

Figure 15: Turnover of Treatment and Control Firms, 2007-2020
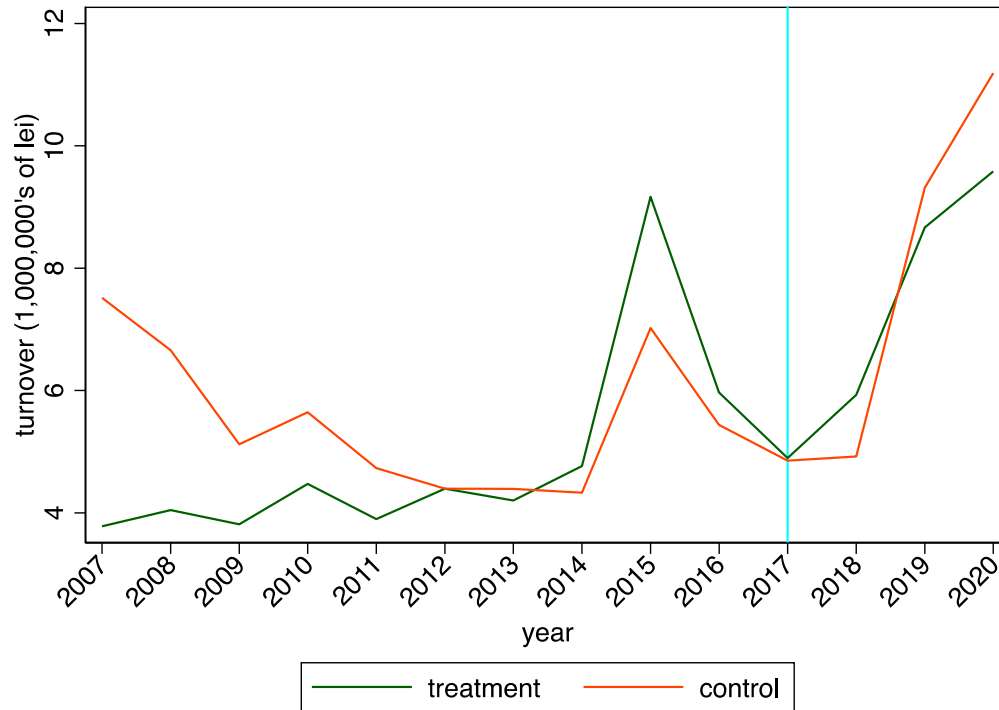
Source: Original analysis using a custom dataset comprising variables from the NTRO and COP-MA.

Figure 16: Firm Size of Treatment and Control Firms, 2007-2020
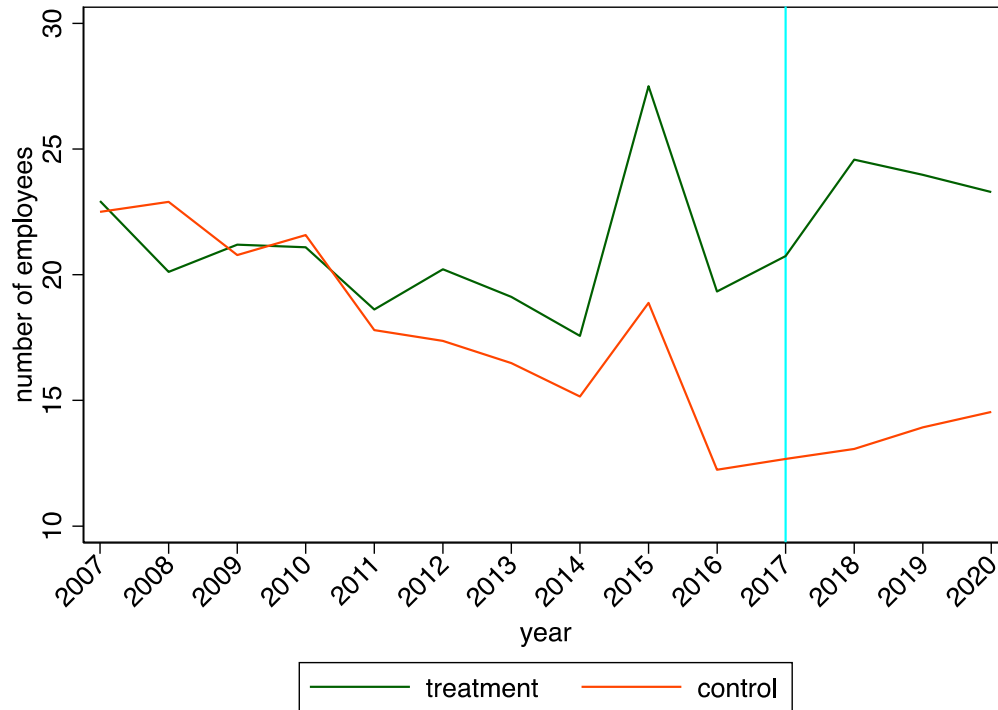
Source: Original analysis using a custom dataset comprising variables from the NTRO and COP-MA.

Figure 17: Fixed Asset Expenditures of Treatment and Control Firms, 2007-2020
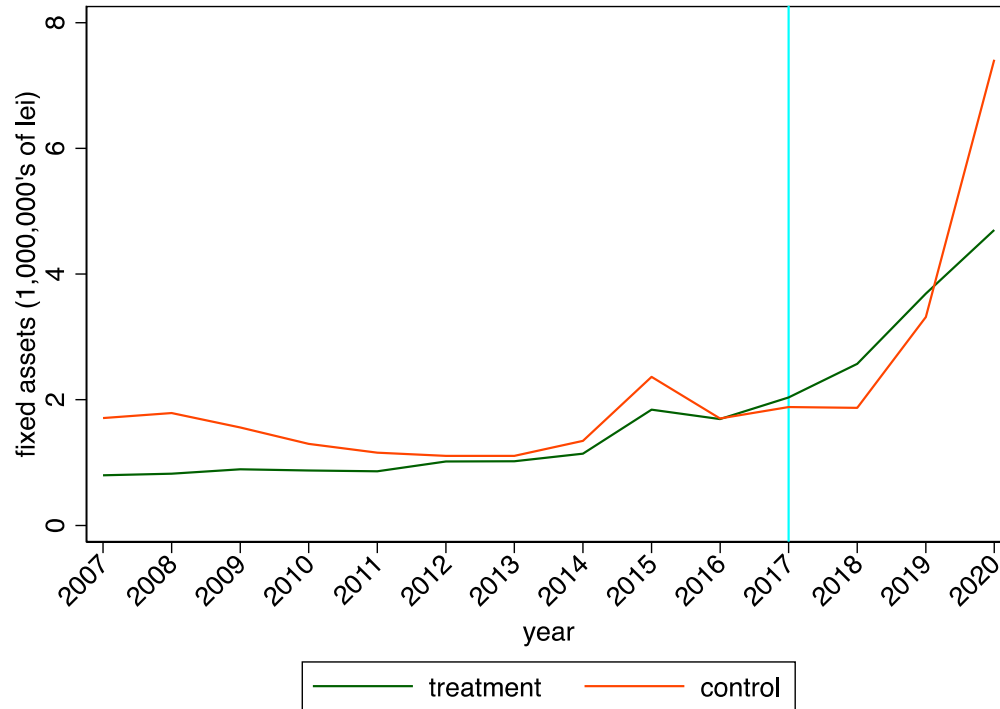
Source: Original analysis using a custom dataset comprising variables from the NTRO and COP-MA.

Figure 18: Net Profit of Treatment and Control Firms, 2007-2020
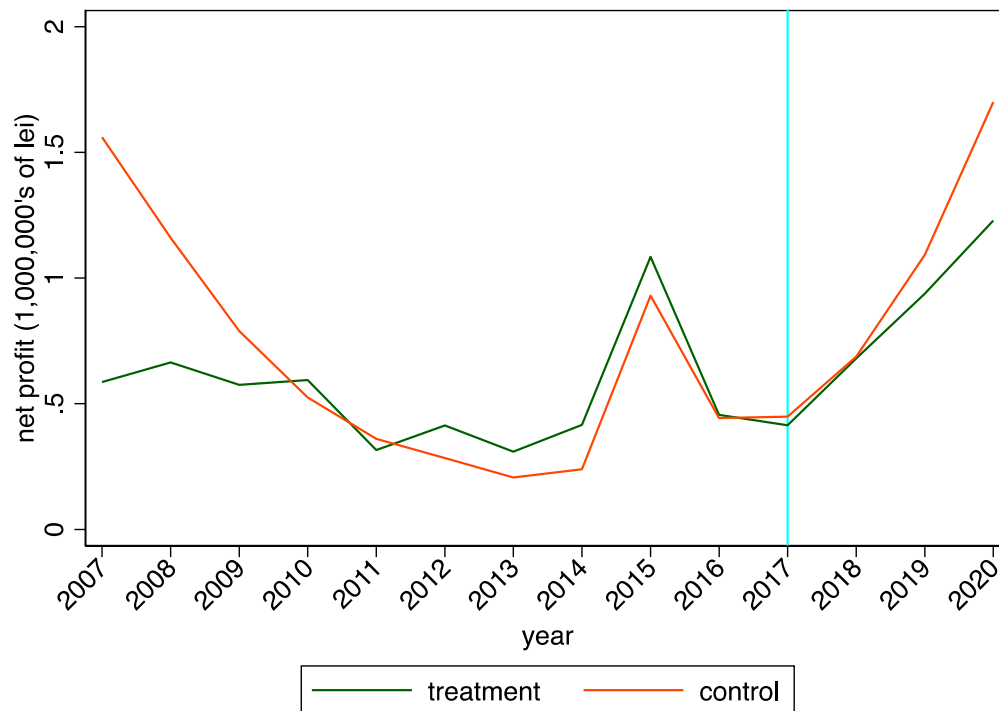
Source: Original analysis using a custom dataset comprising variables from the NTRO and COP-MA.

Figure 19: Operating Revenues of Treatment and Control Firms, 2007-2020
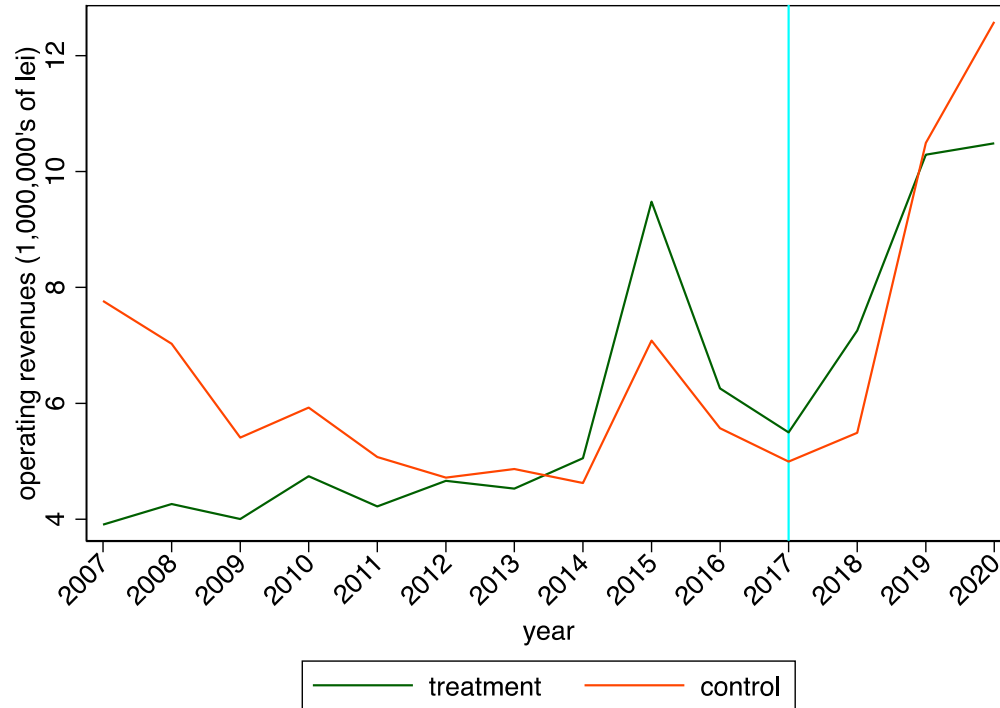
Source: Original analysis using a custom dataset comprising variables from the NTRO and COP-MA.

Although the graphs of parallel trends above offer a direct way to compare the trends of the treatment and the control groups, a more accurate and statistically solid method to verify the parallel trends assumption is to use event study analysis and run an ordinary least squares (OLS) regression to compare the coefficients of interactions terms (between year variable and treatment

indicator) with 0. Figures 20 to 24 show the plots of coefficients for five result variables: turnover, number of employees, net profit, operating revenues, and fixed assets respectively.

Figure 20: Event Study Analysis; Turnover of Treatment and Control Firms, 2007–2020
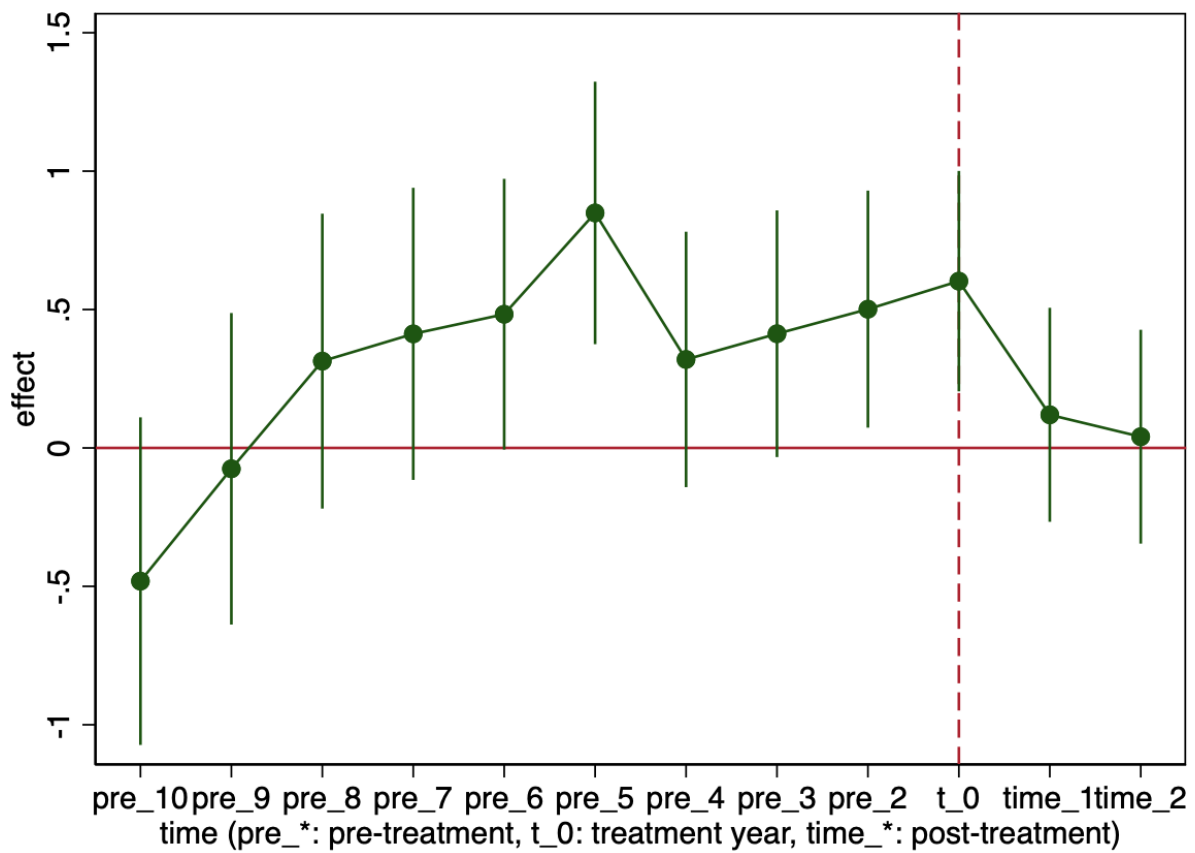
Figure 21: Event Study of Number of Employees of Treatment and Control Firms, 2007-2020
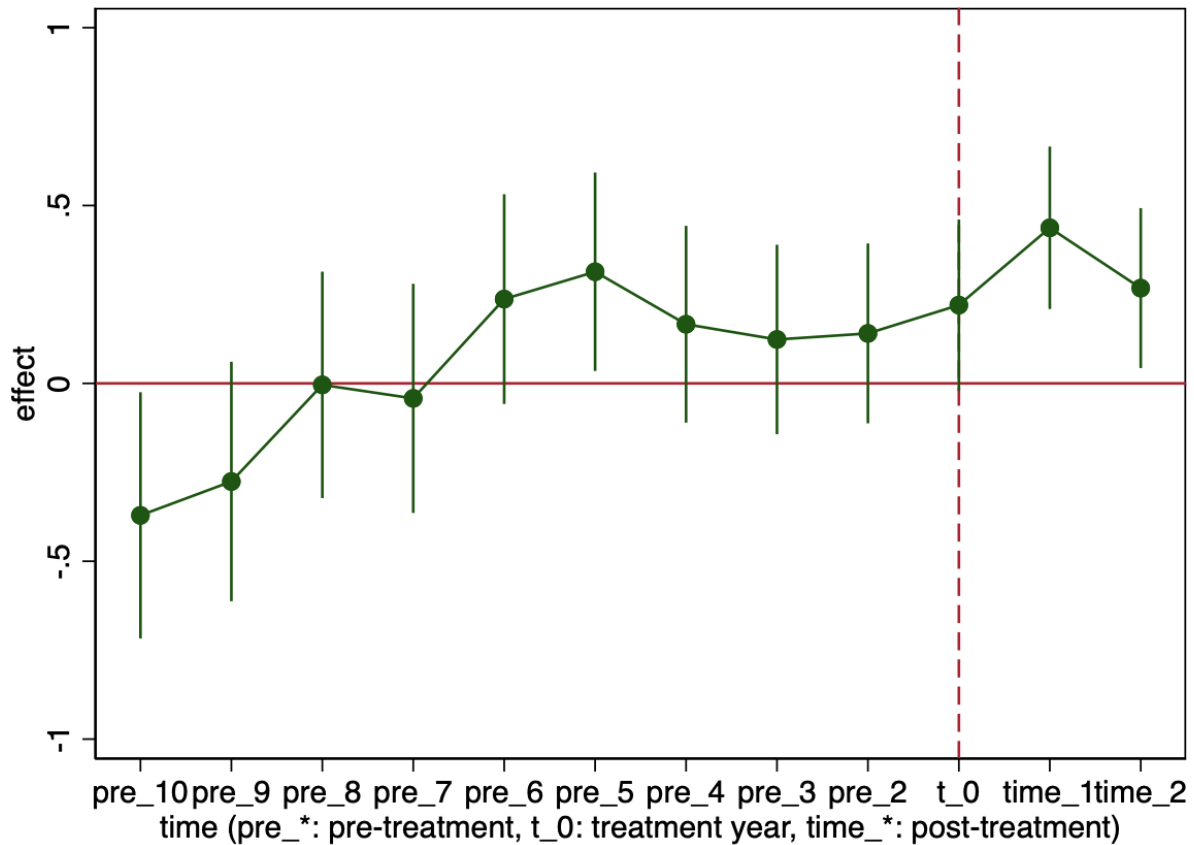
Figure 22: Event Study of Net Profit of Treatment and Control Firms, 2007-2020
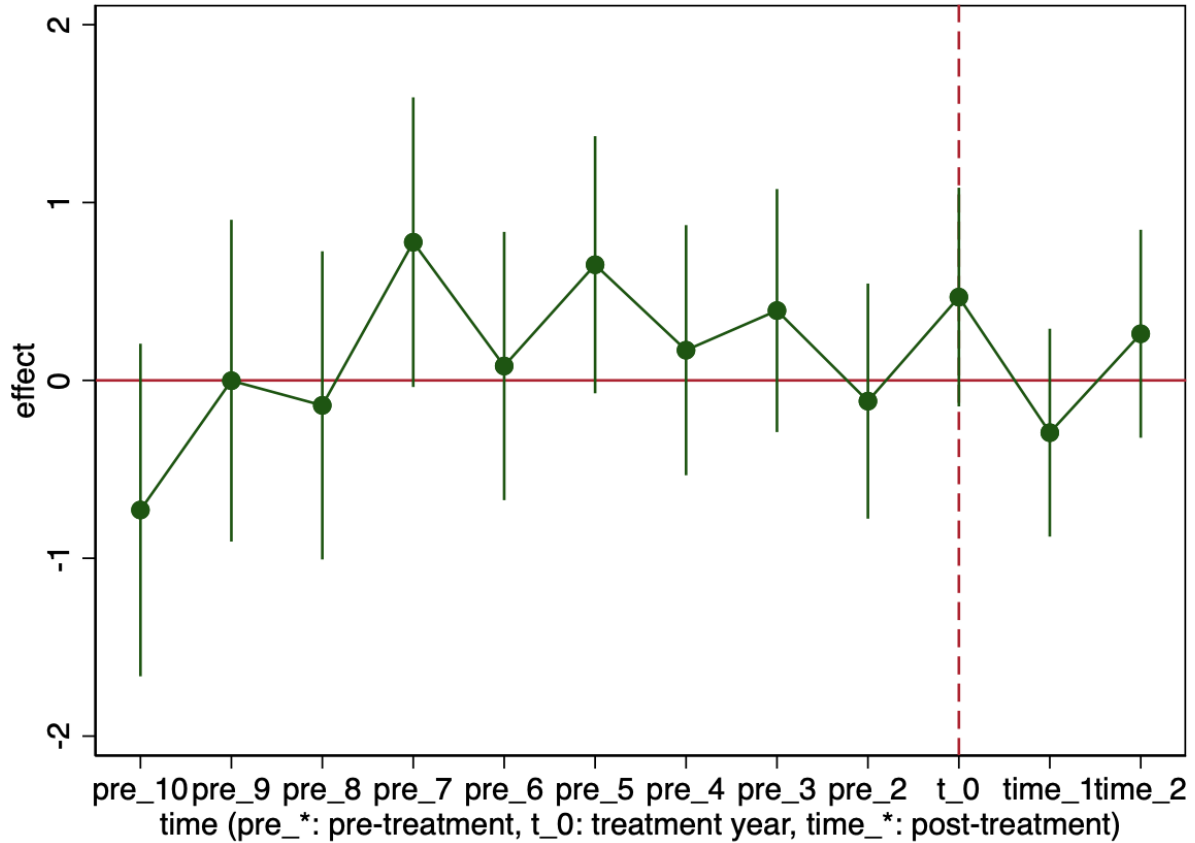
Source: Original analysis using a custom dataset comprising variables from the NTRO and COP-MA.

