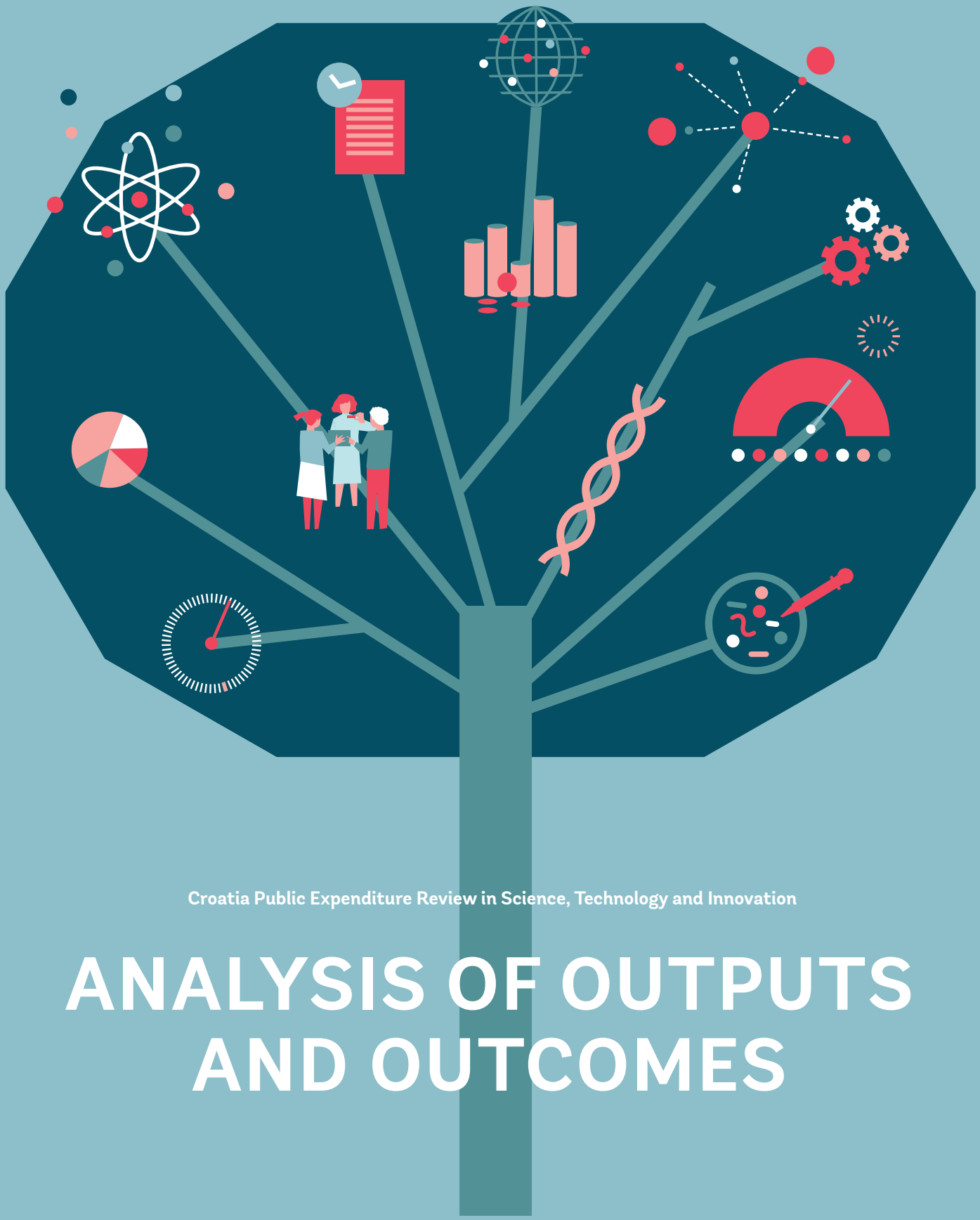

Croatia Public Expenditure Review in Science, Technology and Innovation

ANALYSIS OF OUTPUTS AND OUTCOMES

THE WORLD BANK
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REPUBLIKA HRVATSKA
Ministarstvo znanosti i obrazovanja

REPUBLIKA HRVATSKA
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EUROPSKI STRUKTURNI I INVESTICIJSKI FONDOVI

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Analysis of Outputs and Outcomes

January 2021

Note

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Acronyms and Abbreviations

BSO	business support organization
ERDF	European Regional Development Fund
ESIF	European Structural and Investment Funds
EUR	Euro (currency)
HAMAG-BICRO	Croatian Agency for SMEs, Innovations, and Investments
HEI	higher-education institution
HRK	Croatian kuna (currency)
HRZZ	Croatian Science Foundation
ICT	Information and communication technologies
ICT-R	Improving competitiveness and efficiency of SMEs in areas with special development needs through ICT
IPR	intellectual property rights
IRP	Installation Research Projects
M&E	monitoring and evaluation
MESD	Ministry of Economy and Sustainable Development
MSE	Ministry of Science and Education
NSME-1	Innovations in newly-established SMEs – Phase 1
OECD	Organisation for Economic Co-operation and Development
OPCC	Operational Programme Competitiveness and Cohesion
PER	public expenditure review
PI	principal investigator

PRO	public research organization
R&D	research and development
RDI	research, development, and innovation
RF	results framework
RO	research organization
RP	Research Projects
RS	Research Scholarships
S3	Smart Specialization Strategy
SIIF	Science and Innovation Investment Fund
SMEs	small and medium enterprises
STI	science, technology, and innovation
STPA	sub-thematic priority areas
STRIP	Strengthening Capacities for Research, Development and Innovation
ToC	theory of change