Figure 23: Event Study of Operating Revenues of Treatment and Control Firms, 2007-2020
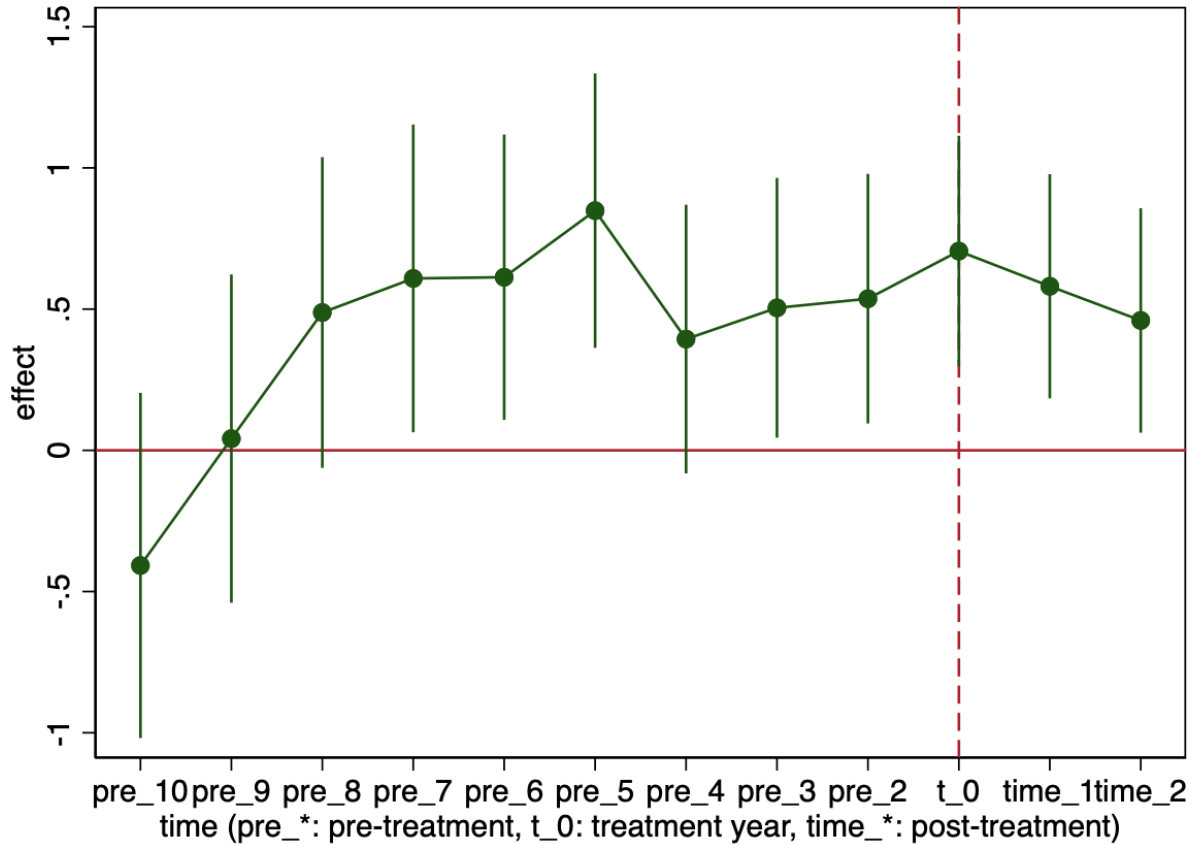
Source: Original analysis using a custom dataset comprising variables from the NTRO and COP-MA.

Figure 24: Event Study of Fixed Assets of Treatment and Control Firms, 2007-2020
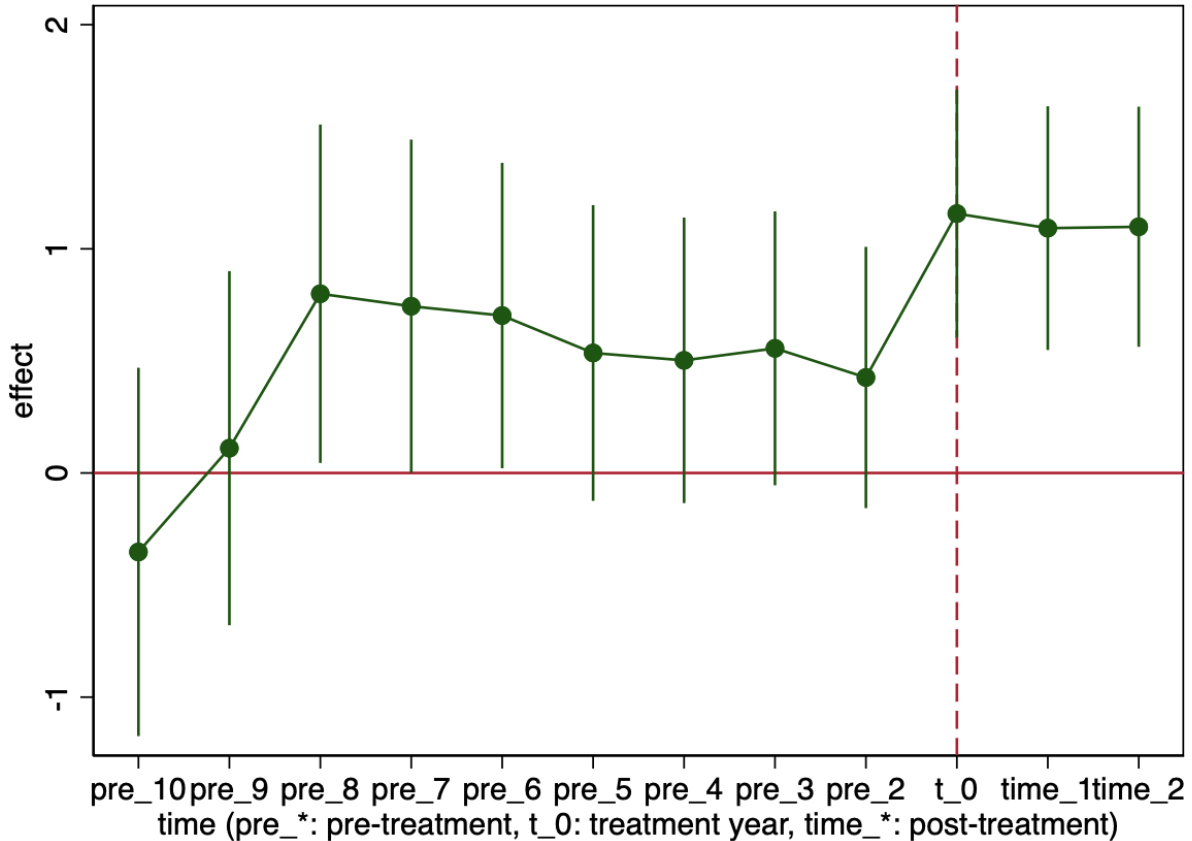
Source: Original analysis using a custom dataset comprising variables from the NTRO and COP-MA.

From the coefficient plots above, we see no significant difference between the treatment and control groups before the treatment year, especially during the last four years before treatment. There is also no clear time trend. Further, it is reasonable to think the parallel trends assumption is justified. According to the beneficiary survey, firms granted COP funds have not received significant funding from other programs, even during COVID-19. From our interviews and focus groups, no sector-specific or region-specific shocks were perceived as a threat to the findings.

We, therefore, proceed with a difference-in-differences estimation of first-round beneficiaries against future round beneficiaries. Table 6 below summarises the statistics of the two groups.

Table 6: Summary Statistics for Treatment and Control Groups for Investment Priority 2.2 Counterfactual Evaluation

Variable	First-round Beneficiaries (treatment)	Future-round Beneficiaries (control)

	Mean/Standard Error	Mean/Standard Error
Year of Approval	2017 [0.000]	2020 [0.522]
Year of Incorporation	2007 [6.382]	2008 [7.865]
Turnover (2020 RON)	6,057,909 [1.44e+07]	6,654,337 [1.66e+07]
Number of workers	22 [35.386298]	16 [30.078]
Net Profit (2020 RON)	663,817 [1795879]	783,465.8 [2201906]
Operating Revenues (2020 RON)	6,743,869 [1.54e+07]	7,224,950 [1.77e+07]
Fixed assets (2020 RON)	2,048,604 [5354244]	2,525,369 [6811646]

Source: Original analysis using NTRO and COP-MA data.

Difference-in-Differences Estimation

The difference-in-differences estimation reports the results of panel data model with fixed effects. This analysis utilizes the panel data of firms over time from the National Trade Registry Organization (NTRO), as panel contains more information, more variability than pure time series data or cross-sectional data. Panel data models can examine geographical variation effects at the county level, and time effects, providing more precise answers to evaluation questions than pooled data alone. A fixed effect (FE) model examines if intercepts vary across county or time-period, or both.

Below are five sets of data analysis where the first scenario illustrates pooled data regression and the last four scenarios have no fixed effects, county fixed effects, year fixed effects, and county-and-year fixed effects included in the regression equation respectively. Note that we do not include the variable for spillover effects on innovation due to lack of within-group variation.

Table 6 contains all the DiD estimates for the four kinds of panel data regressions with robust standard errors. We can see that the results are significantly different from the results from the pooled data regressions.

Table 6: Difference-in-Differences Estimation Results (with and without Fixed Effects (FE))

Model	Fixed asset expenditures (log fixed assets)	Turnover (log turnover)	Firm size (log employee)	Net profit (log net profit)	Operating revenues (log operating revenues)
Pooled data	0.563**	0.122	0.258**	0.0502	0.356**
	(0.228)	(0.185)	(0.123)	(0.214)	(0.176)
No fixed effects	0.212	-0.183	0.266**	-0.0521	0.0318
	(0.264)	(0.182)	(0.113)	(0.211)	(0.180)
County FE only	0.202	-0.199	0.260**	-0.0607	0.0137
	(0.265)	(0.182)	(0.111)	(0.211)	(0.181)
Year FE only	0.156	-0.203	0.238**	-0.0649	0.00250
	(0.277)	(0.190)	(0.118)	(0.213)	(0.190)
County-year FE	0.145	-0.218	0.233**	-0.0747	-0.0146
	(0.279)	(0.190)	(0.116)	(0.213)	(0.191)
N	1910	2026	1905	1782	2040

Note: Robust standard errors are given in parentheses.

Source: Original analysis using a custom dataset comprising variables from the NTRO and COP-MA.

The main specification – which includes county and year fixed effects in the estimation model – shows no statistically significant effects on fixed asset expenditures, operating revenues, or net profit. There is, however, a statistically significant increase in firm size, which may be explained by investments in human resources to help manage new digital products and services that have been developed using these interventions.

To understand the mechanisms that explain this lack of impact, the evaluation conducted six in-depth interviews, and additional econometric analysis that may help explain the findings. As detailed in the methodology section, interviewees were sampled at random in each call, to ensure diversity among beneficiaries at various stages of completion.

First, the team conducted econometric analysis to determine if there were structural differences between the applicant firms and non-applicant firms which may explain the absence of impact. In particular, the team was interested in understanding if certain types of firms – such as those more likely to become bankrupt in the short term – preferentially applied to EU funding opportunities.

To test this hypothesis, a comparison between the firms which applied for EU funds and those which didn't is utilized. The full dataset using the original data from NTRO containing more than 8 million firms' financial information from 2007 to 2019 is first restricted to only those companies in the same set of industry sectors as those applicant firms. Additionally, the analysis leaves out the observations after year 2017 to abstract from the effect of application. The final dataset

contains about 4 million observations. Regressions on the pooled dataset are run to compare between the firms which applied for EU funds and those which didn't.

The most well-known index of bankruptcy likelihood is Altman's Z-Score[9]. With the data we have and based on Altman's Z-Score index, we constructed three dependent variables. They are three ratios: operating revenues to total assets, non-fixed assets to total assets, and equity to total assets. Each of these ratios measure some aspect of financial health of a company and its ability to weather negative shocks. However, results of this model on all three ratios suggest no significant difference of financial health between the applicant firms and the rest of the firms within the industry. In fact, when profits are regressed against the applicant indicator (that is, an indicator constructed to denote whether a firm is an applicant to the call or not), controlling for year and industry fixed effects, the results suggest that on average, applicant firms have a slightly greater profit than non-applicant firms (significant at the 95% level), all other things remaining equal. This suggests that it is not inherent firm selection or characteristics that are driving the lack of impact.

Therefore, the evaluation then assessed how firms were utilizing the EU funds, using in-depth interviews, in an effort to understand underlying mechanisms for the lack of impact. Six firms agreed to take part in the interview process out of total of 9 companies that were randomly selected. The qualitative analysis from interviews suggest that while some firms enjoyed a minor increase in turnover and profitability, this may not be a direct result of COP funding. The primary reason for this is the early stage at which products funded by the COP are, vis-à-vis the market. Interviewed firms suggested that, while they had developed products using COP funding, they were in the investment or market-testing phases, with little revenue to show on the books from products created through COP funding.

Further, most projects used the available funds to hire programmers – some as large as a team of seven to create a product, in one case. Consistent with EU co-financing rules, some companies used their own funds to finance some components of the project – typically human resources and some hardware. In one case, the firm suggested purchasing dedicated space to store and process data via a data center, given the nature of their product relying on machine learning techniques requiring vast computing power. The move by firms to hire more human resources is consistent with the results of the difference-in-difference analysis, which does suggest a statistically significant improvement in firm size. However, such investments are lagged in their ability to impact profit and turnover, due to the inherent time taken for the development, testing, and marketing of a product. All companies, while noting that that they perceive themselves as being more competitive after implementing the COP funded projects, suggested that the sustainability of project results will be determined by their success in the market over next few years.

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[9] For more information on the Altman's Z score, kindly see: Bellovary, Jodi L., Don E. Giacomino, and Michael D. Akers. "A review of bankruptcy prediction studies: 1930 to present." Journal of Financial education (2007): 1-42.

As a result, the lack of impact, as revealed by the counterfactual impact evaluation, may not necessarily suggest the absence of impact of the programme, but the limited time duration after which the results were being evaluated. A full ex-post evaluation after a couple of years may yield more valuable results, as it would give beneficiaries necessary time to approach the market. Further, impact may be limited by the ability of beneficiaries to retain talent, ability to maintain performance at scale, and in some cases, such as with products relying on AI/ML technologies, ability to maintain large storage and processing capacity.

Some interviewees also indicated the need for COP funds to be less administratively burdensome. The processing of paperwork for the procurement of goods and services, and documentation required for the subsequent payment of funds was perceived as a substantial burden on small firms' time. One firm also suggested that payments for activities had been delayed by as much as four months, leading to some liquidity constraints. While not the primary reasons for the lack of impact, analysis of interview responses suggests the need for greater streamlining of administrative procedures in relation to IP 2.2.

Further, an assessment of impact also requires an assessment of unintended effects and spill-over effects, beyond gross effects and net effects. Counterfactual impact assessments are feasible for interventions under Investment Priority 2.2, but not for Investment Priority 2.3. Therefore, these projects are studied through three case studies, which were developed for projects in advanced stages of implementation at the time of this evaluation.

Case Studies for the Assessment of Impact of Investment Priority 2.3

Case Study 1: E-Culture

Project Design

The 2011 European Commission (EC) recommendation 7579[10] stipulated that Romania should digitize 783.000 pieces of cultural heritage. In 2017, Romania had 150.000 cultural artifacts digitized, but as the Europeana.eu cultural platform changed its quality criteria, that number was reduced to approximately 100 in 2021. To implement the EC recommendation, the Ministry of Culture developed the "E-culture: Romania's Digital Library" project proposal, MySMIS code 11436, with the financing agreement signed on July 13th, 2018. The project was expected to be implemented in 3 years but was extended by 12 months.

The project is co-financed from European Regional Fund through the Competitiveness Operational Program 2014-2020, Priority Axis 2, Specific Objective 2.3.3. The total project value is RON 53.2 million, and Table 6 shows its breakdown by source.

Table 7. E-Culture Project: Funding Breakdown by Source

EU funding	National funds	Non-eligible funding
RON 43.6 million	RON 8.1 million	RON 1.5 million

Source: E-Culture project website.

31 cultural institutions were selected to digitize their artefacts during this project, including 19 museums, 5 libraries, the National Film Archive, the Romanian Television Society, the National Heritage Institute, the National Library of Romania, and the "Constantin Brăiloiu" Ethnographic and Folklore Institute[11]. Figure 25 summarizes the project's theory of change:

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[10] https://ec.europa.eu/transparency/documents-register/detail?ref=C(2011)7579&lang=EN.
[11] The list of cultural institutions participating in the E-culture project can be viewed here: https://www.umpcultura.ro/e-cultura_doc_1380_institutii-participante_pg_0.htm.

Figure 25. E-Culture Project: Theory of Change

Issues		Interventions/ Actions		Outputs		Outcomes		Long-term outcomes
• Lack of digitized cultural resources • Low access to cultural resources for the wider audiences • No interconnectivity between Romanian cultural institutions	→	• Creating an online platform that can be a shared catalog and resource for the public • Digitalization of mobile cultural heritage	→	• Creating the Culturalia.ro platform • 560.040 cultural resources digitized • 200.000 cultural resources uploaded to Europeana.eu	→	• Increased access to culture for the wider audience • A shared catalog that can be used by professionals in the cultural sector • Improved public services offered by the Ministry of Culture	→	• Preservation of Romania's cultural resources • Future generations will be able to easily access Romania's cultural resources

Source: Evaluation team

The project's objective is to digitize Romania's cultural movable heritage, with the help of modern IT technologies, to preserve and promote it for the benefit of future generations. In addition, the project aims to improve the public services of the Ministry of Culture by increasing access to cultural resources for the public by using the available information technology and communication (IT&C) resources to digitize movable cultural heritage. Figure 26 summarizes the project's results.

The two major components of the project are:

1. The development of the Culturalia.ro platform
2. The digitalization of the movable cultural heritage

The specific objectives of the project are:

- Increasing the number of digitized elements of cultural heritage stored online and made accessible on a single platform;
- Increasing the interconnectedness between institutions that work with cultural resources;
- Promoting cultural resources by posting them publicly on the Europeana.eu platform.

Figure 26. E-culture Project: Expected Results

| Result 1 | 560.040 cultural resources digitized and publicly available in Romania's Digital Library | Result 2 | The development of an IT platform that can act as a digital library and shared catalogue (Culturalia.ro) | Result 3 | 200.000 cultural resources digitized and delivered to Europeana.eu |
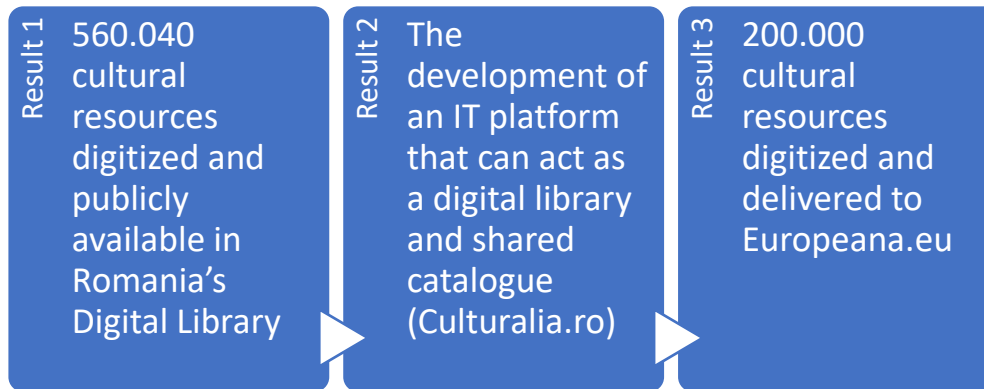
Source: Evaluation team

The design of the project was complicated by the necessity to conform to program level indicators. For the E-Culture project the mandatory breakdown by development regions was challenging since most museums are located in developed regions. This issue was mitigated by attributing artifacts to be digitized to their areas of origin, rather than locations where they were displayed.

Another issue with the design of the project was that it could not accommodate partnerships with other cultural institutions. Due to this impediment, cultural institutions that participated in the project could not be responsible for their own budgets and implementation timeline, therefore the onus fell on the Ministry of Culture Project Management unit to manage all aspects of the project.

Project Implementation and Current Status

The project's implementation started in 2018 and is on track to deliver on its main objectives, albeit with some delays. The Culturalia.ro platform has been delivered but it's still being tested, optimized and configured as of April 2022 (Figure 27)[12]. It is expected that by July 2022, most of the digitized cultural resources will migrate to the platform, but there's no clear timeline when it will be available for the wider audiences and professionals working in the cultural sector.

Figure 27. The Culturalia.ro Platform in Test Environment

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[12] The platform can be seen here: https://culturalia.ro/.

Source: https://culturalia.ro/.
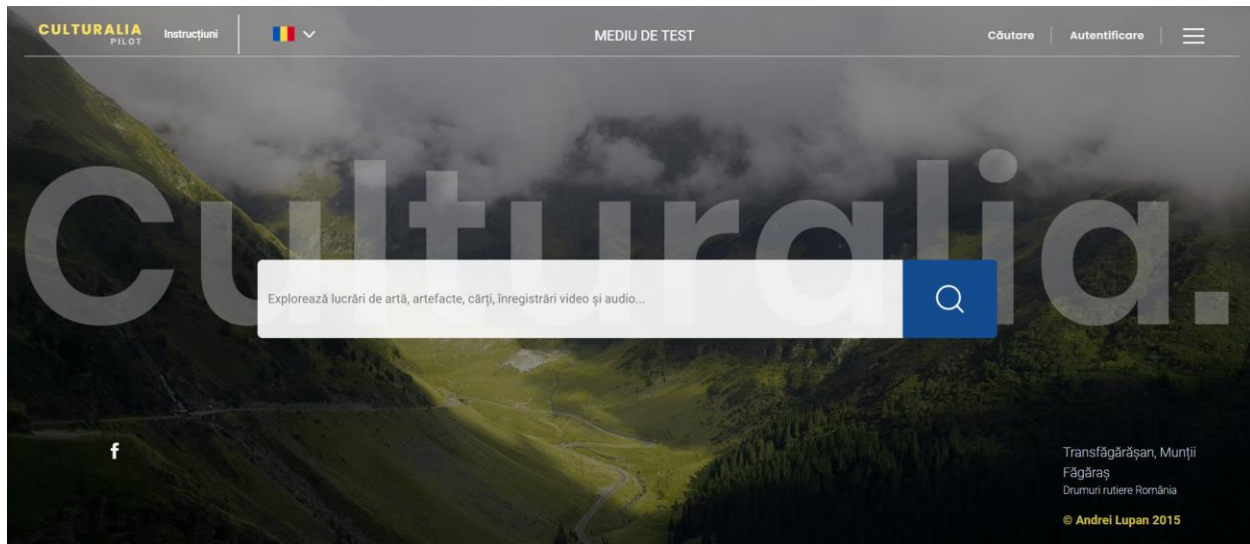
Several issues occurred during the lifetime of the project causing a 12-month delay. The issue faced by the Ministry of Culture's Project Management Unit can be summarized as follows:

- A stalled procurement process in the beginning of the project;
- An underestimation of the time needed to complete 3D scanning of the cultural resources;
- Miscommunication with the contractor on how the data migration for the platform should be conducted.

The project stalled in the initial stages due to the underestimation of the duration of the procurement process. In some instances, companies were not able to join the bidding process, especially for the acquisition of the equipment specified by the Romanian National Television (TVR). In all cases, the biding process needed to be redone from scratch.

The legislation affecting project implementation created several issues for Ministry of Culture. The Ministry of Culture was solely responsible for hiring the people needed to implement the project and had to adhere to the Romanian public administration procedure (job announcements, selection of candidates, organizing hiring exams). In addition, the Intermediary Body for the Promotion of the Information Society (OIPSI) asked to be notified after every hiring exam, which numbered approximately 50 in total during the lifetime of the project.

The digitalization of cultural resources will take longer than initially estimated. The 3D scanning for each cultural resources was expected to take up to 20-30 minutes but, in reality, it may take up to 3 hours. The Ministry of Culture had to procure 59 months of extra labour to complete this process. In addition, not all the necessary equipment to complete the process was purchased. Due to issues related to 3D scanning taking longer than expected, the project will be extended past July 2022.

The 3D scanning process was challenging due complex legal responsibilities for the integrity of cultural resources. It created a situation where one person was legally responsible for the integrity of the cultural resources and another for the scanning process.

Table 8. Types of Cultural Resources to be Digitized

Type of cultural resource	Number to be digitized
Books	16,500
Rare Books	3,390
Documents	268,820
Object digitized	140,500
3D digital objects	6,500
Audio	16,120
Video	9,400
Cultural Articles	120,000
Total	581,230

Source: Ministry of Culture Project Managing Unit link here.

The main challenges for the project were related to the development of the Cultura.ro platform. The complexity of developing a platform intended to be a repository for over 560.000 high resolution images of cultural artifacts (Table 7), presented a series of challenges that were underestimated by both the contractor and the Ministry of Culture.

Data migration was the main issue that strained communications between the Ministry of Culture and the contractor. To efficiently store the data, Culturalia.ro uses a non-static data model or metamodel called entity attribute model[13]. The issue stems from the fact that the complexity of data import was not captured by the tender book. This resulted in a series of divergent discussions between the Ministry of Culture and the contractor on how the data should be transferred to Culturalia.ro. The contractor developed the import mechanism, but as the data needed to be remapped for the platform's model, the Ministry of Culture needed the data import script. As the Culturalia website could not function efficiently without data migration, the project would have been considered a failure without it. The Ministry of Culture and the contractor understood the importance of delivering a functioning platform, so they managed to come to terms regarding the data migration in 2021. The import scripts have been developed by the contractor and are currently being optimized, thus paving the way for 80-90% of the cultural resources being added to Culturalia.ro by end of July 2022.

The development of Culturalia.ro needed more iterations than estimated by the contractor. The contractor estimated that 3-5 iterations will be needed for the platform in total, but actually 10 iterations were needed on core elements and 18 on details. The was partly due to the fact that the Ministry of Culture developed its vision of how the platform should work as it started using and

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[13] Information on the Entity Attribute Model can be found https://en.wikipedia.org/wiki/Entity%E2%80%93attribute%E2%80%93value_modelhere

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understanding it. Due to the high number of iterations, the actual costs of developing the platform doubled, according to the contractor.

The monitoring of the project by Transparency International (TI) and the Institute for Public Policies (IPP) improved its transparency and implementation. In 2014, DG Regio and Transparency International (TI) decided to implement the Integrity Pacts[14] monitoring mechanism of selected EU funded projects with several Managing Authorities being invited to participate from all EU countries. The Integrity Pacts were developed in 1990 to prevent corruption in public contracting. MA POC, POR, and POCA agreed to be part of the Integrity Pacts. Initially, MA POC indicated the Ministry of Education's E-Government project for the TI monitoring, but as the project did not advance as planned, E-Culture was proposed as an alternative.

The independent monitor's recommendations in the two reports improved the overall quality of the documentation and their presence had a moderating effect for both sides. During the project's implementation, the TI team participated in coordination meetings between the Ministry of Culture and the contractor and were granted access to the procurement documentation. Both the contractor and of Ministry of Culture noted that TI's involvement had a positive effect on their communication, especially during the complicated discussions surrounding the data migration for Culturalia.ro.

The E-Culture project was affected by the first wave of COVID-19 pandemic in 2020. One institution closed during that period and the project was given a two-month extension. According to the Ministry of Culture, the major components of the project went along as planned with no major setback in the development of the platform and the digitalization due to COVID-19.

The current IT infrastructure made the adaptation to the pandemic easier. The Ministry of Culture, along with the whole public administration, adapted to the new environment by moving meetings online and teleworking, which was made possible by the high quality of internet connections in Romania.

Project Results

Despite some considerable delays in the development of the Culturalia.ro platform and the 3D scanning process taking longer than estimated, the E-Culture project is set to deliver on its main objectives. *Table* 9 shows the status of results at the time of writing of this report.

Table 9. E-Culture Project: Results as of April 2022

Result Indicator	Current status	Next steps
R1 - 560,640 cultural resources digitized and publicly available in Romania's Digital Library	573,211 cultural resources digitized	1. Uploading the cultural resources on Culturalia.ro and Europeana.eu.

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[14] For more information on the TI Integrity Pacts please click here.

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		2. 100,000 cultural resources are uploaded to Culturalia.ro but only 20% are live.
R2 - The development of an IT platform that can act as a digital library and national shared catalogue (Culturalia.ro)	Culturalia.ro is online but is still being tested, optimized and configured	1. Complete the data migration 2. 80 to 90% of digitized cultural resources will be uploaded by July 2022.
R3 – 200,000 cultural resources digitized and uploaded to Europeana.eu	No cultural resources have been delivered yet	1. The process will be initiated after the cultural resources are added to Culturalia.ro.

Source: Ministry of Culture

The project exceeded its target on Result 1 with 573,211 cultural resources digitized by April 2022. It is expected that by July 2022, 80 to 90 percent of the digitized cultural resources will be uploaded to the platform, but there's still no clear timeline when these resources will be available to the public and professionals from the cultural sector.

Result 2 has been completed with the Culturalia.ro platform delivered to the Ministry of Culture, but it is still in test environment. This is due to the fact that the platform was developed in parallel with the digitalization of cultural resources. As the museums and libraries use different software, the import scripts that adapt the fields of source datasets to new platform's database are being streamlined. This process is expected to be completed by the end of summer of 2022.

The process of uploading the cultural resources to Europeana.eu (Result 3) is a straightforward process but it is dependent on the completion of the data upload to Culturalia.ro. The server that will host the data to be delivered to Europeana.eu has been implemented. The software that will access the data from the server is currently being optimized. Once these steps are completed, the process will be automatic.

The digitalization of cultural resources will make a considerable difference to the working of the cultural sector. All institutions had to take stock and standardize their own cultural resources for uploading to the platform. As smaller institutions do not have the resources to buy and maintain servers, they will be able to take advantage on this new IT infrastructure free of charge.

More importantly, it will provide the public with over 600,000 digitized cultural artifacts and resources on one platform. It will be a significant resource for people who are interested in Romanian culture because they will be able to download books and historical videos which weren't easily accessible to the public earlier.

Risks to Sustainability

Not securing the budget to develop and maintain the platform is main risk to the sustainability of the project. The platform will be maintained by the contractor up to 2025, but there is a degree of uncertainty as to what will happen after that. Without political support within the Ministry of Culture, the platform might struggle past the maintenance period. Also, it is not yet clear which part of the Ministry of Culture will be responsible for maintaining the platform.

Another risk stems from need to ensure the right mix of expertise within the ministry to maintain the platform. The contractor will deliver the platform according to the Ministry's request that no major intervention on the code will be needed for the next 5 years. Nonetheless, the contractor recommends hiring a dedicated team of experts that could routinely maintain and develop the platform without any major overhaul. Hiring IT experts in the public sector, however, is complicated by the fact that salaries are not on par with the private sector where there is high demand for IT specialists.

Professionals in the culture sector may not transition easily to the new platform. As Culturalia.ro will become the new shared catalogue for cultural institutions, it will replace the tried and tested paper-based workflow. Naturally, there might be some resistance to this transition, therefore, political support will be key to ensure the use of this new platform. This might include normative acts, such as ministerial orders, that make the use of the platform mandatory.

Culturalia's relevance to the public demand is a key element that could secure its future. As proven by the closure of TVR Cultural, the public's interest in culture ebbs and flows. To mitigate this, a comprehensive public relations campaign may be needed to raise awareness of the platform. The Ministry of Culture intends to have a communication campaign to promote the platform in partnership with TVR, but this needs to take into consideration the current media landscape with streaming platforms vying for the attention of the public.

Lessons learned

Collaboration between contractors and the implementing team is key to the project's success. As the communication regarding data migration for the platform reached an impasse, the project risked ending in failure. The contractor managed to understand the Ministry of Culture's needs and changed the framework of how they addressed the issues that were important to the development of the platform. The Ministry of Culture's Project Management Unit went to great lengths to understand the platform to better tailor it to the needs of the cultural sector. This was facilitated by representatives from TI, who attended coordination meetings.

Program level indicators should be adjustable in line with the inputs from the experts who implement projects in certain sectors. In the case of the E-Culture project, the mandatory breakdown of indicators by development regions created some challenges because most museums are situated in developed regions. Since certain program level indicators may not relevant to some sectors, there should be a way to adjust them to sector context.

An independent organization monitoring important projects improves transparency and implementation. The monitoring of the E-Culture project by a consortium of NGOs led by Transparency International and the Institute for Public Policies improved the transparency of the E-Culture project and should be implemented more widely in projects funded through EU or national funds. Another unplanned, yet crucial, benefit of TI's presence is that it prompted both sides to seek common ground and overcome their differences on the data migration issue.

Project implementation would have benefitted partnerships between institutions, which is currently not permitted. Partnerships would have spread responsibility and bolstered the efficient use of resources among institutions, especially in cases where complex bureaucratic procedures are required. In the case of the E-Culture project, the implementing team had to hire a lot of people to be able to implement the project which, due to the public administration procedures, proved challenging.

Project design should include a post EU financing sustainability plan. Not securing the budget and human resources are the main risks to Culturalia's sustainability in the long term. Although the platform will be maintained by the contractor until 2025, it is not yet clear, if the Ministry of Culture will secure the necessary budget for developing and maintaining the platform afterwards. If the platform proves a success with the public, it may need to be improved in order to cope with added traffic.

Complex projects, such as digital platforms, need more guidance from IT experts. An independent team of IT experts working with Ministry of Communications, or the Government Chief Information Officer can help with project design and the evaluation of project proposals. This would ensure a better estimation of the complexity of the project, improve documentation, and ensure a higher degree synergy between government agencies.

Case Study 2: The Competition Council's Big Data Platform

Project design

The Romanian Competition Council is the authority tasked with the enforcement of national and EU competition rules[15]. To be able to fully fulfil this role, the Competition Council needed a tool that could analyze big volumes of data that have no apparent connections. A solution was provided by developing a big data platform that would enhance the Competition Council's capacity to analyze large amounts of data through automated processes.

The development of this platform was done through the "Optimization of interactions between the business environment by implementing an advanced analysis and data exchange mechanism through the development of an E-government and Big Data IT System within Romania Competition Council", MySMIS code 109641. The project co-financed from European Regional Fund through the Competitiveness Operational Program 2014-2020, Priority Axis 2, Action 2.3.1.

The project's financing agreement was signed on January 29, 2018 and was expected to be implemented in 36 months. A subsequent amendment extended the project by 12 months and the project ended on January 29, 2022.

The Competition Council partnered with Special Telecommunications Services (STS) on the technological side of the project.

The total project value is RON 50.6 million and the breakdown is shown in Table 9.

Table 10. Competition Council Big Data Project: Funding Breakdown by Source

EU funding	National funds	Non-eligible funding
RON 31.03 million	RON 5.76 million	RON 13.8 million

Source: Competition Council

The project's general objective was to operationalize the analysis of big volumes of data in order to support investigations and other functions of the Competition Council by implementing an IT system based on a big data platform (Figure 29).

Figure 28. Competition Council Big Data Project: Theory of Change

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[15] A full description of the Competition Council's responsibilities can be found here.

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Issues		Interventions/Actions		Outputs		Outcomes		Long-term outcomes
• T h e R		• Operationalization of the analysis of big volumes of data to support the Competition Council's investigations.		• Setting up a big data platform capable of analyzing the Romanian market in 5 areas of investigation.		• Improved operational capacity for the Competition Council in data processing. • Improved services for the private sector.		• Increased use E-Government services. • More competitive markets in Romania.

Source: Evaluation team

The Competition Council's Big Data Platform would help with the following five areas of investigation and analysis as presented in

Figure 29. Competition Council's Five Areas of Investigation

Rigged auctions	Cartel screening	Structural and commercial links between enterprises

Sector inquiries	Economic concentrations

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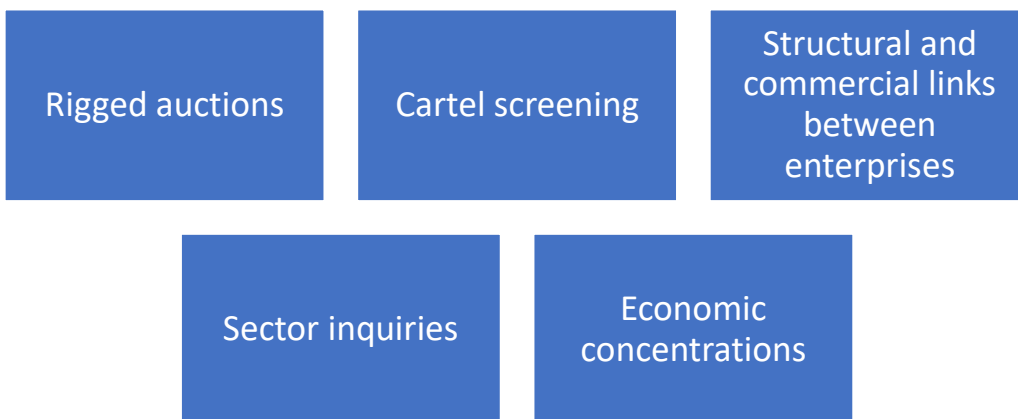
Source: Evaluation team

Five specific objectives (SO) embedded in the project design are summarized in Table 10.

Table 11. Competition Council Big Data Project: Specific Objectives and Results

Specific objectives (SO)	Results
SO 1. Implementing a big data platform by creating the analytical models supporting investigations using at least 9 data sources.	R1. Implementing a big data platform that would consolidate the Competition Council's data. R2. Integrating the structured, semi-structured, and unstructured data in the big data platform; integrating 9 data sources. R3. Implementing 10 reports that would help the strategic decision making of the Competition Council.
SO 2. Increasing the operational capacity by implementing a secured access to a big data platform for 50 users.	R1. Mobile access for 3 big data applications.
SO 3. Increasing the investigative capacity of the Competition Council by using the structured and unstructured data in 10 workflows.	R1. At least 10 workflows that generate data for the big data platform.
SO 4. Ensuring the analytical support for 5 major investigation areas.	R1. The following investigation areas will benefit from tailored big data analysis: screening for rigged auctions; cartel screening; connections between firms; economic concentration. R2. Integrating Council's IT systems in the big data platform.
SO 5. Increasing the capacity of the council's staff by training them in administering and using the big data platform.	R1. 10 Competition Council staff and 10 Special Telecommunication Services staff will be trained to administer the platform. R2. 150 staff of Competition Council will be trained to use the Big Data Platform.

Source: Competition Council

Processing big volumes of structured and unstructured data is a key aspect for Competition Council's investigations. This has been mostly done by consulting the paper archive or the Relational Database Management System, both methods having considerable downsides. A new instrument was needed to proactively flag competition and market distortions. The Big Data Platform will fill this gap in capacity and will provide material for starting investigations ex-officio.

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As private sector companies become more technologically advanced and employ machine learning and artificial intelligence, the Competition Council needed the Big Data Platform to better understand how companies function in this new environment. The implementation of the Big Data Platform will be the foundation for Council's future projects in high end technologies such as artificial intelligence and machine learning.

Understanding the technology was a key issue when the project proposal was written, therefore, the beneficiary had a steep learning curve to understand the potential of this technology and to tailor it to the needs and interests of the Competition Council.

Project implementation

Project implementation was delayed in the early stages. Approving the project's substantiation note through a Government Decision (GD) and responding to three challenges to the procurement process by one of the companies necessitated a 12-month extension, pushing the project's implementation timeline to 48 months. After the beneficiary managed to overcome these initial setbacks, implementation picked up and went without any major issues.

The approval of the project's substantiation note by a Government Decision (GD)[16] took longer than initially expected. The process took approximately 2 months due to several remarks made by the Ministry of Finance and the Economic and Technical Committee on the project's budget, delaying the launch of the tender process. The GD was approved by the Government on March 29, 2018, taking effect on April 11, 2018, when it was published in the Official Gazette[17].

Significant delays were caused during the procurement process as one of the companies challenged the procurement process three times. During the initial stages of the process, a demo session was organized for all the firms that passed the technical and eligibility evaluations. One of the companies that did not pass the demo stage contested the process. The National Council for Solving Contestations (NCSC) ruled in the Competition Council's favor[18].