Executive Summary

The analysis of outputs and outcomes contained herein assesses the efficiency of research and innovation support programs in converting inputs into outputs, tracks progress on outcomes, and reports on the beneficiaries' perceptions of quality of the programs. This report is the fourth in a series of outputs produced under the advisory project Croatia Public Expenditure Review in Science, Technology and Innovation. The analysis covers seven programs led by the Ministry of Science and Education (MSE), the Ministry of Economy and Sustainable Development (MESD) and the Croatian Science Foundation (HRZZ). The analysis uses program-level administrative expenditure data, theories of change developed in the *Analysis of Theory of Change and Results Framework* (World Bank 2020a), as well as information collected from beneficiaries through a beneficiary survey, to answer the following questions:

1. *Efficiency in the use of inputs*: What are the costs covered by the program and the costs covered by beneficiaries? How do they compare?

2. *Efficiency in the generation of outputs*: Are the programs generating the expected outputs with a reasonable amount of inputs?

3. *Progress on outcomes*: Are the programs generating the expected outcomes? What other results were achieved?

4. *Perceived quality*: According to program beneficiaries, what is the level of quality of inputs and program contributions? What are the areas for improvement?

Programs targeting researchers

Administrative and operating costs make up a low share of total program costs, but costs per supported project vary widely across programs. The costs of designing, implementing, and monitoring a program should not exceed its benefits, as measured by the value of disbursed funding and the number outputs and outcomes achieved as a result of such funding. In programs targeting researchers, administrative and operating costs make up between 5 and 10 percent of total program costs. However, administrative costs per project vary from HRK 40,000 to HRK 100,000, with lower administrative costs being associated with programs that have more beneficiaries, but also lower amounts of funds disbursed per project.

Programs targeting researchers are successful at generating outputs related to capacity building and collaborative projects, as well as outcomes related to scientific publications. The average number of outputs per project ranged from 16 to 34, most of them related to capacity building, and, to a lesser extent, collaborative projects during project implementation. Almost all survey respondents achieved these two output types.

Collaborative projects with industry and international collaborative projects lag those with other researchers and domestic projects. There have also been very few examples of collaborative projects with diaspora researchers, showing that the potential of the diaspora remains untapped. Most survey respondents have produced a large volume of scientific publications as a result of their projects, but only around a fifth of them are indexed in citation databases.

The generation of outcomes related to technology transfer, research commercialization, and intellectual property protection has been less fruitful. Even in programs where commercialization of research originating in public research organizations (PROs), technology transfer (including spin-offs, etc.), and IP protection constituted central activities, very few respondents managed to achieve those outcomes. This is, in part, a function of the composition of spending of beneficiaries: most respondents invested a larger portion of their budgets towards researchers' salaries, supplies, machinery, and equipment, but very few allocated any funds for intellectual property protection, market research, and similar activities. Nevertheless, it must be noted that a sizable portion of respondents achieved outcomes related to new products, processes, services, new technology, or software.

Researchers were mostly satisfied with the clarity of program objectives, but indicated lack of flexibility, financial reporting requirements, and administrative and technical support as the main areas for improvement. Project outcomes exceeded the expectations of more researchers than those for whom outcomes fell short of expectations. At the application stage, most respondents were satisfied with the clarity of program objectives, but not many were satisfied with the flexibility for noncompliance with program rules. More flexibility to accommodate the particularities of the discovery process inherent in research projects would be welcome, as long as this is done with transparency and accountability. Financial and monitoring requirements during implementation appear to be particularly burdensome to beneficiaries. Better administrative support would have helped improve the project outcomes of many respondents. Some would also have appreciated more assistance with preparation of project budgets and procurement.

Programs targeting firms

When it comes to programs targeting firms, the application costs are quite high, and many respondents had to bring in experts and consultants to assist with application and project management. Two programs targeting firms were covered by the analysis: one supporting information and communication technologies (ICT) upgrades in SMEs, and another one funding innovation in newly established SMEs. Between these two programs, average application costs ranged from HRK 30,000 to HRK 47,000. On average, firms received two to three times the amount of funding that they invested in participating in the program, a much lower multiplier compared to that for researchers. Over 80 percent of respondents used the additional help of experts and consultants. Such high costs are an indication of complexity and constitute a barrier to participation. Hiring additional experts to assist with the application process and project management puts a financial burden on potential beneficiaries, especially smaller and younger firms.

A significant share of firms achieved the outcomes expected for their programs, including increased sales and employment, but for many the outcomes were below their own expectations. The program supporting ICT upgrades in SMEs achieved outputs in terms of training employees, and most respondents achieved outcomes related to technology upgrades and products or services that were being sold on the market. Over 90 percent improved productivity, and around two-thirds reduced their costs. Most respondents in the program supporting innovation in newly established SMEs hired additional workers; introduced new products, processes or services; accessed international markets; and improved export performance. However, for this program in particular, around 30 percent of respondents stated that the project outcomes fell short of their expectations.

The availability of program information was satisfactory to most respondents, but the time needed to select beneficiaries, meet information requirements, and conduct financial reporting were less satisfactory. Program information was easily accessible to most respondents, which confirms the transparency of program information. Respondents were less satisfied with the time needed to complete the selection process, and indeed, for one of the programs, two years passed between the publication of the call and contract signing. Such long delays disrupt business planning and are unacceptable for science, technology, and innovation (STI) support programs, given the fast pace of technological and scientific advancements. Among different aspects of program implementation, financial reporting requirements were satisfactory for the smallest share of respondents.

Recommendations

Policymakers should address the gaps in the capacity to conduct efficiency analyses. The ability to assess the success of any policy intervention, and thus make decisions on allocation of limited funds, hinges on the ability of policymakers to assess the full costs and benefits of such interventions. In order to achieve that, institutions in charge of research and innovation programs should implement the following actions:

1. *Conduct regular efficiency analyses* – efficiency analyses should be conducted at regular intervals to collect information on programs' efficiency in the use of inputs and generation of outputs and outcomes. This would allow policymakers to make timely and evidence-based adjustments to programs.

2. *Generate and track program-level cost data* – currently, there is no systematic and reliable way to track programs' administrative and operating costs. Institutions should review their financial information systems, based on the experience of the analysis conducted, to enable the tracking of program costs.

3. *Define benchmarks and targets for outputs and outcomes* – based on an explicit theory of change, each program should define a set of intended outputs and outcomes, together with associated benchmarks and targets against which to assess program achievements.

4. *Conduct beneficiary surveys on a regular basis* – beneficiary surveys will allow policymakers to obtain information that is otherwise not available through implementation or post-implementation reports.

5. *Improve quality of data on outcomes* – the quality of the data used to measure efficiency in the generation of outcomes should be improved by conducting more impact evaluations, allowing for attribution of outcomes to a specific program.

The analysis has also revealed room for improvement in the efficiency of individual programs. Some of these recommendations have already been raised in previous reports but have been reaffirmed from a different angle.

6. *Channel funds towards more influential research* – policymakers should start systematically tracking the quality of scientific publications resulting from supported projects and allocating more funds to fields that have a greater impact.

7. *Incentivize international collaborations* – policymakers should provide incentives for international collaboration, either through existing interventions or through new ones.

8. *Encourage science-industry linkages* – existing programs that focus on industry-science collaboration should be scaled up, and new programs could be introduced in the policy mix to facilitate, for example, temporary secondments of researchers to the private sector.

9. *Focus on supporting technology transfer and research commercialization* – the generation of outcomes related to technology transfer and research commercialization should be enhanced by increasing the role of the private sector in support programs, as well as by creating better conditions for researchers to engage in these activities.

10. *Reduce application costs of programs targeting firms* – application costs could be reduced by simplifying the application process and by providing more hands-on support and advice to applicants.

11. *Introduce more flexibility in the application process* – applicants should have the opportunity to revise their proposals and incorporate feedback from reviewers and program officers.

12. *Reduce reporting burdens on beneficiaries during implementation* – policymakers should eliminate overly bureaucratic reporting practices—for example, by reducing the number of documents that need to be provided to substantiate payments, or by using existing public data sources and repositories.

13. *Provide better administrative support* – institutions should invest in the training and career development of program officers, providing them with the tools and autonomy needed to exercise professional judgment, and thus provide better, more practical support to applicants and beneficiaries.

Introduction

The analysis of outputs and outcomes contained herein is the fourth analytical report delivered under the Croatia Public Expenditure Review (PER) in Science, Technology and Innovation (STI). The PER in STI is a methodological approach developed by the World Bank that aims to examine public spending for STI and provide actionable recommendations to increase its effectiveness. This report is prepared under the monitoring and evaluation (M&E) component, which includes advisory support for strengthening the M&E of STI programs in Croatia. The analysis was conducted by the World Bank at the request of the Ministry of Science and Education (MSE), in close cooperation with the Ministry of Economy and Sustainable Development (MESD) and other stakeholders.

The purpose of this analysis is to explore the results related to select STI support and the level of investment required to achieve them. Specifically, the analysis provides an assessment of the efficiency of select STI programs in converting inputs into outputs and outcomes. Different programs generate different amounts and quality of outputs. Analyzing the programs' efficiency allows policymakers to understand the level of investment needed to generate the desired outputs and outcomes, identify opportunities to improve results, and make informed decisions about program design and resource allocation.

The analysis sets benchmarks for assessing the results of research and innovation support programs in Croatia. As a novel approach, one of its main contributions is to introduce benchmark values which can be used to assess program performance going forward. It is important to note that few countries have conducted a comprehensive PER in STI that includes an efficiency analysis. Therefore, the experience in Croatia is not only valuable for the institutions involved but also helps to build global knowledge in this area.

The analysis was conducted on a subset of STI support programs, using a variety of data sources. Among the 42 programs in the PER, seven were selected for analysis in consultation with MSE and MESD. Sources of data included a survey targeted to researchers, a survey targeted to firms, administrative data on program costs, and previous work conducted within the PER, specifically the theories of change (ToCs) developed for the analyzed programs.[1] The surveys collected information on the characteristics of beneficiaries, their experiences with the application process and the implementation of the project, and the project results achieved. A research team, including researchers from the World Bank and local researchers, was assembled to conduct the analysis and lead the data collection.

Various tools were developed in the context of this analysis that may be useful for its replication and for continuity with any forthcoming programming. These include survey questionnaires targeting researchers and firms, databases, a template for program costs

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1 The specific ToCs used for this analysis are presented in the report "Analysis of Theory of Change and Results Framework" delivered under this project.

data collection, and files with tables and charts using data from the surveys. Their design was built upon from the experience of the work conducted under World Bank (2018). Using these tools to replicate the analysis in the context of current or subsequent rounds of these programs will improve its precision (given that some rounds included in the present analysis closed several years ago) and allow for comparisons over time.