The challenges to the procurement process created considerable staffing issues for contracted company. Although NCSC ruled in the Competition Council's favor, the challenges caused an 8-month delay in implementation. This setback proved problematic for the company that won the contract to develop the Big Data Platform, as it had to reallocate its human resources to other ongoing projects until a ruling was issued. After the NCSC decision, the contractor could not immediately allocate the right pool of experts to the project. Due to this misalignment, the relationship between Competition Council and the contractor reached an impasse that was overcome after both sides understood that another delay would pose a serious risk to the achievement of project objectives.

The beneficiary noted in the interview that the National Agency for Public Procurement's (NAPP) ex-ante evaluation of the documents created significant delays. NAPP has a key role in evaluating

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[16] The Government Decision can be found here.
[17] The Official Gazette can be found here.
[18] The CNSC rulings can be viewed here.

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projects' procurement documentation, but some aspects of the process, such as the duration of the review and repeated rejections of the documents with no clear guidance on how to address the problems, cause significant delays. The process is further delayed by the requirement that repeat submissions must be once again verified by the Economic and Technical Committee. The beneficiary cited a specific misunderstanding of a Ministry of Communications' instructions on certifications for security experts. Although included in the project's tender book, NAPP deemed the certifications excessive and ruled that they be removed.

During implementation, importing the databases from other public institutions was fraught with issues. The Competition Council's Big Data Platform needed to collect data from multiple public institutions, namely Electronic Public Acquisitions System (EPAS), Romanian Authority for Digitalization (RAD), National Trade Register (NTRO), Ministry of Justice, and National Agency for Fiscal Administration (NAFA).

For the platform to able to integrate the data correctly, a particular data index was needed for the database to work. Data from EPAS, RAD and NTRO had to be remapped 3 times due to technical difficulties, and additional human resources had to be allocated in order to complete the process.to it.

Certain measures implemented in response to COVID-19 pandemic facilitated project implementation. Paperless document flow, including digital signatures, became more acceptable to the Romanian public administration. Online coordination meetings were well attended and successfully replaced physical meeting. On the negative side, several key experts got sick and could not be easily replaced.

Results

The project closed in January 2022 and has delivered on all its objectives, but the platform is still being optimized and has yet to be used in Competition Council's investigations. As can be seen in Table 12, the project achieved or exceeded all key indicators.

Table 12. Competition Council's Big Data Project: Key Indicators

Indicator	Target value	Value obtained
Number of institutions using the information	3	3
Applications using Big Data Platform	1	1
Number of reports that can be used in the strategic decision making of the Competition Council	10	51
Number of integrated data sources integrated in the Big Data Platform	9	10
Number of mobile big data applications	3	10

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Number of workflows that generated data for the Big Data Platform	10	10
Number of investigation areas	5	5
Number of IT systems integrated in the Big Data Platform	3	4
Number of people from Competition Council and the Special Telecommunication Services trained to administer the application	10	15
Number of people in the Competition Council trained to use the Big Data Platform	150	169

Source: Competition Council

The Big Data Platform is functional, but it's currently being optimized so that it yields a manageable level of alerts. Initially, about 100 indicators were developed for the Big Data Platform, but in February 2022, the platform yielded 4,000 alerts. Therefore, these indicators are being refined and aggregated in order to reduce the number of alerts to a manageable level. After this optimization is completed, the implementing team is planning to work with various departments from the Competition Council to test the platform in an actual investigation. It also intended to revisit older cases to see if the analysis conducted with the help of the Big Data Platform will shed new light on them.

Over 20 years' worth of the Competition Council's paper archive has been digitized and integrated in the Big Data Platform, which is expected to reduce investigation times. Although the Council's archive is well organized, searching and gathering data for a market study used to take weeks, if not months. According to the beneficiary's estimation, the Big Data Platform reduces the data search time to around 5 minutes. Also, the Big Data Platform is expected to reduce the time of sector investigations, and investigations into distorting competition, which, on average, used to take about 6 months and 2 years respectively. Economic concentration is another key area monitored by the Competition Council, and the Big Data Platform will help make decisions regarding potential mergers a lot faster.

Another key result is that the Competition Council has switched to a paperless operation for increased efficiency. The implementation of digital workflows resulted in a significant reduction of the cumbersome paper trail that was needed for day-to-day operations. The workflows also allowed department managers to better understand the operational process and to implement measures to improve it. Moving towards a paperless operation improved the efficiency of decision making in the Competition Council.

Implementing the Big Data platform changed how the Competition Council is perceived internationally and in Romania. The platform will considerably increase the data gathering capacity of the Council and may reduce anti-competitive behavior. As similar big data projects implemented by competition watchdogs in Europe were more modest in scope, the international standing of the Competition Council of Romania has been boosted.

The Competition Council integrated IT strategy made possible the integration of the applications developed in the past. As the Council had the necessary documentation, the contractor could map the updates to REGAS and Price Monitor applications and integrate them with the Big Data Platform.

Risks to Sustainability

In the short term, securing the budget in order to maintain and develop the Big Data Platform has been identified as the key risk for the sustainability of the platform post EU financing. As the EU financing doesn't allow for maintenance activities to be a part of the contract, the Competition Council will need to secure funding from the state budget. Another sustainability risk is keeping up with the technological development of the market that Competition Council monitors. To remain relevant, the platform will need to be updated. This risk was partly mitigated by housing the platform hardware at the STS data center and benefiting from its expertise.

Attracting the right kind of experts is another key risk to the platform's sustainability. The platform will need highly skilled IT specialists to make new data correlations and analyses, especially after the platform has been used in Council's investigations. Since the salaries offered by public administration can't match what such IT specialists earn in the private sector, the Competition Council will need to find a way to attract the necessary cadre if the platform is to retain its viability.

The Big Data supporting in Platform's sustainability will depend on its contribution to Competition Council's investigations in the near future. As the platform is being rolled out and used in actual investigations, its track record of the first few tests will determine if it will be used extensively and to what extend it will improve the competitive environment.

Lessons Learned

Partnerships within public administration may optimize the use of human and other resources and help overcome programme limitations. When the maintenance of hardware could not be included in the financing requests, Competition Council entered in partnership with STS and outsourced this non-core competency to a specialized branch of the Romanian public administration.

Public institutions have different approaches to creating databases, which makes integrating them difficult. As it was the case with the data import from EPAS, RAD, and NTRO, the data were indexed differently, so remapping the data was a complex and time-consuming process for the contractor. The lack of a unitary approach in the development of similar platforms by public institutions may hamper similar attempts in the future.

Case Study 3: National Trade Registry Big Data Platform

Project Design

The Romanian National Trade Register Office (NTRO) is subordinated to the Ministry of Justice and tasked with assembling and keeping key information on Romanian companies. NTRO responsibilities include:

- Keeping the trade register;
- Archiving registration documents;
- Providing documents and information on companies upon request;
- Assisting legal and natural persons subject to registration in the trade register;
- Editing and publishing the Insolvency Proceedings Bulletin.

NTRO had to improve its internal reporting capabilities and its capacity to exchange data with other public institutions and the business environment. The issues stemmed from the fact that the institution had difficulties in running its extensive database. As NTRO had data exchange protocols with public institutions such as the National Agency for Fiscal Administration (NAFA), Ministry of Environment and the Competition Council, it needed a tool to enhance its capacity to analyze big volumes of structured and unstructured data.

Development of the NTRO's Big Data Platform was made possible through the "Improving the capacity to process data and reporting of the National Trade Register Office through Big Data architecture and technologies" project, MySMIS code 108513.

The project was co-financed from European Regional Fund through the Competitiveness Operational Program 2014-2020, Priority Axis 2, Action 2.3.1. The total project value is RON 31.4 million, split between EU and national funding (Table 12).

Table 13. NTRO Big Data Project Funding

EU funding	National funds
RON 26.5 million	RON 4.9 million

Source:

The general objective of the project was to develop NTRO's ability to process information and to deal with data requests from the public administration and private entities more efficiently, while also optimizing internal reporting and management[19].

Figure 30. NTRO Big Data Project: Theory of Change

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[19] Information available on the NTRO website: https://www.onrc.ro/index.php/ro/poc.

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Issues	Interventions/Actions	Outputs	Outcomes	Long term outcomes
● NTRO	• Creating a big data platform to be able to access NTRO's data in real time • Implementing a Business Intelligence platform for internal reporting	• Setting up a big data platform capable of accessing NTRO's data to process information requests more efficiently	• Improved operational capacity for NTRO in data processing • Resuming the data exchange protocols with other public institutions • Improved services for the private sector	• Increased use of e-government services

Source: Evaluation team

The project had 3 strategic objectives:

a) Supporting the implementation of life events listed in the National Strategy on the Digital Agenda[20];
b) Modernizing internal activities involved in providing information to other state institutions;
c) Increasing the use of e-government services.

In addition, the project had 14 specific objectives:

1. Implementing a Business Intelligence subsystem;
2. Implementing a separate database for the NTRO portal for 200,000 users;
3. Creating a big data system in order to integrate the structured and unstructured data of NTRO;
4. Integrating the electronic archive in the BIG data system;
5. Upgrading NTRO servers;
6. Purchasing mobile and fixed equipment for accessing the Big Data and Business Intelligence systems;
7. Developing a web app for direct data exchanges with public institutions;
8. Developing software that allows the electronic data transfer of off-line requests;
9. Installing the IT hardware in the NTRO Bucharest Data Centre;
10. Creating a hardware and software platform to develop and test the new applications;
11. Providing technical consultancy, project and financing management;
12. Providing the necessary equipment for the data centre;
13. Making the project publicly visible;
14. Ensuring the technical and financial audit of the project.

Project Implementation

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[20] The National Strategy on the Digital Agenda can be found here.

The project was implemented without any major setbacks, but delays occurred during procurement. These delays triggered an amendment extending the project by 9 months. After the beneficiary solved these issues, the project was implemented as planned.

Technical difficulties in communication between Electronic Public Acquisitions Platform (ESAP) and Official Journal of the EU (JOUE) caused a 4-month delay. The notification of the extension of the deadline for submitting bids for the project management contract did not reach JOUE in time, therefore, the procedure was rejected and had to be restarted. The procedure was relaunched but with a significant 4-month delay. In addition, the modification of Government Emergency Ordinance 114/2018[21], which made Managing Authorities responsible for the ex-ante control over the public acquisition procedures, created confusion within all contracting authorities, as it was not clear where the documentation needed to be approved. Further, implementing the internal reporting platform, Business Intelligence (BI), was challenging for both NTRO and the contractor.

COVID-19 pandemic had a considerable impact on project implementation, but all parties involved adapted to the new setting. Due to social distancing measures, the training process for users of the Big Data Platform was delayed. The solution was to split the training into multiple sessions due to attendance caps implemented during the pandemic. Also, the MySMIS application was updated to support online reimbursements, but for a short period in was not clear if the paper-based system was still being used. Nonetheless, the last three reimbursement request for this project were submitted online.

Project Results

The project closed on the January 28th, 2021, after 36 months of implementation, and it delivered on its main objectives. The Big Data Platform has been implemented, the hardware was installed in the NTRO Centre, while the BI reporting tool is used extensively within the NTRO. Table 13 details project completion indicators.

Table 14. NTRO Big Data Project Indicators

Indicator	Estimated value	Value obtained
Number of institutions that use and access the information	449	449
Big Data application	1	1
Number of users benefitting from more efficient electronic services	306322	306322
Upgrade kit implemented for database server of the current IT systems	1	1

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[21] The Emergency Ordinance can be viewed here.

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As the Big Data Platform is operational, NTRO can resume its data exchange protocols with NAFA, the Competition Council and the Ministry of Environment. With the old system, it took up to 8 hours to process more complex information requests. In addition, users had to be careful not overload the system. After the implementation of the Big Data Platform, the information is available in real time and can be tailored to the specification of the requesting entity, be it a private company or a public institution.

The archive up to 2005 was also integrated within the Big Data Platform. Although there were some issues between in optimizing the speed of the optical character recognition and its precision, the archive can be used when processing data requests. Another key result is that NTRO will reduce its dependency on paper. The archive will be further digitized through the life events project which also benefits from COP funding[22]. As the information exchange is automated, paper and email request can now be directed exclusively to the NTRO portal[23].

Risks to Sustainability

Maintenance will be a key challenge to the sustainability of the NTRO Big Data Platform. Maintenance activities can't be included in EU funded projects, therefore, most IT platforms are only covered in case of hardware and software faults during the warranty period. As public administration budgets have a limited space for investments, updating IT platforms may prove challenging in the long term. Without updates, the platform may become obsolete. To mitigate this risk, the NTRO will maintain the platform through a ticket system and will try to externalize the maintenance of the platform if needed.

Lessons Learned

As procurement processes present many challenges in the initial stages of the project, beneficiaries should plan for all possible scenarios. Beneficiaries should consider a more conservative estimate of the time needed to complete procurement process because coordinating with multiple public institutions can be challenging. As the process can get bogged down in complex administrative procedures at any stage, teams should also consider a possible worst-case scenario, where bids are rejected and need to be relaunched. A more conservative estimation of the time needed to complete the procurement process will ease the pressure on the project's implementation timeline.

As noted in the interviews, lack of advance payments in financing agreements can severely limit the pool of firms that are able sustain complex IT projects. The project had 4 billing milestones with 40 percent of the sum billed during implementation and 60 percent at final acceptance. In a 36 months long project, companies face a long period without receiving payments, creating a situation where contracting firms effectively have to finance these projects for several months. This is especially problematic for IT projects in which up to 70 percent of the budget is for hardware purchase.

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[22] More information on the NTRO's life events project can be found here.
[23] The portal can be found here.

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IT projects for central authorities can take a long time to be implemented, which limits the pull of potential contractors and, by implication, may limit project effectiveness. From concept to final acceptance an IT project for the central government may have a 4-year timeline, which is very long for the IT sector. Long implementation periods may reduce the number of companies that are able to sustain these kinds of projects.

Adaptation to the COVID 19 pandemic proved essential in managing the project. Although the training process was affected by the pandemic, due to social distancing requirements, the project was able to move forward by switching to online communication, as the broadband infrastructure in Romania has the capacity for high-speed connections. Online coordination meetings proved beneficial for this project.

6. Conclusions and Next Steps

The main findings, conclusions, and recommendations of the interim evaluation are summarized below. The findings are categorized by investment priority, where relevant.

Investment Priority	Findings	Conclusions	Recommendations and Timelines	Responsible Actors
Overall Progress under COP PA 2				
All Investment Priorities	• As of December 31, 2021, the Programme has 85.34 percent of the total project value in projects under implementation.	• Delays in implementation and disbursement were attributable to 1) restrictions due to COVID-19 that prolonged projects 2) design of large-value projects to disburse at the end of product delivery (expected 2022-23)	• Recommendation: Design major projects to commence implementation (award of contracts) earlier within the 2021-2027 programming cycle to prevent project bunching towards the end of the programming period. • Timeline: Short-term (2021-2027 Programming Period) • Priority: High	Competitiveness Operational Programme Managing Authority (COP-MA)
Evaluation Question 1: To what extent were the interventions carried out according to expectations, produce the desired change (achieve specific objectives) and must be further funded?				
Investment Priority 2.1 (Broadband Access)	For Ro-NET, construction works in all lots have been completed and are in various stages of administrative acceptance and processing.	Progress is being made towards effectiveness under IP 2.1, albeit with delays. Causes for these delays relate to administrative processing, which	Recommendation: Coordinate closely with national, regional, and local authorities to coordinate and streamline permitting processes for building permits to expedite implementation.	COP-MA, OIPSI

Investment Priority	Findings	Conclusions	Recommendations and Timelines	Responsible Actors
	For NGN/NGA access by private firms, 27 contracts with firms were signed in 2019 and 2020, however, projects continued to face delays due to building permitting procedures at various administrative levels. Construction permits were obtained for 576 localities, of which for 178 the works have already been completed, with 325 localities still under construction.	must be addressed in the short term for projects to reach effective outcomes.	Timeline: Immediate to short-term (pre-2023) Priority: Medium	
Investment Priority 2.2 (Innovative Products and Services)	The initial output indicator was set at 45 innovative products or services. As of December 31, 2021, this target had been exceeded with 153 products/services finalized. Most COP funding under this Investment Priority has gone into	Considerable progress has been made in financing innovative products and services and enhancing digitisation of firms. However, products funded by these investments are in early stages of market testing and scale-up to demonstrate	Recommendation: Streamline administrative processes for payments to small firms awarded grants, and disburse them in a timely, efficient manner. Timeline: Short-term Priority: High Recommendation: Scale up financing and programming to support digitalization of SMEs	COP-MA OIPSI

Investment Priority	Findings	Conclusions	Recommendations and Timelines	Responsible Actors
	procuring human resources and some hardware and software. Most of the products produced are yet to generate revenue and remain in stages of market testing and early release, with low effects on firm-level outcomes.	effects on firm-level outcomes such as profitability and turnover.	and the development of innovative products by SMEs, while continuously evaluating demand and need for such aid. Timeline: Medium- to long-term (2025-40) Priority: High	
Investment Priority 2.3 (E-Government/Big Data)	Projects for E-culture, Competition Council, and the National Trade Registry were in advanced stages of implementation or completion. Other projects under e-health were contracted in 2021 and show limited progress at this stage.	Delays and extensions were primarily granted due to increased complexity of projects observed during implementation, with increased risk to sustainability due to paucity of funds from national budgets	Recommendation Design of large value e-government projects projects must conduct thorough needs assessment and plan for sustainability beyond the programming period. Timeline: Short-term (2021-2027 Programming Period) Priority: High	Responsible ministries
Evaluation Question 2: What factors influence the effects of interventions and how?				
Investment Priority 2.1	Progress continues to be challenged by the heterogeneity in local regulations and processes – such as building permits and rights of way – and poor federal-municipal	Measures to address challenges to effectiveness are essential for future programming periods. Further, the lack of addressing these	Recommendation: Coordinate with local and regional municipal bodies to harmonize or seek permits in a joint manner. Timeline: Immediate (pre-2023) Priority: High	COP-MA

Investment Priority	Findings	Conclusions	Recommendations and Timelines	Responsible Actors
	coordination to resolve these issues led to delays.	factors may lead to significant detrimental effects on ongoing projects, if not resolved prior to their completion.		
Investment Priority 2.2	Applicants were challenged by the complexity of documentation (often required to be submitted on paper, or through cumbersome online platforms), budget preparation, changes to deadlines and other key criteria in the Applicants' Guide. Smooth communication with the managing authority facilitated speedy implementation of projects.	It is essential to address bottlenecks in the selection processes, even for projects demonstrating good progress towards their targets.	Recommendation: Simplify documentation submission requirements for applicants. Ongoing requirement to commence as soon as possible. Improv; e user interface of the MySMIS portal. Timeline: Short-to-Medium term. Priority: Medium	COP-MA
Investment Priority 2.3	For projects nearing completion, the lack of budget for maintenance and the lack of specialized IT resources within government are key factors	Building capacity within government for IT systems and human resources, and planning for budgetary needs for operational and maintenance costs will be key for	Recommendation: Build capacity and recruit talent in cutting-edge software and hardware systems into government. Timeline: Medium- to long term Priority: High	Responsible ministries COP-MA

Investment Priority	Findings	Conclusions	Recommendations and Timelines	Responsible Actors
	affecting impact and sustainability.	sustainability of effects.	Recommendation: Plan O&M budgets during project design and seek commitment from beneficiaries prior to allocation of funds Timeline: Short term (2021-27 Programming Period) Priority: High	

Evaluation Question 3: How efficient were project selection and implementation processes of the Competitiveness Operational Programme? *Addressed in Output 2; no additional analysis conducted on selection processes in this report*

Evaluation Question 4: How efficient were COP projects relative to relevant outcomes? Cost per product/service developed under IP 2.2 was estimated at ~8000 EUR. *A full cost-effectiveness analysis was unable to be conducted at this stage and will be conducted for Output 4. No recommendations can be made in relation to this evaluation question at this stage.*

Evaluation Question 5: What is the observed progress in meeting the stated objectives in targeted sectors, territories, and groups since the beginning of the interventions (gross effects)? *See Table 5: Current Status of the Projects under Priority Axis 2*

Evaluation Question 6: To what extent may the observed progress be attributed to the funded interventions (net effects)?
Evaluation Question 7: What are the non-intended effects of funded interventions, positive or negative, if any?
Evaluation Question 8: Are there any effects of funded interventions beyond the targeted territory, sectors, or groups (spillover effects)?

All three of these questions are studied only for IP 2.2 using counterfactual methodologies. IP 2.1 and 2.3 were not studied using counterfactual impact evaluation in this report, and therefore do not have recommendations

| **Investment Priority 2.2** | Statistically significant increases in firm size were observed, with no effects on firm turnovers or net profits one year | The results suggest that input costs such as for personnel and fixed assets increase with grants made under IP 2.2. However, | Definitive recommendations to improve the impact of projects cannot be made in this deliverable, and will be considered in the final output as significant | |

Investment Priority	Findings	Conclusions	Recommendations and Timelines	Responsible Actors
	after project finalization. Interviews confirm that most funds were utilised for hiring human resources (programmers) and in some cases, hardware and software. These investments have a lagged impact, as the products developed are still in market testing and early release stages.	this does not translate to outcomes in innovation or firms' economic performance in the immediate term, and may only show results in the medium term.	time has not yet passed to see the funded products and services' performance in the market.	