The report is structured in 10 sections. Section 1 presents the analytical framework used, including data collection. Section 2 provides a comparison of key results across the seven programs in the analysis. Then, seven program-specific sections follow, presenting detailed analysis. Section 10 concludes and provides recommendations.

1 Approach

Approach

1.1 Analytical framework

The analysis of outputs and outcomes aims to assess the efficiency in the use of inputs, the efficiency in the generation of results, and the perceived quality of select STI programs. The overall question is whether the programs generated their expected results with reasonable amounts of input. Seven programs were selected for analysis based on (1) the number of recipients that had completed their projects, (2) the prospects for continuation of the program, (3) the availability of information and data on inputs, outputs, and outcomes, and (4) the importance of the program in the portfolio of the implementing institution. Five programs supported a total of 532 research projects and two supported a total of 272 firm projects. In the current policy mix, the five programs targeting researchers represent 31 percent of the overall project financing for researchers, while the two programs targeting firms represent 13 percent of project financing for firms. All programs provided beneficiaries with grants and required investments or contributions from the projects. Table 1.1 provides more detail.

Table 1.1 Programs analyzed

MINISTRY	PROGRAM	PROJECTS COMPLETED	CALL(S) START YEAR
Science and Education (532 researchers' projects)	Science and Innovation Investment Fund (SIIF)	24	2009
			2011
	Strengthening capacities for research, development and innovation (STRIP)	19	2014
	Research Scholarships for Professional Development of Young Researchers (RS)	52	2014
	Research Projects (RP)	335	2013
			2014
			2016
	Installation Research Projects (IRP)	102	2013
			2014
Economy and Sustainable Development (272 firms' projects)	Improving Competitiveness and Efficiency of SMEs through ICT (ICT-R)	219	2015
	Innovations in newly established SMEs – Phase 1 (NSME-1)	53	2016

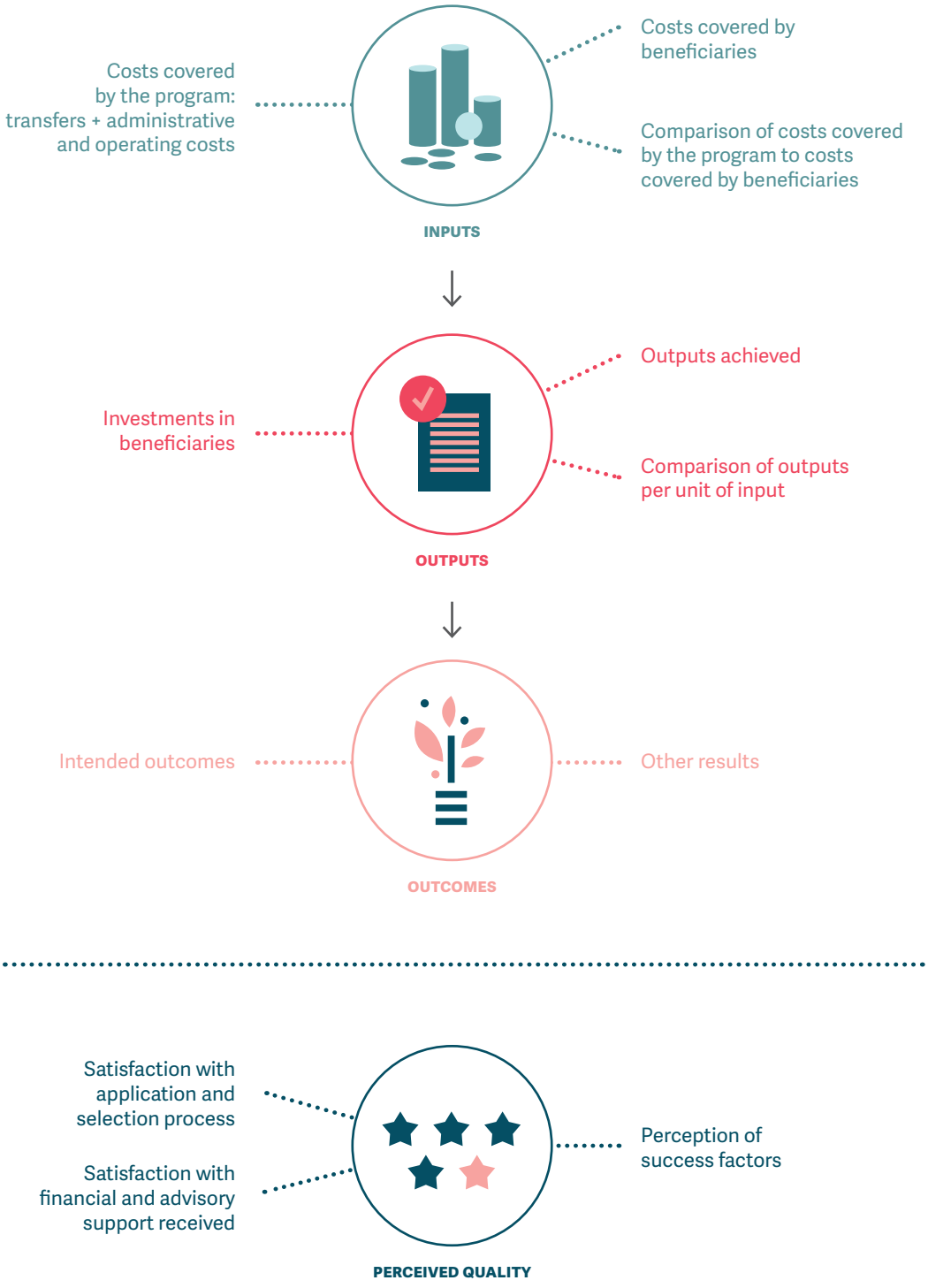
Source: Staff elaboration.

The analysis for each program covers four areas: efficiency in the use of inputs, efficiency in the generation of outputs, efficiency in the generation of outcomes, and perceived quality. These areas were defined based on the World Bank guidance note "Public Expenditure Reviews in Science, Technology, and Innovation" (Correa 2014) and lessons from a previous efficiency analysis conducted by the World Bank. In general terms, the efficiency of a program refers to the costs of generating results. Figure 1.1 presents the framework underpinning the analysis presented in this report. The analysis follows the basic logic of an intervention. That is, each program starts with a certain investment of inputs, measured as costs covered by the program and costs covered by beneficiaries, which are, through project activities, converted into outputs achieved during the projects and longer-term outcomes. The perceived quality of the program cuts across these three areas to present the satisfaction of respondents with different aspects of the program and the alignment of their project objectives with the program. Each area covers certain sub-areas used for the analysis. For example, the analysis of the use of inputs entails an analysis of: (i) costs covered by the program, (ii) costs covered by beneficiaries, and (iii) comparison of costs covered by the program to the costs covered by beneficiaries.

Under each area, several indicators were selected for this analysis based on ToCs and program documentation. For each program, a ToC was built providing a description of the expected pathways of change connecting inputs, activities, outputs, and outcomes. These ToCs are available as part of a separate PER in STI report titled *Analysis of Theory of Change and Results Framework* (World Bank 2020a). Based on these ToCs and the data collected, a set of indicators was selected for each area of analysis. Annex 1 provides definitions for key indicators.

The "efficiency in the use of inputs" area includes an assessment of and a comparison between the costs covered by the programs and the costs covered by beneficiaries. Costs covered by the programs include direct financial transfers to beneficiaries (the grants), indirect financial transfers (such as tax deductions or discounts), administrative and operating costs (such as personnel, fixed costs, and external services), and non-financial transfers (such as technical assistance and office space or equipment lent to beneficiaries) (Table 1.2). Administrative and operating costs include personnel expenses for program design and implementation, fixed costs such as offices and equipment for staff, and external services such as contracts for studies or experts. To assess the costs covered by beneficiaries, data were collected on application costs (including funds, resources, and time required to complete an application) and cash and in-kind contributions to the project from researchers' institutions. The efficiency in the use of inputs is measured by the average administrative and operating cost per project, the average cost per project covered by beneficiaries, and the ratio of costs covered by the program to costs covered by beneficiaries.

Figure 1.1 Analytical framework for the analysis



Source: Staff elaboration.

Table 1.2 Analysis of efficiency in the use of inputs

CATEGORY	INDICATORS
Costs covered by the program	• Amount and composition of program costs, including transfers to beneficiaries and administrative and operating costs • Average administrative and operating cost per project
Costs covered by beneficiaries	• Amount and composition of application costs • Contributions from institutions • Average cost covered by beneficiary per project • Ratio of costs covered by the program and costs covered by beneficiaries

Source: Staff elaboration.

The area on "efficiency in the generation of outputs" first presents data on the relative investment made in beneficiaries and then presents progress on intended outputs. Regarding investments in beneficiaries, efficiency measures used include the average transfer per project and the transfers per unit of operating costs. In addition, we analyze the uses of the funding transferred to beneficiaries (Table 1.3). When it comes to intended outputs, the analysis starts with the projects completed, followed by a customized set of outputs that are relevant for the program. Examples include collaborative projects and capacity building events, market-oriented research, and number of researchers involved in the project. Also, the average number of outputs achieved per project and the number of outputs per unit of cost are provided.

Table 1.3 Analysis of efficiency in the generation of outputs

CATEGORY	INDICATORS
Investments in beneficiaries	• Value of funds disbursed • Average transfer per project • Transfers per unit of administrative and operating costs • Use of funding by beneficiaries
Intended outputs achieved	• Projects completed • Set of customized outputs relevant to the program • Average number of outputs achieved per project • Number of outputs per unit of program cost

Source: Staff elaboration.

The next area in the analysis is "efficiency in the generation of outcomes" which includes a summary of data collected for intended outcomes and a summary of other results achieved. The researcher and firm surveys collected data on several outcomes related to STI. A classification of the survey outcomes into intended outcomes and other results was based on the programs' ToCs and is therefore different for each program. The measure of efficiency is the average number of outcomes achieved by project.

Last, the "perceived quality" area summarizes the perceptions of beneficiaries regarding program design and implementation, as well as their overall assessment of project success. The analysis starts with an assessment of the quality of program contributions (Table 1.4), including quality of contributions at the application stage (design, call for proposals, eligibility and selection criteria) and quality of contributions during implementation (including quality of feedback provided to beneficiaries, other support provided, whether the funding was received according to contract terms, and whether the program provided sufficient funding and time).[2] Next, the analysis presents factors of success identified by beneficiaries and areas of support that they would have appreciated but did not have. Regarding the overall assessment of project success, the analysis presents the most important project objectives identified by respondents and their overall evaluation of project outcomes.