Annex 1: List of Evaluated Projects under Priority Axis 2

Table 14 provides the list of projects approved under Priority Axis 2 of the Competitiveness Operational Programme until December 31, 2021. This list was obtained for the purposes of evaluation by the evaluation team in January 2022. Approved projects are listed with the corresponding MySMIS code, total funding from ESIF, funding (if any) from the national budget, as well as beneficiary contributions. All amounts are listed in Romanian Lei.

Table 15: List of Projects under Priority Axis 2

MySMIS Code	Name of the Project	EU funding (RON)	National Budget (RON)	Beneficiary contributions (RON)
115726	ICloudSolutions	625897.59	110452.52	484413.7
115809	Cresterea competitivitatii sc prodinf software srl prin dezvoltarea unei solutii tic	1440353.3	254179.99	1048687.32
115986	Travel 365	3481880.1	614449.44	1536474.26
117489	Cresterea competitivitatii societatii enjoy smart solutions srl prin dezvoltarea unei platforme informatice inovative in domeniul sanatatii	1663627.3	293581.29	677745.15
	Dezvoltarea unei platforme e-commerce inovative in cadrul business sense partners s.r.l.	1883829.3	332440.46	1043204.12
115937	Inovare prin integrarea soluțiilor tic pentru creșterea competitivității economice a sectoarelor tic, industriilor creative și turismului prin intermediul platformei informatice	2537346.1	447766.95	1069337.58

116116	Yupp media – platforma elastica e-commerce de personalizare publicitara	1210606.5	231636.45	315216
119055	Cresterea competitivitatii IMM-urilor prin implementarea unei solutii digitale inovative pentru un management performant al proiectelor cu finantare nerambursabila	2434958.1	429698.49	1655239.79
119052	Loranet – platforma Internet of Things (iot)	3384337.6	597236.04	2098058.89
115883	Sprijin pentru creşterea valorii adăugate generate de sectorul tic şi a inovării in cadrul rap systems srl	192884.77	34038.49	86360.69
115631	Portal gis 3d	2469250	435750	639000
115791	Dezvoltarea unei platforme software de management si control al productiei (post-calcul) in domeniul alimentar	1317259.1	232457.49	574044
115887	Filed book agro application-fbaa	1150622	203050.95	1100722.32
116314	Dezvoltarea unei plaforme e-learning cu suport de analiza comportamentala a interactiunii utilizator-lms	794751.5	140250.27	276660.91
119286	Readme – aplicație interactivă, inovativă, de evaluare a lizibilității textelor în limba română și de îmbunătățire a stilului de redactare	2814714.8	703678.71	875079.04
119261	Marksense - platformă informatică de analiză în timp real a fluxurilor de persoane bazată pe algoritmi de inteligență artificială și prelucrare inteligentă de informații pentru afaceri și mediul guvernamental	3145876.9	786469.24	1375102.53
115926	S.i.r.o – solutie inovativa de recrutare online	3096018.8	774004.7	1224860.65

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115724	Dezvoltare aplicatiei software inovative "Treasure Open Source Software – TOSS"	2754696.1	688674.03	2682994
117046	Omnidj - Platforma de streaming colaborativ cu servicii la cerere	1114600.8	278650.2	398394
116265	Crearea unei platforme cloud pentru aplicatii software	2069074.4	517268.6	1308001
115577	Dezvoltarea unei platforme pentru crearea vizuala de site-uri bazate pe wordpress	2115826.5	528956.63	1064885.09
115917	Temprent – platforma evolutivă de micro-tranzacționare	1227120	306780	429900
115866	Dezvoltare prin inovare la senior software agency srl	1587334.9	396833.73	1361979.77
115622	Studio Scope: Dezvoltare produs inovativ de tip Configure Price and Quoting	2242185	560546.25	2028751.25
115722	Soluție pentru integrarea pe verticală a soluțiilor tic în economia românească prin dezvoltarea produselor informatice dynamic dox© cloud și dynamic dox© mobile	1624958.9	406239.72	1132399.87
115560	Sistem informatic inovativ de tip comanda si control c2i (command, control & intelligence)	2532573.3	633143.32	1173003.89
115946	Sistem integrat de management al securității informației în cadrul unei organizații	1410126.7	352531.66	703318.79
115847	Sistem informatic integrat, inovativ si securizat de examinare auxologica, urmarire a pacientului si generare a diagramelor de crestere pentru populatia din romania	2091764	522941	862290

115688	Livehr – platforma de gestionare a resurselor umane	2098872.3	524718.07	1507229.65
115817	„Integrarea pe verticala a ip3d prin dezvoltarea unei solutii informatice – cabina virtuala - prin activitati de cdi „	782706.84	195676.71	277228.46
115911	„Cresterea competitivitatii sc yalos software labs srl prin dezvoltarea unei solutii informatice inovatoare"	2452875.6	613218.89	657456.3
115876	Sistem informatic inovativ factura inteligenta	2432346.3	608086.58	652739.62
115698	Sistem informatic integrat pentru colectarea si procesarea de date anonime in interiorul spatiilor comerciale	898360.23	224590.06	474760.01
115857	Inovare prin conectare	2414727	603681.75	2406584.22
115646	Adselect – Platforma de Management pentru publicitate stradala	3065803.2	766450.79	965544.53
115834	HR fara hartie	1952796.2	488199.06	1651738.81
115610	Dezvoltare aplicatie software si componente hardware pentru analizarea, controlul si partajarea fluxurilor de resurse	3292880	823220	807275
115656	Coopid – sistem cooperativ de management al identitatii digitale	2939783.6	734945.9	875000
116150	Dezvoltarea unui sistem business intelligence pentru lanturi farmaceutice	1939595.4	484898.84	1023332.81
115916	Dezvoltarea aplicatiei smart hut- solutie software-hardware care integreaza echipamente pentru facilitarea managementului cladirilor	1185166.1	296291.51	760345.02
116347	Mytechjob – PLATFORMA INOVATIVA CU LOCURI DE MUNCA	1323168	330792	1301670

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115806	Solutie tic inovativa pentru cresterea competitivitatii economice a marketizator friends srl	1855368.7	463842.17	1114023.23
117850	Cresterea competitivitatii sc blue sky software srl prin dezvoltarea unei aplicatii informatice inovative	1733067.7	433266.92	617580.4
117396	QRAM – sistem de optimizare a capitalului uman	1048354	262088.5	931062.5
115841	Dezvoltarea unei solutii inovative de business discovery pentru cresterea competitivitatii si profitabilitatii companiilor	602276.25	150569.06	519610.42
115933	Sitac – sistem inovativ de testare adaptivă computerizată	2892483.2	723120.81	2037253.75
115643	Sistem inovativ integrat tic pentru controlul si monitorizarea in timp real a calitatii energiei electrice si a pierderilor pe liniile de transport si distributie din sistemul energetic national	3003435.7	750858.93	753244
115581	Tehnologie inteligentă pentru sănătatea familiei	816443.79	204110.95	671801.19
119666	Av sensors manager	3270601.9	817650.47	917800
115788	Platforma inovativa bazata pe tehnologii de realitate virtuala si augmentată pentru tratarea fobiilor	2470998.3	617749.58	726389.62
115980	Cloudbox	2847889.6	711972.4	977135
115616	Servicii inovative pentru publicarea, editarea, consultarea şi gestiunea online a manualelor şcolare	1802336.1	450584.02	570950.25
115645	Ansamblu de indici imobiliari structuraţi pentru piaţa românească acronim: rmi	1781188.8	445297.2	428734

116470	Zidox – platformă inovativă de gestionare a resurselor umane	1330068.4	332517.1	2647755.76
115612	Creşterea competitivităţii companiilor româneşti prin dezvoltarea de către omega trust a unei noi platforme inovative de auto-testare specializată în domeniul securităţii cibernetice	1481379.1	370344.78	406274.1
115595	Cercetarea si dezvoltarea unui sistem inovativ de monitorizare, in timp real, a consumurilor energetice industriale pe platforma cloud privata	1790109	315901.59	501660.34
119086	Dezvoltare tehnologică şi inovare in domeniul asistentei sociale la domniciliu prin aplicatia dezvoltata de polysoft srl	756992.66	133586.94	420803.4
115618	Platforma inovativa de tip data center modular	3410001.7	601765.01	1364614.75
116487	Activarea oraşelor inteligente cu zoniz smartcity	1411250.2	249044.15	766896.24
116028	MOQUPS - Aplicație online inovativă, bazată pe tehnologii cloud, pentru realizarea machetelor software, design grafic și prototipuri interactive într-un mediu colaborativ	3434052.7	606009.3	2435574
116105	Instrument informatic inovativ pentru instruirea si testarea controlorilor de trafic aerian	3029107.7	534548.41	970606.9
116081	Dezvoltarea unei platforme inteligente pentru monitorizare rutieră – "mr - iot"	2810731.6	496011.45	1050150
117534	Dezvoltarea unui sistem dedicat de licitație electronică on – line pentru imm–24auction	998501.3	176206.11	586565.55

116673	Inotic - programmatic consulting online platform	1394266.4	246047	686761.59
116247	„Platformă inovativă intelligent environment cu asistent virtual de inteligență artificială"	823125.91	145257.51	423863.53
115854	Investoapp – platformă online bazată pe inteligență artificială pentru managementul și realizarea investițiilor	2625437.9	463312.58	1307178.18
115579	Platformă inteligentă pentru eficientizarea activității companiilor din sectorul imobiliar	2360732.2	416599.8	1307252
116285	Dezvoltarea unei aplicatii informatice de calcul a sumelor partiale in evidenta temporara a stocurilor din interiorul spatiilor logistice	1489904.8	372476.2	784014
115930	Asistent pentru nutriție și antrenament bazat pe i.a.	2586200.5	456388.32	1556454.52
115905	Dezvoltarea de produse TIC integrabile pe verticala in economia reala	1126999.2	198882.21	858082.42
115932	Dezvoltarea unei platforme inovative de marketing interactiv pentru susţinerea creşterii antreprenoriale şi competitivităţii organizaţiilor	3257406.3	574836.4	3748862.55
115897	Dezvoltarea unui framework flexibil și scalabil pentru video colaborare cu aplicații în domenii precum telecomunicații, educație și formare profesională, sănătate și mediul de afaceri	3136946.3	553578.75	892850

115940	Dezvoltarea produsului tic unicornspace, instrument de prototipare, design vizual si generator de cod cu aplicabilitate in sectoarele industrii creative, sanatate si tic pentru integrarea pe verticala a solutiilor tic	3208791.8	566257.37	735384.85
115683	Platforma colaborativă online pentru clustere si membrii acestora	2498290	440874.71	1327520.59
115978	Margo - un start pentru imm-uri competitive	3468174.3	612030.75	2049045
115665	Un sistem informatic inovativ - o colectie de servicii integrate	1368912.8	241572.85	1078008.75
115991	Platforma cloud saas inovativa de arhivare electronica edi si non edi integrata cu sistem de management a documentelor	1547343.3	273060.59	651027.91
115705	Casebond	2251640.9	397348.39	1494030.9
118302	Dezvoltarea unor game de produse/servicii tic cu aplicabilitate in restul economiei romanesti pentru integrarea pe verticala a solutiilor tic	240398.56	42423.28	165820.5
115921	Cresterea competitivitatii sc intelive metrics srl prin dezvoltarea unei solutii informatice inovatoare	1557406.6	274836.45	378297
115586	Cresterea contributiei sectorului tic pentru competitivitatea economică prin dezvoltarea unei platforme electronice inovative e-retail	2984077.1	526601.83	1767040.1
115869	Esv – aplicatie de comunicatii mobile securizate	3061016.4	540179.37	810680.97

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116428	TEMPO – solutie pentru cresterea relevantei in relatia cu clientul si oferirea de beneficii de fidelitate pentru stimularea vanzarilor	2477925.7	437281	813694.44
119223	Dezvoltarea aplicatiilor tic inovative multimodale adaptate la nevoile clientului	2876730.3	507658.29	2036651.88
115732	Sistem de suport decizional pentru viticultura de precizie	2505119.3	442079.88	918663.87
115945	Aplicație informatica inovativa bazata pe modele matematice pentru optimizarea bugetelor de marketing	3480898.9	614276.28	1099479.2
118840	Akademia.ro – specializare inteligenta, testare si recrutare in domeniul tehnologiei informatiei	2922549.3	515743.99	931446.85
119148	Control panel – sistem de administrare servere si domenii web	2999407.5	529307.2	945807.5
116371	Sistem integrat tic, accesibil, pentru controlul microclimatului, optimizarea inteligentă a producției și a consumului de apă și substanțe nutritive, în vederea creșterii competitivității economice a producătorilor agricoli- solatic	1899630.8	335228.97	637863.23
115783	Eduvr apps – aplicatie pentru generarea cursurilor multimedia interactive folosind realitate virtuala si augmentata	2375888.1	419274.38	832137.5
	Dezvoltare platformă colaborativă în domeniul cercetării	2551444.3	450254.87	1190748.28
115676	Dezvoltarea unei soluții inovative de management saas pentru domeniile horeca și Retail	2566246.1	452866.95	1190457
115714	Dezvoltarea platformei electronice – piata gelior	1256972.7	221818.7	684616.8

115790	Dezvoltarea și punerea pe piață a aplicației kpeye	1013197.3	178799.52	827731.2
115881	"Logios - cercetarea si dezvoltarea unui sistem inovativ de e-learning dedicat mediilor de invatamânt universitar si preuniversitar"	972346.38	171590.54	518393.82
115605	Qodemo – tehnologie specializata pentru maker movement	3413951.7	602462.06	803986.69
115686	Ecosistem multifunctional pentru integrarea serviciilor medicale de tip "self-management disease" (emim)	2399640	423465.89	2008125
116445	"Dezvoltarea unei soluții tic inovative certificate pentru protejarea confidențialității datelor de pe dispozitivele mobile prin ștergere definitivă"	2074115.8	366020.43	1603999.8
	Solutie mobila de colectare si intretinere date pentru sistemele de tip asset management	1643049.2	289949.85	839936
115624	Cercetare,dezvoltare si implementare a unei noi generatii de algoritmi de optimizare si reducere a consumului de materiale bazati pe calcul paralel intensiv pe tehnologie CUDA	2764316	487820.48	1576597.68
115919	Cutie neagra și platforma tip crm pentru evaluarea si diminuarea riscurilor in traficul rutier	1555547.7	274508.42	473070.49
117324	Nou produs inovativ software – Visio 3D MAG, platforma hardware si servicii pentru proiectarea interactiva de case din lemn, mobilier si amenajari interioare	2465364.8	435064.37	1232879.15
119805	Contact - Accesibilitate la purtator	2408447.6	425020.15	792618.3

116086	Appsflow – dezvoltarea saas a sistemului de aplicatii configurabile de procese de business ce accelereaza initiativele de lucru inteligent in organizatii	3099588.2	546986.15	1690167.55
115800	Aplicatie inovativa de administrare a infrastructurii it virtualizate	3244698.6	811174.66	2560930.5
115920	Cresterea competitivitatii sc arcadia promo srl prin dezvoltarea unei solutii informatice inovatoare – oglinda inteligenta	1428365.6	357091.4	396783
118785	Talos - comunicare intraorganizaţională mobilă securizată	2796496	493499.3	1593524.63
116017	Microsere Inteligente – Sistem inovativ de automatizare si monitorizare a culturilor „micro-greens"	2831658.7	499704.47	988628.38
115823	Familia – asistență medico-socială integrată stimulând îmbătrânirea activă	1905574.9	336277.92	805699.2
115878	Mec - iot - dezvoltarea unei platforme inteligente pentru managementul eficienței clădirilor	2687480.1	474261.19	1030875.3
116038	Dezvoltare aplicație în cadrul s.c. autowass manager s.r.l.	2132352.8	376297.55	1443616.24
117373	Servicii inovative de acces control si pontaj in cloud pentru IMM	585378.31	103302.05	536078.44
116348	Inovarea si dezvoltarea sistemului gloobus service bus (gsb) în vederea creșterii competitivității economiei naționale și internaționale	421753.99	74427.17	235914.43

115970	Dezvoltarea sistemului inovativ iot "navigator cloud" pentru o economie modernă	1402482.5	247496.92	758551.05
115654	Realizarea unui sistem de dermato-microscopie cu software de recunoaştere a leziunilor cutanate de tip melanom malign şi premalign	1373788	242433.17	416610.68
115641	„Platformă digitală multifuncţională pentru integrare economică inteligentă şi promovarea serviciilor şi produselor locale / tradiţionale din Transilvania – „TDD-Transilvania Digital Dominion""	3502338	618059.65	1383427.29
115549	Platforma unificata inovativa de securitate cibernetica	3440127	607081.24	2115708
116063	Platforma convergenta inovativa de difuzare video	2697279.9	475990.57	1065463.5
115607	Sistem integrat de management automat al utilitatilor - smart admin	3345152.8	590321.08	1132968.11
115793	Platforma inovativa de agregare a conexiunilor radio cu facilitati de optimizare a traficului	2460026.7	434122.35	964537.5
117293	Dezvoltare aplicație de simulare avansată a piețelor internaționale de capital cu utilizarea inteligenței artificiale	1598080.2	282014.16	1456962.8
115906	„Asi in informatica – dezvoltare aplicatie de securitate infrastuctura it&c (asi)"	3076224.5	542863.14	769918.06
115649	Sm@rt city p@rking – sistem inteligent pentru managementul parcarilor urbane	2730867.3	481917.75	2588000

	Smart Bill Intelligence – inovare in gestiunea economico-financiara prin algoritmi de inteligenta artificiala	1649702.4	291123.95	758731.28
115918	Docigniter – agregator inovativ de documente inteligente	1056071.1	186365.49	399589.46
115599	Dezvoltarea unei aplicații integrate pentru furnizori de servicii juridice	1353242.5	238807.5	1212245
115697	Dezvoltarea unei platforme software cu pret scăzut si cerinte hardware reduse, pentru managementul inteligent și controlul activitatilor intr-o tipografie	466957.7	82404.3	432868
115838	Platforma integrată spark onedata	2686024.3	474004.29	1598910.25
109953	RO-NET:"Construirea unei infrastructuri nationale de broadband in zonele defavorizate, prin utilizarea fondurilor structurale"	202250270	35691224	0
103258	Modernizarea modalitatilor de culegere, evaluare, analizare si raportare a datelor din Registrul Agricol National prin utilizarea tehnologiei informatiei – Faza II	16360009	3037424.8	395866
101622	SII ANALYTICS - Sistem informatic de integrare si valorificare operațională și analitică a volumelor mari de date	119824244	22246756	0
103257	Sistem informatic colaborativ pentru mediul performant de desfăsurare al achizițiilor publice – SICAP - FAZA a II a aferenta exercitiului financiar 2014-2020.	5556187	1031570.3	134444.03
109641	Optimizarea interacțiunii cu mediul de afaceri şi implementarea unor mecanisme avansate de analiză şi schimb de date prin implementarea unui sistem informatic de e-guvernare şi analiză de tip Big Data în cadrul Consiliului Concurenţei	31031880	5761433.6	0
108513	Îmbunătăţirea capacităţii de procesare a datelor şi creşterea performanţelor de raportare ale ONRC prin arhitecturi şi tehnologii Big Data	26502261	4929456.6	0

120197	Sistem de interoperabilitate tehnologicaƒ cu statele membre UE - SITUE	8277312.3	1536780.4	0
120025	Sistem informatic integrat pentru emiterea actelor de stare civiläƒ - SIIEASC	155964264	28956600	0
114367	E-cultura: Biblioteca Digitala a Romaniei	43648530	8103863	0
123312	Platforma naţionala integrata - Wireless Campus	177049421	27765690	0
126954	Realizarea infrastructurii de broadband în zonele albe NGA din judeţul Arad	7482384.9	1320420.9	1148494.67
126955	Realizarea infrastructurii de broadband în zonele albe NGA din judeţul Sibiu	7482385	1320420.9	1870909.93
126956	Realizarea infrastructurii de broadband în zonele albe NGA din judeţele Calarasi si Ialomita	7440887.2	1313097.7	1308066.41
126957	Realizarea infrastructurii de broadband în zonele albe NGA din judeţul Bihor	7457300.6	1315994.2	974810.76
126651	Realizarea retelelor de internet in banda larga in judetele tulcea si braila	6842194.4	1207446.1	894404.5
126953	Realizarea infrastructurii de broadband în zonele albe NGA din judeţul Dolj	11468793	2023904.6	1839912.99
127127	Dezvoltarea infrastructurii de comunicatii in bandaƒ largaƒ de mare vitezaƒ in judetul Constanta	7462452.8	1316903.4	1798181.38
127129	Dezvoltarea infrastructurii de comunicatii in bandaƒ largaƒ de mare vitezaƒ in judetul Hunedoara	11511362	2031416.8	2522332.39
127125	Dezvoltarea infrastructurii de comunicatii in bandaƒ largaƒ de mare vitezaƒ in judetul Arges	11511362	2031416.8	1567451.05
127128	Dezvoltarea infrastructurii de comunicatii in bandaƒ largaƒ de mare vitezaƒ in judetul Harghita	7482385.7	1320421	1858370.42
127131	Dezvoltarea infrastructurii de comunicatii in bandaƒ largaƒ de mare vitezaƒ in judetul Neamt	11511362	2031416.8	1551691.43
127132	Dezvoltarea infrastructurii de comunicatii in bandaƒ largaƒ de mare vitezaƒ in judetul Salaj	7482385.3	1320420.9	1893481.33

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127133	Investitii in infrastructura broadband in judetul Bistrita Nasaud	7482299	1320405.7	1692948.93
127135	Investitii in infrastructura broadband in judetul Galati	11490170	2027677.1	1501983.04
127138	Investitii in infrastructura broadband in judetul Vaslui	18418179	3250266.9	4484036.38
127134	Investitii in infrastructura broadband in judetul Olt	7481798	1320317.3	993250.04
127298	Imbunatatirea infrastructurii in banda f larga f si a accesului la internet in judetul Vrancea	8953281.3	1579990.8	4741253.91
127299	Imbunatatirea infrastructurii in banda f larga f si a accesului la internet in judetele Prahova si Dambovita	5767238.3	1017747.9	2907851.26
123634	Sistem Electronic Integrat al ONRC consolidat si interoperabil destinat asigurarii serviciilor de e-guvernare centrate pe evenimente de viata, (ONRC V2.0)	159728629	29655499	0
127185	Construire infrastructura de comunicatii in banda larga cu retele de tip NGN in judetul Cluj	11481224	2026098.4	1500813.61
127283	Creare infrastructura in banda larga si acces la internet in judetul Botosani	11455734	2021600.1	1497481.53
126951	Realizarea infrastructurii de broadband in zonele albe NGA din judetul Iasi	18337216	3235979.2	2397024.09
126343	Realizarea infrastructurii de broadband in zonele albe NGA din judetul Buzau	18418179	3250266.9	5121176.64
127296	Imbunatatirea infrastructurii in banda f larga f si a accesului la internet in judetul Alba	8941981.2	1577996.7	4530062.02
122632	Hub de servicii (centrul de furnizare servicii electronice) la nivelul mai	75906977	14093023	0
127682	Sistem Naţional de Management privind Dizabilitatea (SNMD)	37989303	7053161	0

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127309	Sistem informatic integrat de emitere si gestiune a pasaportului electronic, pasaportului diplomatic si de serviciu si a titlurilor de calatorie in oficiile posturilor consulare (epass)	52810948	9804973.8	0
127136	Investitii in infrastructura broadband in judetele Giurgiu si Teleorman	7481958.5	1320345.6	1364367.31
127137	Investitii in infrastructura broadband in judetul Mures	7481665.3	1320293.9	1087882.58
127139	Investitii in infrastructura broadband in judetele Timis si Caras-Severin	7480389.6	1320068.8	1010532.93
127130	Dezvoltarea infrastructurii de comunicatii in banda$f$ larga$f$ de mare viteza$f$ in judetul Mehedinti	18418179	3250266.9	3298063.82
127221	Actualizarea și dezvoltarea sistemului național de protecție a infrastructurilor IT&C cu valențe critice pentru securitatea națională împotriva amenințărilor provenite din spațiul cibernetic	174332138	32366812	0
130632	Sistem informatic de management al scolaritatii - SIMS	190132540	35300343	0
130181	Platforma digitala cu resurse educationale deschise (EDULIB) (Biblioteca virtuala)	194619924	31518410	4615068.06
130277	Sistem de alerta timpurie si informare în timp real - RO-SAT	58717037	10901509	0
127312	Sistem integrat de alertare personalizata si actualizare permanenta a indicatorilor de risc pentru destinatiile de calatorie ale cetatenilor	12584528	2336465.7	0
129052	Platforma$f$ inovativa$f$ de comunicatii iot bazata$f$ pe tehnologia lora	13646665	2408235	6655900
128998	Platforma inovativa pentru difuzarea continutului video folosind mecanisme de machine learning	13893548	2451802.5	6836292.86
129007	Cresterea contributiei sectorului TIC pentru competitivitatea economica$f$ prin dezvoltarea de produse TIC inovative cu aplicabilitate in restul economiei romanesti	14508996	2560411	6282358.07

129084	Platforma Inovativa pentru Administrarea Inteligentq$f$ a resurselor bazata pe Inteligenta Artificiala$f$	14384562	2538452.1	6788406
129001	Sistem automat pentru analiza semantica$f$ si gradarea lemnului in imagini folosind metode eficiente de vedere computationala si retele neurale convolutionale adanci - Neural Grader	3707116.8	919241.66	1481720.5
129020	Platforma inovativa r.a.r.e.	14371013	2536061.1	6805396
129002	Platforma de auditare si testare structurala neinvaziva a performantelor si monitorizarea continua a operationalitatii unui Centru de Comanda si Control/Contact Center – PLATES	10712652	1890468	4862615.31
129003	Sistem IT inovativ bazat pe inteligenta artificiala si realitate augmentata pentru evidenta si mentenanta structurilor complexe de resurse si mijloace fixe ale companiilor si institutiilor - WINNER	11597104	2046547.9	4849481.52
129090	SEER - Sistem Electronic de Evaluare si Raspuns a scenariilor de afaceri prin analiza predictiva a datelor cu ajutorul inteligentei artificiale	2158722	539680.5	824336.12
129076	Sistem automatizat pentru acoperire radio si cartografiere 3D folosind vehicule aeriene fara pilot	13683959	2414816.3	6718475
129221	My identity - platforma inovativa destinata identificarii si autentificarii persoanelor	14561863	2569740.6	6869540.28
131382	Sistem Informatic National pentru Adoptie - SINA	38763530	7196905.4	0
129325	AIDAA (Artificial Intelligence Data Automation Assistant) - platforma software inovativa pentru procesarea automata a informatiilor pentru afaceri	10227939	1804930.5	6161761.84

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129092	Platforma inovativa 'Software-as-a-Service' aplicatii smartphone inovative pentru industria de transport	4042791.5	713433.78	1775393.7
129006	Sustinerea inovarii si cresterea productivitatii SC trustchain SRL prin realizarea unei platforme unificate inovative de comunicare si control al echipamentelor integrate in casele inteligente	13457729	2374893.3	6067128.92
129332	Platforma inovativa Autonomus Driving	13799725	2435245.5	6901130
128975	Platforma inovatoare de gestionare prin inteligenta artificiala a proceselor de lucru in fabrici si depozite - pleit - Perpetual Low Energy iot	9768807.7	1723907.2	3627410
129321	Platforma inovativa de cloud cu sisteme de provizionare si migrare automatizata a aplicatiilor	13822934	2439341.3	6784975
129490	Platforma inovatoare de gestionare prin inteligenta artificiala a proceselor de lucru in fabrici si depozite	5287749.8	1321937.5	1213568.45
129760	V.A.M.M.P. Platforma inovativa integrata pentru identificarea si clasificarea persoanelor	13875342	2448589.7	10602037.6
129354	Aplicatie pentru comanda si controlul unei retele de drone utilizata f in misiuni de ca$f$utare si salvare in situatii de urgenta$f$ (skynet)	6426388.5	1134068.6	1793498.02
129271	TERMENE AI 360 - platforma inovativa pentru analiza automata a datelor si informatiilor pentru afaceri	13599980	2399996.4	4627491.53
128967	Inteligenta artificiala si realitate virtuala intr-o platforma inovativa de comert electronic	8107400.5	1430717.7	2549886.44
128985	Alumnus - platforma digitala inovativa pentru recrutare si gestiune contractori	3783887.3	667744.81	2632430.71
130051	Platforma inovativa integrata pentru furnizarea de servicii POS	12936799	2282964.6	6523756

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129803	Sistem integrat pentru extragerea, prelucrarea si clasificarea informatiilor publice in timp real, folosind metode avansate de analiza semantica bazata pe machine learning - MEDIAWIRE	14483125	2555845.6	6699559.5
129950	UPCARS - Platforma de recomandare on line folosind mecanisme de machine learning si inteligenta artificiala	14016992	2473586.9	10503697
129933	Echipament criptografic cu management online	5419749.1	956426.31	1946126.6
129888	Platforma software inovativa medoscope smart	13782482	2432202.8	6723615
129077	HOLOTRAIN - Platforma inovatoare de training in realitatea augmentata asistat de holograme fotorealistice interactive	11159151	1969261.9	4219692.21
129459	Dezvoltarea platformei informatice micromed in vederea cresterii competitivitatii S.C. Medicamed Market SRL	9761885.9	1722685.8	3585041.22
130039	PIST - Platforma inovativa pentru tranzactii financiare rapide si securizate	9310835.9	1643088.7	3268649.27
129606	Trecerea la dezvoltarea bazata pe CDI a companiei OMEGA TRUST SRL prin realizarea unei aplicatii TIC inovative in scopul asigurarii protectiei impotriva amenintarilor cibernetice de la nivelul infrastructurilor industriale critice	3329551.4	832387.84	975434.8
129017	Smartbusiness PLATFORMĂ INOVATIVĂ de automatizare pe bază de informații comportamentale a proceselor de business	4049526.1	714622.23	1664904.84
129023	Dezvoltare marketplace veterinar inovativ	9458755.8	1669192.2	4189562.04
129841	Realizarea unui algoritm bazat pe inteligenta artificiala in cadrul societatii POWERSOFT BUSINESS SOLUTIONS SRL	3923699	692417.46	1104890.15
130016	Dezvoltarea unei aplicații TIC inovative, ca metodă de terapie pentru copii cu probleme de dezvoltare	2867278.4	505990.29	979206.07
130068	Platforma inovativa locationchest	13779146	2431613.9	6755968.4

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130057	Cercetare si dezvoltare, calificare, certificare, testare si pregatire de lansare comerciala proiect ,,Platforma de servicii pentru Conectivitate Inteligenta 5G/iot - E-SIM, OTA - HTTP, DM - iot	6458604.9	1139753.8	2824975.9
130067	Platforma inovativa de procesare si difuzare a continutului multimedia si de integrare a solutiilor Internet of Things	11254722	1986127.5	4968961.44
130078	Platforma inovativa Meteorite Cloudspace	13718652	2420938.5	6732610
129132	IMOPEDIA – Sisteme inovative de Inteligență Artificială în domeniul portalurilor imobiliare	6440519.4	1350507.8	2161816.86
129869	Platforma avansata de tip cloud pentru stocare, arhivare si interogare fisiere de imagistica medicala utilizand standardul DICOM	14292118	2522138.5	6369913.19
130084	Linda – Sistem de monitorizare, diagnoza si integrare inteligenta a proceselor tehnologice in cloud	8049980.6	1420584.8	2720379.09
129553	Tele-contact	11034426	2758606.6	4137186.9
129926	Sanimed - unitate medicala virtuala	13979743	2467013.5	9506504.53
129965	MEDYSPORTLINE - Sistem inovativ de inteligență artificială pentru prognoza, prevenția și tratarea herniilor de disc și a scoliozelor	12995889	3248972.2	3833759.75
129970	SINTARA - Sintetizarea, aductia si reutilizarea apei prin tehnologii sustenabile	4138832.5	730382.17	1697572.23
129987	Syscad Application	5029002	887470.93	2052919.43
129680	Sistem informatic integrat de identitate, gestiune si intermediere de plati pentru activitati-servicii si control acces	10127479	1787202.1	5665873.53
129765	Roadn - platforma web pentru realizarea profilelor genetice	6091202	1074918	1806710

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130119	Dezvoltarea unei platforme informatice inovative pentru automatizarea proceselor de creștere a plantelor în mediu controlat și monitorizarea acestora prin intermediul serviciilor cloud–greenhouse iot	11338495	2000910.8	5026001.5
129817	Inovatie printr-o solutie personalizată de e-learning în cadrul clusterului ITC „Dunarea de Jos"	8721387.4	1539068.4	2862825.08
128963	Smartsense - cadru tehnologic pentru cercetarea și promovarea sustenabila a zonelor turistice folosind tehnici inovative de vizualizare computerizata si recunoaștere audio-vizuala	5273924.9	930692.63	2295165.08
130100	Iconvert – Dezvoltarea unei suite de produse pentru marketing destinate site-urilor ecommerce folosind tehnologii de inteligenta artificiala	3916239.4	691101.07	1779885.08
129898	IBL - dezvoltarea unei soluții inovative și accesibile de automatizare	7430424.6	1311251.4	2428035.86
129946	Dezvoltarea platformei informatice syscore multilayer si multitenant, de integrare a aplicatiilor iot si M2M si implementarea rezultatelor in industrii conexe	9214208	1626036.7	2924213.06
129874	Proiectare și dezvoltare a unui produs software de monitorizare - machine vision	2661342.9	469648.75	1121260.04
129173	Banca virtuala simulata	11788430	2080311.2	5897714
129405	Solutie Inovativa Colaborativa pentru post productia audio-video utilizand mecanisme de Inteligenta Artificiala	8406988.1	1483586.1	2900336.49

130075	Cercetare in filtrarea semnalelor in banda HF si realizarea unei matrici de comutare automata de antene de receptie pentru ambarcatiunile navale de mici dimensiuni	4531365	1057561.9	2152639.35
129112	Code of Talent Inteligent - inovare in microlearning prin utilizarea inteligentei artificiale	3639339.5	909834.86	1593365.7
129846	Sistem inteligent de monitorizare si detectie a urgentelor cardiovasculare majore	12931385	2297267.9	5031538.37
129617	Solutie de management al identitatii si autentificare avansata folosind tehnologii convergente si asigurand nivele superioare de securitate pentru accesul la aplicatii si platforme critice: Legitim-ID	5196080.8	916955.4	2362348.71
129315	Platforma inovativa bazata pe Inteligenta Artificiala in Inginerie si Industria Constructiilor	13783094	2432310.8	6889845
129906	Dezvoltarea unui sistem de telecitire a contoarelor de utilitati (electricitate, gaz, apa) – TEL-EGA	7074907.5	1248513.1	2870622.7
129731	Platforma de automatizare infrastructura IT, augmentata cu tehnologii de vanzare produse digitale	4534206	800154	1476920
129891	Dezvoltarea si proiectarea unui produs software integral de administrare si monitorizare intreprinderi de catre societatea Web-Guru SRL	3774519.7	666091.65	2039519.62
128960	Platformă inovativă pentru măsurarea audienței TV, identificarea automată a telespectatorilor și corelarea cu date analitice din platforme de socializare online	7733358.5	1364710.3	2228942.31
129993	Iot MEDICAL ASSET MANAGEMENT SOFTWARE	10632592	1876339.8	3693521.8

130052	Sisteme software cu arhitecturi versatile de management al energiei si de optimizare a indicatorilor de performanță energetica a clădirilor inteligente, dezvoltate în cadrul clusterului euronest itc hub	5308606.5	936812.91	2497188.22
129916	Dezvoltarea unui sistem informatic de generare automată a codului sursă pentru aplicatiile software prototip și a ecosistemului aferent ciclului de dezvoltare utiliz nd componente de inteligentă artificială – dood robot	6864090.9	1211310.2	3253383.69
129880	Sdnot – sistem inovativ de securitate pentru ecosistemul iot	5199363.9	917534.79	2441472.86
129400	Platforma bioinformatica pentru diagnosticul precoce al cancerului colorectal și bronhopulmonar	11618678	2050354.9	3271044.29
129143	E-CIRCLE - Platforma Inovativa pentru Economia Circulara	10426922	1840045.1	4305759.48
130106	Realizarea unei harti imagistice necesara conizatiilor colului uterin	3262590	575751.14	988698.67
129410	Sistem integrat isense de monitorizare prin telemedicina a pacientilor, dezvoltat in cluster IT Iconic	6606581.4	1165867.3	2187192.92
130599	Platformă Software Centralizată pentru Identificare Digitală - PSCID	84285768	13649956	1998688.24
129318	Platforma de inovare deschisa pentru gestionarea creativitatii colaborative in Marketingul Digital - aimedia	9664282	1705461.5	3173894.82

129511	Crearea unui produs software inovativ de tip Saas (software as a service) prin colaborarea între întreprinderi centrate pe domeniul TIC și clusterele din domeniu, pentru asigurarea unui acces rapid și facil la implementarea rezultatelor cercetării/dezvoltării	9398739.9	1658601.2	3462206.64
129200	Dezvoltare platforma de administrare ierarhica - crossa	5696971.8	1005347.9	2213093.56
130096	Cresterea competitivitatii SC Focsani Proiecte Consultanta SRL prin dezvoltarea unei aplicatii informatice inovative	5200628.4	917757.93	171498.75
130044	Managementul digitalizarii sistemelor de fabricatie, si nu numai, bazat pe paradigma iot sau management digital - automatizare 100%	4383684.1	773591.31	1022121.33
130718	Sistem informatic pentru registrele de sănătate – regintermed	57003506	110639.94	10472731.6
143526	Sistem de protecție a terminalelor operaționalizate la nivelul SRI împotriva amenințărilor provenite din spațiul cibernetic	65779786	12212791	0
145394	Consolidarea capabilităților de prevenire, identificare, analiză și reacție la incidentele cibernetice, la nivelul Serviciului de Protecție și Pază << POC_CYBER_2021>>	21049860	3908154.1	0
144154	Achizitionarea de tablete si dispozitive electronice pentru invatamant, pentru Scoala Gimnaziala " Enea Grapini" Sant si Scoala Primara „Lucian Valea", din comuna Sant	808584.38	123665.85	19025.51
144004	Achizitionarea de tablete si dispozitive electronice pentru invatamant, pentru Scoala Gimnaziala Artemiu Publiu Alexi si Liceul Teoretic Solomon Halita, din orasul Sangeorz-Bai	3168455.8	484587.36	74551.9

144066	Îmbunătățirea conținutului digital și a infrastructurii TIC sistemice în domeniul e-educație în Comuna Santău, județul Satu Mare	466056.34	71279.19	10966.03
144131	Achiziționarea de tablete și dispozitive electronice pentru învățământ, pentru Școala Gimnazială George Coșbuc, din Comuna Coșbuc	284154.52	43458.92	6685.99
144034	Creșterea numărului de elevi și profesori care utilizează serviciile și aplicațiile digitale în vederea derulării cursurilor on-line	366041.62	91510.4	0
144028	E-educatie în Scoala Gimnaziala „Zelk Zoltan"Valea lui Mihai	1666707.4	294124.84	0
144078	Achiziţionare echipamente pentru dotarea scolilor de pe raza comunei totești	106620.35	16306.65	2508.71
144121	Achizitionarea de tablete si dispozitive electronice pentru invatamant, pentru Liceul Tehnologic „Liviu Rebreanu" si Scoala Gimnaziala „Iustin Iliesiu" din comuna Maieru	2106932.6	322236.75	49574.89
144050	Achizitionarea de tablete si dispozitive electronice pentru invatamant, pentru Scoala Gimnaziala "Sever Pop" din comuna Poiana Ilvei	317469.22	48554.06	7469.92
144101	Achiziţionare echipamente pentru dotarea scolilor de pe raza comunei giarmata	874936.69	133813.84	20586.75
144017	Achizitie echipamente electronice	1357466.4	207612.51	31940.38
144068	Achizitia de echipamente din domeniul tehnologiei informatiei necesare desfasurarii in conditii de preventie a activitatilor didactice in Comuna Tureni, Judetul Cluj	310758.54	47527.79	7311.95
144281	Îmbunătățirea calității activităților didactice in mediul online in cadrul LICEUL TEHNOLOGIC NR. 1 BALS	1792634.3	316347.24	0

144064	Achiziţionare tablete școlare și alte echipamente it pentru dotarea liceului teoretic "ion constantin brătianu" hațeg, județul hunedoara	1804440.7	275973.29	42457.43
144008	Asigurarea accesului elevilor Liceului Teoretic Teiuș la procesul de învățare online prin furnizarea tabletelor școlare și a altor echipamente IT pentru activități didactice	1302624.7	229874.95	0
144159	Achiziționarea de tablete și dispozitive electronice pentru învățământ, pentru Școala Gimnazială din comuna Spermezeu	459306.25	70246.83	10807.21
144043	Cresterea gradului de utilizare a internetului in unitatile de invatamant din comuna Șinteu, pentru a asigura desfasurarea in bune conditii a serviciului public de educatie in contextual riscului de infectie cu coronavirus SARS-cov-2	147523.88	22562.47	3471.15
144024	Achizitia de echipamente din domeniul tehnologiei informatiei necesare desfasurarii in conditii de preventie a activitatilor didactice in comuna ilva mica, judetul bistrita-nasaud	573113.31	87652.62	13485.02
144060	Achiziţionare tablete școlare și echipamente it pentru dotarea școlilor de pe raza comunei bretea română	141556.38	21649.8	3330.74
144059	Achiziţionare echipamente pentru dotarea școlii de pe raza comunei sarmizegetusa	128267.93	19617.45	3018.07
144147	Achizitionarea de tablete si dispozitive electronice pentru invatamant, pentru Scoala Profesionala din comuna Tarlisua	646786.7	98920.32	15218.51
144199	Asigurarea accesului elevilor la procesul de învățare în mediul on-line	431282.73	65960.88	10147.84