Table 1.4 Analysis of perceived quality

CATEGORY	INDICATORS
Quality of program contributions	• Satisfaction with program design, call for proposals, selection process • Satisfaction of contributions at implementation stage • Funding received according to contract • Sufficient funding and time • Success factors • Support needed and not present
Overall project quality	• Alignment of project and program objectives • Evaluation of project outcome

Source: Staff elaboration.

Throughout the report, prices are reported in constant terms, in local currency. More specifically, data on transfers and costs were collected in nominal terms at the year they occurred and then deflated to constant 2019 prices using the consumer price index from the Croatian Bureau of Statistics. In programs where transfers were originally reported in EUR, average annual exchange rates from the Croatian National Bank were used to convert the amounts into local currency.

When interpreting the results, it is important to recognize that programs that have fewer outputs or higher costs are not necessarily less efficient. In the calculation of efficiency indicators, different output types are aggregated to obtain the total number of outputs,

2 Typically, perception data were collected on a scale from 1 to 5. To improve accuracy, beneficiaries received a random mix of statements, some framed positively and some framed negatively (for example, "selection criteria were fair" vs. "selection criteria were unfair"). For each statement, half of the respondents received the positive version and the other half the negative version. Satisfaction or agreement was defined as obtaining a score of 4 or 5 (or 1 or 2, depending on the valence of the question).

however, the aggregate results should be taken in the context of the characteristics of the program, the differences between outputs and their quality. Outputs that require a higher level of effort to attain will understandably be less ubiquitous, which does not make them less valuable. For example, a program that focuses on collaboration may have fewer outputs than a program that focuses on capacity building, but this does not make it less efficient as the type of output produced is different. Additionally, where possible, information on the quantity of outputs should be complemented by an analysis of their quality. For example, data on the number of peer-reviewed articles should be complemented by an analysis of citations in order to discourage overproduction of low-quality outputs. In a similar vein, the amount and composition of costs should be interpreted in the context of the program and the need to improve different aspects of program design and implementation. For example, it may make sense for a program to invest more in administrative and operating costs, if that investment is used to address some shortcomings in the M&E system or beneficiary support.

One limitation to the analysis presented in this report relates to the time horizon. The programs analyzed started between 2009 and 2016. Therefore, all the data collected were retrospective with long recall periods. Cost data were very difficult to retrieve, and data on quality and perceptions may be affected by many factors after so many years. Going forward, programs may consider recording the data for this type of analysis in a more systematic way during implementation, at the completion of projects, and a few years after completion.

Certain measurement issues also limit the analysis in this report. Sample sizes were small due to the small number of beneficiaries in some programs and survey attrition. In addition, some of the results expected from innovation programs are hard to measure. For example, some programs aim to improve skills to conduct high-quality research through training or collaborations, but it is very difficult to measure the improvement in skills. In these cases, a set of more quantifiable indicators (like training conducted and funding granted) are typically used, but they may not fully capture the expected result.

Finally, the analyses presented here cannot assess the effects attributed to the programs or the impacts of the programs. The report tracks progress towards input, output, and outcome indicators with data from beneficiaries only. To evaluate the effects attributed to the programs, data from a group of non-beneficiaries needs to be compared with data from beneficiaries. However, we do not have data on outcomes for a group of non-beneficiaries that is similar to the beneficiaries. It is therefore not possible to attribute the achievement of these outcomes directly to the programs.[3] Programs may consider gathering

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3 To measure the effects or the changes in outcomes attributed to the program, impact evaluation methodologies using a counterfactual are needed. Such methodologies include randomized controlled trials, regression discontinuity analysis, propensity score matching, or difference in differences. The aim is to compare what would have happened to beneficiaries without the program (the counterfactual) to what happened to them with the program. To build a counterfactual, programs need to collect data and track outcomes for a group of researchers or firms that do not get program support and yet are similar to those supported. The methodologies listed above differ in the way they build a counterfactual and the assumptions made about it. For more information,refer to Gertler et al. (2016).

data for non-beneficiaries at the application stage and then follow up at least once after the projects are closed to assess more accurately the impacts attributed to the programs.

1.2 Sources of data

The sources of data for the analysis included two beneficiary surveys and administrative data on program expenditures. One survey was designed for beneficiaries of programs that support researchers, and it was delivered to principal investigators of 531 out of 532 supported projects.[4] The other survey was designed for programs that support private firms, and was delivered to a designated contact person for the project in 271 out of 272 supported firms.[5] For the implementation of the beneficiary survey, a World Bank research team worked in collaboration with a local research team. Best practices for data collection were applied to (i) develop the questionnaires, (ii) ensure a high response rate through reminders and targeted contacts, and (iii) verify the quality of data through a flag system. The researchers' survey was implemented between June and July 2020 and the firms' survey between June and September 2020.

Survey questionnaires were developed and adapted to the local context by a specialized research team, in consultation with the program managers. Both questionnaires gathered information about the characteristics of beneficiaries, their experiences and perceptions with the application process, the implementation of their projects, and the results achieved to date. Questionnaires were first developed in English and then translated by the local research team to Croatian. Then, they were programmed into a survey delivery software application (Qualtrics) to implement them as computer-aided web interviews while ensuring compatibility with desktop and mobile devices. Program managers received a draft of the questionnaires and provided feedback that was incorporated into the final versions presented in Annex 2 and Annex 3.