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144104	Achiziţionare terminale media tip tablete, laptopuri camere web și table interactive	1013816.6	155054.31	23854.5
144048	Cresterea gradului de acces a elevilor din invatamantul preuniversitar la procesul de invatare on-line prin dotarea acestora cu echipamente de tipul tabletelor scolare	38418954	8644264.6	960473.86
144005	Echipamente it pentru scoala din comuna ciumani, județul harghita	569816.37	87148.37	13407.46
144100	Achizitionarea de tablete si dispozitive electronice pentru invatamant, pentru Scoala Gimnaziala Nr. 1 din comuna Lesu	455801.74	69710.85	10724.75
144177	Crearea contextului necesar desfășurarii nealterate a activităților didactice în contextul crizei pandemice	488118.62	74653.44	11485.15
144015	Achizitia de echipamente scolare pentru sustinerea invatamantului preuniversitar din localitatea Mihai Viteazu Judetul Cluj	163705.16	25037.26	3851.88
144020	Achizitionarea de tablete si dispozitive electronice pentru unitatile de invatamant din comuna Gilău	1226245	187543.35	28852.82
144052	Cresterea gradului de utilizare a internetului in unitatile de invatamant din comuna Moftin, pentru a asigura desfasurarea in bune conditii a serviciului public de educatie in contextual riscului de infectie cu coronavirus SARS-cov-2	726874.21	111168.98	17102.93
144023	Imbunatatirea accesului la procesul de invatare in mediul online in cadrul Colegiului National "Nicolae Titulescu" Craiova	1695286	299168.12	0
144029	Imbunatatirea accesului la procesul de invatare in mediul online in cadrul liceului teoretic „petre pandrea", bals	1768791.5	312139.68	0

144184	Achizitionarea de tablete si dispozitive electronice pentru unitatile de invatamant din comuna Calatele	388340.33	59393.22	9137.42
144124	Achizitionarea de tablete si dispozitive electronice pentru invatamant, pentru Liceul Tehnologic Florian Porcius din comuna Rodna	1694589.3	259172.49	39872.69
144030	Achizitionarea de tablete si dispozitive electronice pentru invatamant, pentru Scoala Gimnaziala " Dariu Pop", din comuna Magura Ilvei	410087.99	62719.33	9649.13
144006	Asigurarea accesului elevilor de la nivelul comunei Săsciori la procesul de învățare online prin furnizarea tabletelor școlare și a altor echipamente IT pentru activități didactice	1522783.5	232896.28	35830.21
144168	Achizitionarea de tablete si dispozitive electronice pentru invatamant, pentru Liceul Tehnologic „Vlădeasa" Huedin si Liceul Teoretic "Octavian Goga"	1825267.4	279166.02	42939.98
144171	Achizitionarea de tablete si dispozitive electronice pentru unitatile de invatamant din comuna MAGURI-RACATAU	499453.68	76387.04	11751.85
144163	Achizitionarea de tablete si dispozitive electronice pentru invatamant, pentru Scoala Gimnaziala din comuna Luna	295924.87	45259.1	6962.93
144019	Îmbunătățirea accesului la procesul de învățare în mediul online în cadrul Colegiului Național Pedagogic "Ștefan Velovan"	3295750.4	581603	0
144051	Achizitie de tablete scolare si alte echipamente necesare desfasurarii activitatii didactice on-line in comuna Ciurea, judetul Iasi	2237741.2	342242.73	52652.77
144114	Achiziționarea de tablete și dispozitive electronice pentru învățământ, pentru Școala Gimnazială Lunca Ilvei	473393.65	72401.38	11138.68
130963	HUB de Servicii MMPS - SII MMPS	112280486	232580.04	20613613.2

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131065	Sistem Informatic pentru Evidenta Clinica a sectiilor A.T.I. (S.I.E.C.-A.T.I.)	113432922	256791.42	20803365.1
144562	Achizitie de tablete scolare si alte echipamente necesare desfasurarii activitatii didactice on-line in comuna Sinesti, judetul Iasi	1063359.1	162631.39	25020.21
144046	Achizitie de tablete scolare si alte echipamente necesare desfasurarii activitatii didactice on-line in comuna Pipirig, judetul Neamt	1276847.7	195282.58	30043.49
144454	Achizitie de tablete scolare si alte echipamente necesare desfasurarii activitatii didactice on-line in comuna baia, judetul suceava	1086705.5	166204.46	25567.11
144303	Achiziţionare tablete școlare pentru dotarea școlilor de pe raza comunei sântămăria-orlea	142630.14	21814.01	3356.01
144150	Achiziția de echipamente mobile din domeniul tehnologiei informaţiei pentru desfăşurarea în bune condiţii a procesului educaţional atât pentru elevi, cât şi pentru cadrele didactice, în comuna Sântandrei, judeţul Bihor	859657.39	131477	20227.23
144585	Achiziţionarea de echipamente tic pentru şcoala gimnazială vasile alecsandri nufăru, jud. Tulcea	407449.77	71902.89	0
144587	Achiziţie de tablete școlare și alte echipamente necesare desfăşurării activităţii didactice on-line în comuna gârceni, judeţul vaslui	736267.49	112605.61	17323.94
144130	Investitii de raspuns la pandemia cu coronavirusul SARS-COV-2 prin achizitionarea de echipamente IT in vederea desfasurarii activitatilor scolare.	2678987.1	409727.44	63034.99
144057	Achiziţionare tablete școlare pentru dotarea scolii gimnaziale checea, judeţul timiş	141482.79	21638.55	3329.01

144086	Echipamente it pentru scoala din comuna pauleni ciuc, județul harghita	188814.1	28877.43	4442.7
144079	Echipamente it pentru scoala din comuna sansimion, județul harghita	574627.9	87884.26	13520.67
144146	Achizitie de tablete scolare si alte echipamente necesare desfasurarii activitatii didactice on-line in comuna Lunca, judetul Mures	279297.91	49287.86	0
144490	Achizitie tablete scolare si echipamente IT pentru desfasurarea activitatii didactice la nivelul comunei Simnicu de Sus	552252.7	84462.15	12994.19
144248	Achizitie de tablete scolare si alte echipamente necesare desfasurarii activitatii didactice on-line in comuna Solovastru, judetul Mures	493893.99	87157.76	0
144065	Îmbunătățirea dotării TIC a infrastructurii educaționale din orașul Tăuții Măgherăuș	835982.54	147526.34	0
144429	Achizitie de tablete scolare si alte echipamente necesare desfasurarii activitatii didactice on-line în comuna Zădăreni, județul Arad	400899.22	61313.97	9432.94
144191	Sprijinirea elevilor din comuna Gornet, județul Prahova în procesul educațional	395858.74	60543.1	9314.32
144107	Achizitie de tablete scolare si alte echipamente necesare desfasurarii activitatii didactice on-line in comuna Gurghiu, judetul Mures	1196900.8	211217.79	0
144604	Achiziție de tablete școlare și alte echipamente necesare desfășurării activității didactice on-line în comuna bogdanesti, județul vaslui	760247.06	116273.07	17888.17
144063	Îmbunătățirea infrastructurii TIC în domeniul e-educație, în unitățile de învățământ din Comuna Moldovenești	512283.23	78349.21	12053.72

144090	Achiziție de tablete școlare și alte echipamente necesare desfășurării activității didactice on-line în comuna vlădeni, județul iași	1423792.6	217756.52	33501
144039	Creșterea gradului de utilizare a internetului în unitățile de învățământ preuniversitar de stat din sectorul 3	66418221	14944100	1660455.52
144273	Achiziţionare echipamente pentru dotarea scolilor de pe raza comunei pischia	514138.86	78633	12097.39
144182	Achiziţionarea de echipamente tic pentru şcoala gimnazială nalbant, jud. Tulcea	454332.03	80176.24	0
144292	Achiziţionare echipamente pentru dotarea scolilor de pe raza comunei giroc	142049.85	21725.27	3342.35
144067	Echipamente it pentru scoala din comuna carta, județul harghita	427485.98	65380.2	10058.51
144322	Achiziţionare tablete școlare pentru dotarea școlilor de pe raza comunei topolovățu mare	141482.79	21638.55	3329.01
144185	Achiziţionarea de echipamente TIC pentru şcolile din UAT FRECATEI	459165.02	70225.23	10803.89
144203	Imbunatatirea continutului digital si a infrastructurii TIC sistemice in domeniul e-educatie in Comuna Mera judetul Vrancea	681062.44	104162.5	16024.99
144315	Achiziţionare tablete școlare și alte echipamente it pentru dotarea școlii gimnaziale comuna săcălaz, județul timiș	941419.2	143981.76	22151.04
142462	Cresterea competitivitatii economice a SC Euro Active Photoprint SRL prin crearea unui sistem inovativ de monitorizare si asistenta a parametrilor de sanatate-activesmartmed	13128148	2316731.9	4728323.6

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142474	Dezvoltarea şi implementarea unor algoritmi inovativi care să permită utilizatorilor să identifice rapid răspunsuri relevante în urma analizei unor volume mari de date	8351207.3	2087801.8	3312390.22
142654	Innovative smart digital platform [isdp]	14997842	2646678	5845684.6
143046	AI - Methica - Platforma digitala de management	5952498.6	1050440.9	1385222.16
142811	Automated monitoring analysis platform (amap)	11769245	2076925.5	5053710
142817	Algorina safe web	4147335.2	731882.66	888457.08
142406	E-safety driving application [esda]	14025740	2475130.5	5507500
142837	Platforma de testare aplicatii inovative utilizand infrastructura de comunicatii 5G	20718077	3656131.2	10327832
142870	Bestinform	14428547	2546214.2	7272585
144091	Consolidarea capacității Școlii Gimnaziale „Dimitrie Cantemir" Rădăuți de a desfășura activități didactice în mediul on-line prin achiziția de echipamente/dispozitive electronice	594802.35	104965.11	0
144158	Imbunatatirea continutului digital si a infrastructurii TIC sistemice in domeniul e-educatie in Comuna Gura Calitei judetul Vrancea	377030.41	57663.48	8871.29
144049	Echipamente it pentru scoala din comuna sândominic, județul harghita	500299.37	76516.36	11771.77
142482	Hub de inteligenta artificiala	20984018	3703062	10326450
142764	Platforma inovativa de analiza a imaginilor bazata pe Inteligenta Artificiala pentru detectarea afectiunilor pulmonare, inclusiv cele cauzate de COVID-19	20728087	3657897.8	10264665
142643	Sistem de comunicatii ce utilizeaza terminale securizate si noduri de comunicatii blockchain	12799226	2258687	6546427

144832	Achiziție de tablete școlare și alte echipamente necesare desfășurării activității didactice on-line în comuna Fruntișeni, județul Vaslui	395737.86	60524.61	9311.48
145148	Achizitia de echipamente scolare pentru sustinerea invatamantului preuniversitar din comuna Salva, judetul Bistrita-Nasaud	626795.48	95862.84	14748.13
144085	Dotarea elevilor cu tablete scolare precum si dotarea cadrelor didactice cu echipamente/dispozitive electronice necesare desfasurarii activitatii didactice in mediu on-line pentru Scoala Gimnaziala Nr 1 Motatei, judetul Dolj	709773.74	125254.19	0
144381	Achizitia de echipamente electronice din domeniul tehnologiei informației in vederea asigurarii accesului elevilor din comuna sisesti, judetul maramures, la procesul de învățare în mediul on-line	783584.58	119842.34	18437.28
144080	Dotarea unităților de învățământ preuniversitar din comuna Dumbrava Roșie, județul Neamț, cu echipamente TIC necesare pentru derularea activităților didactice în mediul on-line	922571.3	141099.14	21707.56
144525	Achizitie de tablete scolare si alte echipamente necesare desfasurarii activitatii didactice on-line în Școala Dobroteasa, jud Olt	256085.58	45191.57	0
144095	Acces la educație în mediul on-line pentru elevii din Comuna Naruja, judetul Vrancea, în contextul crizei pandemice create de coronavirusul SARS-cov-2	385272.39	58924.02	9065.22
144719	Achizitie de tablete scolare si alte echipamente necesare desfasurarii activitatii didactice on-line în comuna Semlac, jud. Arad	590846.7	90364.74	13902.33

144109	Dotarea cu tablete si echipament IT pentru scoala on-line a unitatilor de invatamant din Comuna Cata din Judetul Brasov	590175.86	90262.19	13886.49
144962	Echipamente it pentru scoala din comuna ciceu, judetul harghita	237357.26	36301.67	5584.91
145251	Dotarea unitatilor de invatamant din comuna Valea Marului, judetul Galati cu echipamente electronice	559681.44	85598.33	13168.97
144405	Imbunatatirea continutului digital si a infrastructurii TIC in unitatea de invatamant din Comuna Ciupercenii Noi	459597.81	70291.42	10814.07
144829	Achiziție de tablete școlare și alte echipamente necesare desfășurării activității didactice on-line în comuna Tăcuta, județul Vaslui	724328.6	110779.66	17043.03
144739	Achiziție de tablete școlare și alte echipamente necesare desfășurării activității didactice on-line în comuna hănțești, județul suceava	735416.01	112475.39	17303.91
144796	Achiziție de tablete școlare și alte echipamente necesare desfășurării activității didactice on-line în comuna Zăpodeni, județul Vaslui	320994.84	49093.33	7552.82
144671	Achiziție de tablete școlare și alte echipamente necesare desfășurării activității didactice on-line în comuna Gropnița, județul Iași	904892.28	138395.29	21291.58
144442	Achizitie de tablete scolare si alte echipamente necesare desfasurarii activitatii didactice on-line pentru Școala Fiscut, jud Arad	272764.95	48135	0
144421	Achiziționarea de echipamente IT în vederea desfășurării activităților scolare din cadrul SCOLII GIMNAZIALE GEMENELE in contextul riscului de infectie cu coronavirus SARS-Cov-2 "	386341.36	59087.49	9090.4

144878	Achizitie de tablete scolare si alte echipamente necesare desfasurarii activitatii didactice on-line in comuna Mischii, judetul Dolj	164337.16	25133.9	3866.78
144623	Achiziție de tablete școlare și alte echipamente necesare desfășurării activității didactice on-line în comuna Probota, județul Iași	789306.82	120711.5	18577.93
144280	Achiziția de echipamente mobile din domeniul tehnologiei informației necesare desfășurării activității didactice în mediu on-line pentru a se asigura în bune condiții desfășurarea activităților didactice în anul școlar 2020-2021 la nivelul UAT ȘIMIAN	1494506.8	228571.62	35164.87
144823	Achiziție de tablete școlare și alte echipamente necesare desfășurării activității didactice on-line în comuna Grivița, județul Vaslui	513340.52	78510.9	12078.6
144202	Achizitia de echipamente din domeniul tehnologiei – it mobile, respectiv tablete, echipamente și dispozitive necesare activitătii didactice pentru elevii şi cadrele didactice din învățământul preuniversitar, Comuna Breaza, Judetul Buzau	217698.84	33297.46	5119.98
145439	Achiziție de echipamente de tipul tabletelor școlare, precum și a altor echipamente electronice pentru Școala Gimnazială comuna Sutești, județul Vâlcea	334240.15	58983.55	0
144993	Achiziție de tablete școlare și alte echipamente necesare desfășurării activității didactice on-line în comuna Oltenești, județul Vaslui	525582.86	80383.25	12366.66
144965	Asigurarea dreptului la educație de calitate bazată pe Resurse și Tehnologii digitale pentru elevii din Comuna Ghidigeni, judetul Galati in contextul crizei epidemice generate de virusul SARS cov2	1223866.7	187179.63	28796.86

145392	Achizitie echipamente IT pentru scolile din comuna Mileanca judetul Botosani	590062.57	90244.85	13883.84
145248	Dotarea unităților de învățământ din comuna Siliștea, județul Brăila cu echipamente electronice	319681.78	48892.5	7521.93
142466	Platforma inovativa binbox Cloud	20980529	3702446.3	10330375
144721	Dotarea cu echipamente IT a unităților de învățământ special prin U.A.T. Județul Harghita	242123.97	37030.72	5697.04
144600	Îmbunătățirea infrastructurii TIC în domeniul e-educație, în unitățile de învățământ din Comuna Noșlac	163685.9	25034.33	3851.42
145331	Proiect de achizitionare a tabletelor si a altor echipamente electronice conform OUG 144/24.08.2020 cu completarile ulterioare.	756341.37	133472.01	0
145145	Achiziție de echipamente de tipul tabletelor școlare, precum și a altor echipamente electronice pentru Școala Gimnaziaă, comuna Amărăști, județul Vâlcea	215474.6	38024.92	0
144880	Achiziție de echipamente de tipul tabletelor școlare, precum și a altor echipamente electronice pentru Școala Gimnaziala, Comuna Crețeni, județul Vâlcea	276293.42	48757.67	0
144542	Asigurarea infrastructurii tic la nivelul școlii gimnaziale „sfântul gheorghe" sângeorgiu de mureș pentru combaterea riscului de infectare cu sars-cov2	1141597.3	174597.22	26861.11
144036	Tablete si echipamente electronice pentru unitatile scolare din U.A.T. Comuna Zorleni, judetul Vaslui	1577096.3	241202.96	37108.15

145258	Consolidarea capacității unităților de învățământ preuniversitar de stat din Comuna Vatra Moldoviței, jud. Suceava de a desfășura activități didactice în mediul on-line prin achiziția de echipamente/dispozitive electronice	908391.62	138930.47	21373.93
145338	Asigurarea infrastructurii tic la nivelul școlii gimnaziale fântânele pentru combaterea riscului de infectare cu sars-cov2	723580.21	110665.2	17025.42
144584	Achizitie de tablete scolare si alte echipamente necesare desfasurarii activitatii didactice on-line în comuna Drajna, județul Prahova	716283.39	109549.2	16853.74
144528	Echipamente din domeniul informatiei-IT mobile, respectiv tablete pentru uz scolar cu acces la internet, precum si a altor echipamente/dispozitive electronice necesare desfasurarii activitatii didactice in mediul on-line pentru Scoala Gimnaziala Cozmesti si Scoala Profesionala Stolniceni-Prajescu din comuna Stolniceni-Prajescu.	816451.54	124869.06	19210.63
144116	Îmbunătățirea infrastructurii TIC în domeniul e-educație, în unitățile de învățământ din Comuna Unguraș	372295.65	56939.33	8759.89
145400	Educația ta, prioritatea noastră indiferent de vremuri - dispozitive IT pentru e-educatie	6403651.5	1440821.6	160091.29
144097	Asigurarea accesului elevilor la procesul de învățare în mediul on-line prin dotarea elevilor cu echipamente mobile din domeniul tehnologiei	464892.29	71101.18	10938.64
145252	Achizitie echipamente IT pentru scolile din comuna Vlasinesti judetul Botosani	771567.14	118004.37	18154.54
144521	Creșterea gradului de utilizare a internetului pentru studenții UTC-N sprijiniți cu echipamente mobile IT pentru a participa la cursuri on-line	4620741.4	706701.62	108723.34

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150176	Asigurarea de infrastructura IT in cadrul procesului educational online la UPG Ploiesti	763857.45	116825.25	17973.12
150048	Imbunatatirea continutului digital si a infrastructurii tic in domeniul e-educatie la nivelul usamv iasi	956221.89	146245.7	22499.34
145081	Imbunatatirea infrastructurii tic in domeniul e-educatie, comuna racovita, judetul sibiu	611350.76	93500.68	14384.74
145387	Achizitie de tablete scolare si alte echipamente necesare desfasurarii activitatii didactice on-line in comuna gagesti, judetul vaslui	502865.04	76908.78	11832.12
146061	E-UORADEA - ACCESS FOR ALL	1692667.3	258878.53	39827.46
144108	Îmbunătățirea infrastructurii TIC în domeniul e-educație, în cadrul Școlii Gimnaziale „Mihai Viteazu" Șelimbăr	516801.37	91200.24	0
144694	Asigurarea infrastructurii tic la nivelul școlii gimnaziale „szentivani mihaly" gălești pentru combaterea riscului de infectare cu sars-cov2	432958.24	66217.14	10187.25
144110	Îmbunătățirea infrastructurii TIC în domeniul e-educație, în unitățile de învățământ din Comuna Braniștea	327914.79	50151.68	7715.64
144437	Achizitie de tablete scolare si alte echipamente necesare desfasurarii activitatii didactice on-line in comuna Măgirești, județul Bacău	337740.09	51654.32	7946.87
145045	Achizitie de tablete scolare si alte echipamente necesare desfasurarii activitatii didactice on-line pentru Școala 1 Moisei, jud. Maramures	550225.1	97098.54	0
144960	Achizitie de tablete scolare si alte echipamente necesare desfasurarii activitatii didactice on-line pentru Școala Gimnazială "Dragoș Vodă" Moisei, jud. Maramureș	478894.44	84510.78	0

144826	Achiziție de tablete școlare și alte echipamente necesare desfășurării activității didactice on-line în comuna Hoceni, județul Vaslui	687596.97	105161.9	16178.74
144946	Achizitia de echipamente/dispozitive TIC in cadrul Scolii Gimnaziale, Comuna Sirineasa, judetul Valcea	360563.02	63628.76	0
144119	Îmbunătățirea infrastructurii TIC în domeniul e-educație, în unitățile de învățământ din Comuna Cricău	213020.38	32579.59	5012.25
149674	Soluții digitale pentru cresterea participarii studentilor si imbunatatirea calitatii procesului de predare on-line	936699.83	143259.97	22040
144129	Achizitie de tablete scolare si alte echipamente necesare desfasurarii activitatii didactice on-line in Comuna ZAMOSTEA, judetul SUCEAVA	603179.63	92251	14192.47
145421	Proiect de achiziționare a tabletelor și a altor echipamente electronice conform OUG 144/24.08.202/ cu completările ulterioare	487220.8	85980.14	0
144693	"Achizitie tablete pentru uz scolar cu conexiune la internet pe o perioada de 24 de luni, precum si alte echipamente electronice necesare activitatii didactice, in cadrul comunei Amarastii de Sus, judetul Dolj"	251861.45	38519.99	5926.15
144800	Tic4ubb	6175840.8	944540.35	145313.9
146058	Acces la invatamantul universitar on-line pentru toti. E-educatie pentru toti!	1964122.6	300395.22	46214.65
149656	Sanse egale pentru e-educatie de calitate	3371625	515660.28	79332.36
145038	Acces la e-educatie prin dotarea studenţilor Universităţii Ştefan cel Mare din Suceava cu echipamente mobile din domeniul tehnologiei informaţiei de tipul tabletelor școlare	1047292.7	160174.18	24642.18

149725	Sprijin pentru desfășurarea în condiții de prevenție a activităților didactice aferente anului universitar 2020/2021 la nivelul UVT, în contextul riscului de infecție cu coronavirus SARS-cov-2	674935.62	103225.44	15880.84
150076	Digitalizare integrată pentru e-learning performant la USAMV CN	1470198.7	224853.9	34592.91
144164	Consolidarea infrastructurii TIC in domeniul e-educatie în comuna Motca, judetul Iasi	467981.43	71573.62	11011.34
144446	Achizitie de tablete scolare si alte echipamente necesare desfasurarii activitatii didactice on-line pentru Școala Șagu, jud Arad	355173.19	62677.62	0
145172	Dotarea elevilor cu tablete scolare precum si dotarea cadrelor didactice cu echipamente/dispozitive electronice necesare desfasurarii activitatii didactice in mediu on-line pentru Scoala Gimnaziala Gruia, judetul Mehedinti	676453.32	103457.56	15916.55
144093	Îmbunătățirea infrastructurii TIC în domeniul e-educație, în unitățile de învățământ din Comuna Bocșa	625235.36	95624.24	14711.42
149868	Universitatea aproape de tine, soluții TIC online	366009	55977.83	8611.98
144867	”Achizitia de echipamente din domeniul tehnologiei – it mobile, respectiv tablete, echipamente și dispozitive necesare activității didactice pentru elevii şi cadrele didactice din învățământul preuniversitar, Comuna Bran, Judetul Brasov”	714073.59	109211.31	16801.68
143488	SOLIS - Sistem Omogen multi-Locatie cu functionalitati Inteligente si Sustenabile	4759623.8	1189905.9	2001975.28
143458	MARKETPLACE PENTRU DIGITALIZAREA IMM-urilor	11900765	2100135	5275450
149371	Educaţie digitală interactivă inclusivă în cadrul UAV	697862.7	106731.92	16420.32

144326	Dezvoltarea sistemului de E-Educație al Școlii Gimnaziale Platonești	345737.95	61012.58	0
145705	Creşterea accesului studenţilor universitatii la educatie online, UNITEC	1743751.6	307720.86	41866.79
144963	Dotarea școlii gimnaziale Pericei cu echipamente mobile din domeniul technologiei informației de tipul tabletelor	212795.36	32545.18	5006.95
144260	Îmbunătățirea conținutului digital și a infrastructurii TIC sistematice în domeniul e-educație a Școlii Gimnaziale Greci, județul Tulcea	237534.21	36328.75	5589.05
150245	Dezvoltarea infrastructurii IT a UMF Craiova in vederea desfasurarii activitatii didactice in mediul online	742545.73	113565.82	17471.67
146739	Achiziționarea de echipamente IT pentru studenții cu burse sociale în vederea desfasurarii activitaților didactice în contextul pandemiei SARS-COV-2	487811.93	86084.47	11712.17
150323	Achizitia de echipamente mobile IT pentru participarea studentilor Academiei de Politie "Alexandru Ioan Cuza" la cursuri on-line	108320	24372	2708
150060	Agrivetdigital - sanse egale pentru toti!	2676626	593126.68	66729.64
144698	Achizitie echipamente IT pentru scolile din comuna Hiliseu Horia judetul Botosani	984574.88	150582.04	23166.47
144345	Achizitia de echipamente din domeniul tehnologiei – it mobile, respectiv tablete, echipamente și dispozitive necesare activității didactice pentru elevii şi cadrele didactice din învățământul preuniversitar, Comuna Cicarlau, Judetul Maramures	580035.44	88711.31	13647.89
148345	Facilitarea accesului studenților UPT la educația digitală -eduupt	1856680.7	283962.93	43686.61

150049	Imbunatatirea continutului digital si a infrastructurii TIC pentru studentii ACADEMIEI DE STUDII ECONOMICE DIN BUCURESTI beneficiari de burse sociale si burse sociale ocazionale	1723082.7	387693.59	43077.08
150105	PREGONLINE - Pregatiti pentru educatie on-line! Asigurarea accesului studentilor la procesul de invatare in mediul on-line in conditiile pandemiei SARS cov 2	241583.63	36948.08	5684.32
144658	Consolidarea capacității unităților de învățământ preuniversitar de stat din Comuna Horodnic de Sus, jud. Suceava, de a desfășura activități didactice în mediul on-line prin achiziția de echipamente/dispozitive electronice	892247.06	136461.32	20994.05
143454	Sistemului inteligent criptografic integrat [sici.ai]	16777250	2960691.2	5772692.44
150190	Imbunatatirea infrastructurii TIC in Universitatea Tehnica de Constructii Bucuresti - elife, estudent	1086514.4	244465.73	27162.86
149760	Imbunatatirea accesului la e-educatie prin dezvoltarea infrastructurii TIC - UMFST "G.E.Palade" din Targu Mures	1540832.7	235656.75	36254.89
149875	Dezvoltarea infrastructurii TIC a TUIASI pentru sustinerea e-learning si a educatiei mixte - ELEARN4ALL	6124894.3	936748.52	144115.18
145956	Acces la educație online pentru studenții cu burse sociale din Universitatea din București	3061184.2	688766.4	76529.65
145499	Acces la educație în mediul on-line pentru elevii din Comuna Desa, judetul Dolj	713422.37	109111.65	16786.42
144463	Dotarea Liceului Tehnologic Topoloveni si a Liceului Teoretic "Ion Mihalache" din orasul Topoloveni, Judetul Arges cu echipamente TIC necesare pentru derularea activitatilor didactice in mediul on-line in contextul pandemiei Covid	2150230.1	328858.73	50593.65

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145289	Dezvoltarea sistemului de E-Educație în Comuna Independența, județul Călărași	622497.2	95205.45	14647
144656	Acces la e-educație prin dezvoltarea infrastructurii IT la nivelul Școlii Gimnaziale "Ioan Murariu" Cristinești	1156745	204131.46	0
144808	Dotarea unitatilor de invatamant din comuna Pușcași, judetul Vaslui cu echipamente si dispozitive electronice necesare desfasurarii activitatii didactice in mediul on-line	465994.17	71269.7	10964.57

Annex 2: Interviewees

Between January and March 2022, representatives of the following organisations were interviewed for the purposes of the evaluation

Organization	Theme/Specific Objective
Ministry of Culture	Increasing use of e-government
ANCOM (National Authority for Management and Regulation of Communications)	Access to broadband infrastructure
ADR (Authority for the Digitalization of Romania)	All themes
Transparency International team monitoring the E-Culture Project	1. Increasing economic competitiveness 2. Increasing use of e-government
Contractor for the E-Culture Project	1. Increasing economic competitiveness 2. Increasing use of e-government

Contractor for the Competition Council Big Data Project	1. Increasing economic competitiveness 2. Increasing use of e-government
Contractor for the Trade Registry Big Data Project	1. Increasing economic competitiveness 2. Increasing use of e-government
Competition Council	1. Increasing economic competitiveness 2. Increasing use of e-government
Trade Registry	1. Increasing economic competitiveness 2. Increasing use of e-government

Annex 3: References

Competitiveness Operational Programme Document (version September 2020)

Ex-ante evaluation of the Sectoral Operational Program Increasing Economic Competitiveness

Monitoring Framework for the Competitiveness Operational Programme 2014-2020

Various project-level documents, including but not limited to records for the case study projects

Macro Poverty Outlook for Romania : April 2022 (English). Macro Poverty Outlook (MPO) Washington, D.C. : World Bank Group. http://documents.worldbank.org/curated/en/099044204222234290/IDU0af11e9460e0970420309811022ad13984eca

Romania's recovery and resilience plan and EU assessment https://ec.europa.eu/info/business-economy-euro/recovery-coronavirus/recovery-and-resilience-facility/recovery-and-resilience-plan-romania_en

High-Frequency Monitoring Systems to Track the Impacts of the COVID-19 Pandemic, World Bank Group, 2020

COVID-19 Business Pulse Surveys Dashboard (for Romania), 2021

The Online Labour Index, The iLabour Project, Oxford University, https://ilabour.oii.ox.ac.uk/online-labour-index/

ANNEX 4: Stakeholder Interview Questionnaire and Beneficiary Survey Questionnaire

Stakeholder Interview Questionnaire

This interview questionnaire seeks to understand stakeholder perspectives to assess the extent to which interventions funded under the Competitiveness Operational Programme (2014-2020) have met their goals and objectives.

Introduction

Thank you for agreeing to participate in this interview. My name is <insert name>. I am conducting this interview on behalf of the World Bank Group to evaluate the effect of interventions funded under the Competitiveness Operational Programme. The purpose of this interview is to help us better understand the effect that the COP has had on key stakeholders such as yourself.

It is important that you respond to all of the interview questions based on your experience and perspective.

Warm up

Do you have any questions before we begin?

Objective questions

Design

- Have you been involved in the design of POC Axis 2? If so, could you kindly describe the nature of your involvement and the processes by which you were consulted in different phases of design of the programme?

- Did you participate in the design of the Project for submission to ESIF/COP-MA? (If yes, go to sub-questions; if no, ask for the right person to pose these questions to)

    o What challenges/problems necessitated the inception of this project?

    o What were you looking for in a solution and how did it inform the design of your project?

    o What initial challenges did you encounter in the design stage and how did you engage with the POC Selection Process? Kindly describe your engagement in detail.

- Was the design adequate in your opinion, in view of the objectives you sought to achieve?

- Were the project risks adequately identified? Were appropriate actions to mitigate those risks planned?

- Did lessons from earlier projects influence design? Examples?

Implementation

- What were the most difficult aspects of implementing this Project? What worked / what did not?

- How do you rate the various aspects of implementation below? Are there any lessons that we could draw for the following areas?
    - Commitment and leadership on the agenda
    - Coordination and engagement with various stakeholders
    - Organizational capacity for implementation
    - Legislation and regulations affecting the project (National/EU)
    - Monitoring and Reporting (to the MA)

- Do you think the implementation timeline was adequate for the project?
    - What could (if anything) have been done to tighten the implementation timeline of the Project?

Outcomes

- In your opinion, what were the Project's most significant outcomes?

- Kindly describe any anecdote of how the project may have made a difference.

- Have there been any unplanned benefits (ex. institutional strengthening) as a result of the Project?

- How would you describe the impact of the Project (macro-view)?

- How would you describe the sustainability of the outcomes post-completion? What are some key outstanding challenges?

- Did COVID-19 affect project implementation? How? What were some ways you overcame the challenges? What lessons would you have for other projects under implementation?

Monitoring and evaluation of outcomes

- Were the indicators adequate to assess the progress made under the project? Were the M&E arrangements effective?

- Was data collected and analyzed in a timely manner?

- Was M&E data used to inform project management and decision-making? If so, how?

- Was the partnership with the Managing Authority effective? What worked? What didn't work?

Lessons Learned

- What are the key lessons learned (positive and negative)?

- What are some lessons for the next programming period? Are you planning to apply?

- If you were assisting another person design a similar project, what would you recommend that they include in the design?

Questions for further data collection

Whom else should we contact as part of this process to gain additional insights on the design and implementation of this project?

Conclusion

Those are all the questions I have for you today.

Are there any other comments you would like to provide?

Thank you very much for your time.

Survey questionnaire for beneficiaries only

No.	Question	Response
1	Name of firm/organization	
2	Nature of the firm/organization	Public Private Non-governmental organization Other: _____
3	Year founded	
4	Number of employees	
5	Company turnover (annual) (if applicable)	
6	Name of the call for projects applied for, in the 2014–2020 cycle (as in the Call for Projects)	
	Code for the call for projects you applied for	
7	Size of award requested for (in Lei)	
	Size of award granted (in Lei)	
	Did you have any co-financing for this award?	Yes No
	Size of co-financing/financing from other sources (if applicable, in Lei)	
8	Are you implementing projects under any other EU-funded Operational Programmes (including POC Axis 1) in this cycle?	Yes No
	If yes, which Operational Program? If yes, how many projects financed through EU Funds were you awarded to date?	
	If you are implementing projects under other Operational Programmes in the 2014–2020 cycle, how do you rate your experience with projects financed through those programmes compared to POC – Axis 2?	Much better Better Similar Worse Much worse Not applicable
9	On a scale of 1–10, how satisfied were you with the process used for monitoring the implementation of projects by firms under this call for projects?	
10	Why? Please elaborate on your rating above.	
11	What are your opinions on the timeliness of the reimbursement process?	
	Were there any situations of delays that impacted your cash flow and normal operations? Kindly elaborate.	
12	What part of managing the implementation process did you find the most challenging?	
13	Why? Please elaborate on your answer above.	
14	Were your queries at various stages of the implementation process responded to in a timely and efficient manner?	Yes No Prefer not to say

15	How was your experience with the software platform used for submitting operational documents during implementation?	Very Good Good Neutral Bad Very Bad Prefer not to say
16	How would you assess the reliability of the platform used for submitting operational documents during implementation?	Very Good Good Neutral Bad Very Bad Prefer not to say
17	If there is anything you would like changed/improved about this process, what would that be?	
18	How would you rate the efficiency of the implementation process overall, based on your experience?	Very good Good Neutral Bad Very bad Prefer not to say

ANNEX 5: List of members of the Evaluation Coordination Committee

Number	Institution's name	Representative
1.	Ministry of Education	Government representative at public policy level in education and research and data provider
1.	Ministry of Transport and Infrastructure	Government representative for the implementation of public policies in the field of communications and data provider
2.	Ministry of Economy	Government representative for public policies in the field of trade and the business environment
3.	Ministry of Health	Government health public policy representative and data provider

4.	Ministry of Environment, Waters and Forests	Government representative at environmental public policy level and data provider
5.	National Institute of Statistics	Data provider
6.	The Authority for Digitization of Romania	Government representative at the level of public policies in the digitalization field
7.	Executive Unit for Financing Higher Education, Research Development and Innovation	Government representative at public policy level and data provider
8.	Directorate General for the European Competitiveness Programs, Management Authority for the Competitiveness Operational Program	Government representative for the management of European structural and investment funds
9.	General Directorate of the Intermediate Organization for Research (OIC), Ministry of Research, Innovation and Digitaliaztion	Government representative for the management of European structural and investment funds
10.	General Directorate of the Intermediate Body for the Promotion of the Information Society (OIPSI), the Authority for the Digitization of Romania	Government representative for the management of European structural and investment funds
11.	General Directorate, Regional Operational Program, Management Authority for the Regional Operational Program, Ministry of Development, Public Works and Administration	Government representative for the management of European structural and investment funds
12.	Romanian Association of Banks	Social partner
13.	General Association of Romanian Engineers	Social partner
14.	Association of Romanian Businesspeople	Social partner
15.	Alma Mater National Trade Union Federation	Social partner

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16.	The National Council of Small and Medium Private Enterprises in Romania	Social partner
17.	Romanian Research and Design Patronage	Social partner
18.	Patronage of Young Entrepreneurs from Romania	Social partner
19.	Academic Society from Romania	Social partner
20.	Analysis and Programming Directorate	Government representative for the management of European structural and investment funds
21.	National Authority for Communications Administration and Regulation	Government representative for administration and regulation in the communications sector
22.	Association for Information Technology and Communications from Romania	Social partner
23.	Association of Regional Development Agencies in Romania	Social partner
24.	Romanian Association for the Electronics and Software Industry	Social partner
25.	Employers' Association of the Software and IT Services Industry	Social partner
26.	Chamber of Commerce and Industry of Romania	Social partner
27.	Ministry of Labor and Social Solidarity	Government representative at the level of public policies in the field of labor and social protection and data provider
28.	Ministry of Culture	Government representative at the level of public policy in the field of culture and data provider
29.	Management Authority for the Administrative Capacity Operational Program, Ministry of Public Works, Development and Administration	Government representative for the management of European structural and investment funds and data provider

30.	Association for Intercommunity Development ITI Danube Delta	Government representative for the management of European structural and investment funds
31.	General directorate for public policies, strategies and internal managerial control, General Secretariat of the Government	Government representative at the level of public policies
32.	The National Organization of Disabled Persons from Romania	Social partner
33.	National Council for Combating Discrimination	Anti-discrimination authority
34.	Federation of Democratic Trade Unions from Romania	Social partner

ANNEX 6: Econometric Methods Utilized

While counterfactual evaluations cannot be performed under all themes of the COP, based on the literature and availability of data, this output focuses on the effectiveness of ICT sector investments under Investment Priority 2.2

The evaluation measured the impact of interventions seeking to improve digital adoption and innovation among firms via small grants measures of firm performance and innovation through a difference-in-differences (DiD) approach. The effects are measured using the following variables: change in firm size (number of employees), fixed assets expenditures, operating revenues, turnover, and net profits. While estimates on research and development expenditures and number of patents filed were attempted, this was not feasible due to absence of sufficient data for inference. The evaluation's difference-in-differences (DiD) analysis used administrative data on all firms in Romania from 2007 to 2020 (about 13 million observations). The evaluation team merged data from the COP Managing Authority on beneficiaries awarded funding in 2017, 2019 and 2020. This data was mapped to data with financial and performance variables in the overall data set.

The difference-in-differences method compares the changes in outcomes over time between a population that is enrolled in a program (the treatment group) and a population that is not (the comparison group). The treatment group is constituted by firms approved for funding in 2017. The control group consists of firms that are as similar to treatment firms as possible. Control group was chosen from among the firms that applied for and were approved for programme funding in subsequent rounds of funding applications under the same investment priority in 2019 and 2020. The evaluation compares the beneficiary firms in the first call (the treatment group) with those approved later (the control group), which controls for unobservable characteristics of the companies.

Simply observing the before-and-after change does not capture the program's causal impact because many other factors are also likely to influence firm outputs and productivity over time. At the same time, just comparing beneficiaries and non-beneficiaries would be problematic if unobserved reasons exist for why some firms enrolled in the program and others did not.

The difference-in-differences method thus accounts for both. The difference in the before-and-after outcomes for the beneficiaries—the first difference—controls for factors that are constant over time in that group, since we are comparing the same group to itself. By measuring the before-and-after change in outcomes for a group that did not enroll in the program at the same time but later (in 2019 and 2020) but were similar in other observable and unobservable characteristics – we obtain the second difference and account for time-varying factors that may interfere with inference.

The model is specified as follows. Let $t = 0$ before the intervention (Round 1 of grants), and $t = 1$ after. $Y_t T$ and $Y_t C$ are the respective outcomes for the treatment group and control group (those who did not) in time t. The difference-in-differences estimator can be specified as

$$\delta = E\,(Y_{1T} - Y_{0T} \mid T_1 = 1) - E\,(Y_{1C} - Y_{0C} \mid T_1 = 0)$$

where $T_1 = 1$ denotes treatment group at $t = 1$, whereas *$T_1 = 0$ denotes the control group*

For the method to be valid, the comparison group must accurately represent the change in outcomes that would have been experienced by the treatment group in the absence of treatment. To test the validity of the DiD approach, the evaluation tested for the parallel trends assumption in the 2007–2020 period (the universe for which data is available) and discussing stable unit treatment value assumption (SUTVA) and why it holds in this case. A full elucidation of the parallel trends test and event study estimation, and a discussion on SUTVA, is presented in Chapter 6.