Field protocols were developed to monitor the implementation of the survey and ensure high-quality data. A detailed log file was used to track all interactions with respondents and the status of their interviews. In addition, a flag scheme was developed to identify data inconsistencies. For example, if the reported tenure in an institution was higher than the age of the respondent, a flag was triggered, and the data were verified by contacting the respondent. A weekly field report was prepared summarizing the status of interviews, flags, and quality checks conducted.

Considerable effort was put into maximizing the response rate through reminders and customized communication. First, all respondents received an email from the institution in charge of the program informing them about the survey and the confidentiality of their information, including a helpline phone number and email address for the research team,

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4 The discrepancy in the number of sent surveys compared to the number of beneficiaries is due to the fact that a valid contact for one principal investigator in SIIF could not be found.

5 One beneficiary firm went bankrupt and its contact information was not available.

and including a letter from the MSE explaining and supporting the survey effort. Shortly afterwards, respondents received the invitation to fill the questionnaire via an email from the Qualtrics platform. During implementation, the survey team sent reminders through the Qualtrics platform to respondents with incomplete surveys (1,682 reminders to researchers and 1,324 reminders to firms). Customized communication consisted of emails to individual respondents from a World Bank email account following up on specific matters, as well as phone calls by the local research team (Table 1.5). This hands-on approach was key for achieving a high response rate during the COVID-19 pandemic and post-earthquake period.[6]

Table 1.5 Beneficiary surveys response rate

CONTACT ATTEMPT	DATE SENT	INCREASE IN NUMBER OF SURVEYS COMPLETED AT 50% OR MORE	CHANGE IN RESPONSE RATE
Researchers' Survey			
Agency email with MSE letter + Qualtrics survey	Jun 6	115	22%
Qualtrics reminder 1	Jun 16	76	19%
Qualtrics reminder 2 + WB email	Jun 23–24	28	8%
Qualtrics reminder 3 + WB email	Jul 2	27	9%
Phone reminder + WB email with survey link	Jul 7–14	53	19%
Qualtrics reminder 4	Jul 16	14	6%
Firms' Survey			
Agency email with MSE and MESD letter + Qualtrics survey	Jun 19	38	14%
Qualtrics reminder 1	Jun 26	34	15%
Qualtrics reminder 2	Jul 3	9	5%
Qualtrics reminder 3 + WB mail + phone reminder	Jul 7	27	14%
Qualtrics reminder 4	Jul 20	16	10%
Qualtrics reminder 5 + WB mail with survey link	Aug 4	8	5%
Qualtrics reminder	Sep 15	8	6%

Source: Staff elaboration.

6 On March 22, 2020, an earthquake of high magnitude struck Zagreb and especially the city center where several faculties and research institutes are located. Their facilities were severely damaged, and most of the researchers were working from home with limited availability.

Overall, the survey implementation was successful, with over 50 percent response rate in both surveys. A 54 percent response rate was achieved in the researcher's survey and 47 percent in the firms' survey, calculated as surveys completed at 100 percent over the total number eligible respondents. Response rates for researchers and firms increase to 60 and 52 percent, respectively, if calculated as the share of surveys completed at 50 percent of more. The questionnaires were designed to be completed in 45 minutes. In practice, the median completion time was 60 minutes and the minimum completion time was 17 minutes for researchers. For firms, median and minimum completion times were 62 and 17 minutes, respectively. However, it is important to note that respondents could pause or stop and then resume their questionnaire as needed.

The main challenge of the survey data collection was the lack of availability of respondents due to the earthquake and COVID-19 mobility restrictions. Initially, the research team envisioned supplementing web-based interviews with phone interviews. However, most respondents were not answering phones, likely because researchers were not physically in their offices and some firms were closed. Therefore, the approach was modified to incorporate email and platform communication more prominently. Another challenge was that the level of detail of some questions (such as the distribution of project costs) caused some respondents to slow or stop the survey to seek clarifications. However, the survey team was highly skilled and trained to answer any questions about the questionnaire. They also sent personalized emails with resources when they noted respondents stopping the survey.

Administrative data on program expenditures were gathered by the institutions in charge of the programs using a template prepared by the World Bank team. The template included definitions and instructions to facilitate and harmonize the information on expenditures. Expenditures were classified into direct financial transfers to beneficiaries (the grants provided), indirect financial transfers to beneficiaries (benefits such as fiscal incentives or discounts), non-financial support to beneficiaries (such as technical assistance, facilities or equipment lent), and administrative and operating costs (including personnel, fixed costs, and external services).

Overall, detailed administrative data on expenditures were made available for two out of the seven programs in the analysis, and less detailed data were received for other two programs. For two programs targeting firms and one program targeting young researchers, the efficiency analysis was not possible because data on costs were not provided. For these programs, the analysis was limited to the information collected from the survey. In these cases, the periods analyzed dated some years back, and retrospective data can be difficult to retrieve. It is important for the responsible institutions to acknowledge this weakness and make sure that expenditure data are collected going forward to facilitate future efficiency analyses. Of course, the quality of the efficiency analysis depends on the availability and quality of the data provided.

2 Key Results Across Programs

Key Results Across Programs

This section provides a comparison of key results across programs. It presents findings for a select set of indicators that can be compared across programs, such as administrative and operating costs per project, results achieved per project, and so on. The program-specific sections that follow present more granular data and findings that are particular to each program.

When comparing results across programs, it is important to consider the differences in their target beneficiaries and the number of beneficiaries supported. The five analyzed programs directed at researchers (and selected calls within these programs) supported between 19 and 335 projects. The Science and Innovation Investment Fund (SIIF) program provided support to 19 projects, the Strengthening Capacities for Research, Development and Innovation program (STRIP) to 24, Research Scholarships (RS) to 52, Installation Research Projects (IRP) to 102, and Research Projects (RP) to 335. Two programs targeted at firms, Improving Competitiveness and Efficiency of SMEs in Areas with Special Development Needs through ICT (ICT-R) and Innovations in Newly Established SMEs (NSME-1), supported 219 and 53 projects respectively. The differences in target beneficiaries have an important bearing on expectations regarding the type and amount of inputs, outputs and outcomes.

The gender composition is skewed towards male project leaders. Among programs targeting researchers, IRP, RP, and RS had a higher share of female principal investigators (PIs), but women were still in the minority (between 42 and 45 percent, Figure 2.1). In SIIF and STRIP, the share of female PIs was closer to a third. When it comes to programs targeting firms, the gender disbalance was particularly striking in the case of NSME-1, where only one in five projects had a female project leader. This may reflect a lack of women's participation in entrepreneurship in general, and a lack of representation in the industry most supported by the program–ICT–in particular.[7]

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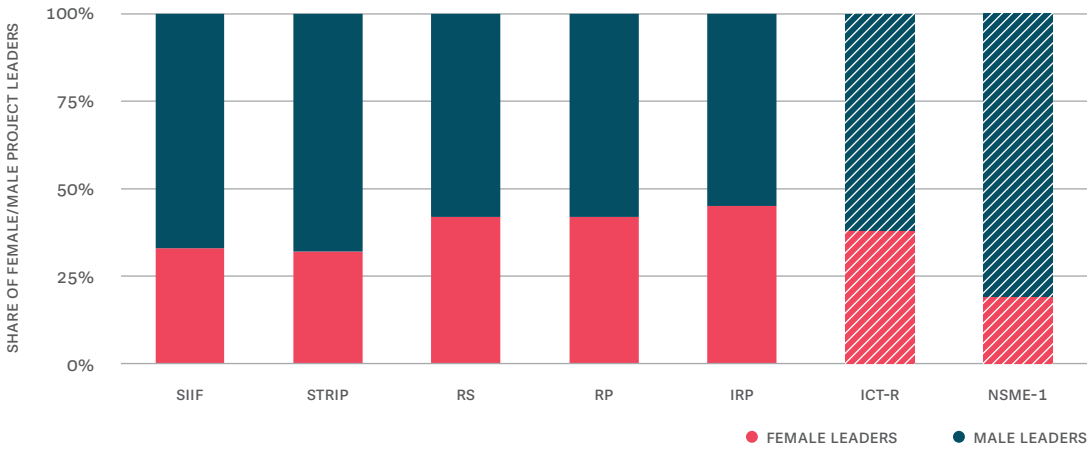
7 For a more detailed review of women's participation in entrepreneurship and economic opportunities, see World Bank Group (2019).

Figure 2.1 Women are generally underrepresented in project leadership positions



Source: MSE, HRZZ, and MESD data. Bars filled with a diagonal pattern denote programs targeting firms.

2.1 Efficiency in the use of inputs

Costs covered by the program

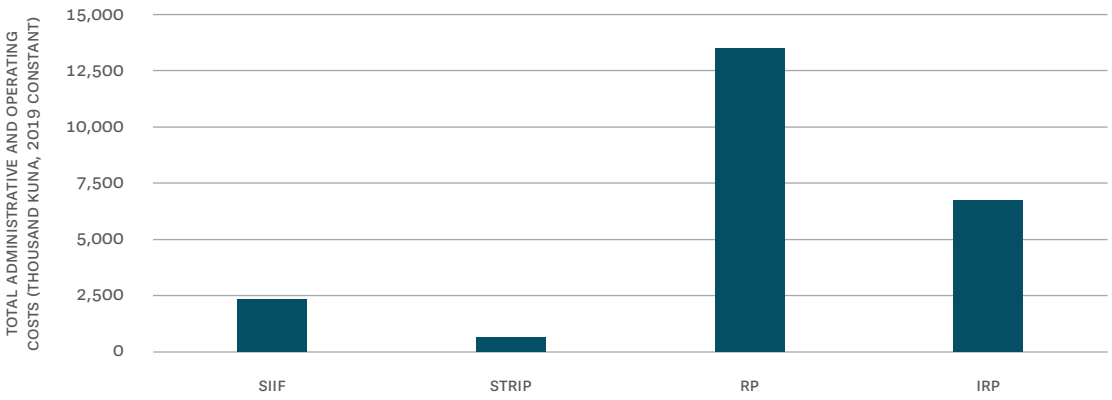
Programs with fewer beneficiaries tend to have a lower share of administrative and operating costs in total program costs. Total program costs[8] were mostly composed of direct financial transfers made to beneficiaries and administrative and operating costs. Only SIIF provided non-financial transfers to beneficiaries in the form of experts to support them during implementation. None of the four programs that provided cost data reported providing beneficiaries with indirect financial transfers such as tax deductions. Direct financial transfers are predominant in the composition of total program costs, as expected. Administrative and operating costs for programs with fewer beneficiaries (SIIF and STRIP) ranged between 1 and 2 percent of total program costs, a share which rose to 5 to 10 percent for programs with more beneficiaries (IRP and RP).

Programs with more beneficiaries and more calls have higher operating costs in absolute terms, but not when controlling for the number of projects. Administrative and operating costs range from close to HRK 40,000 to HRK 100,000 per project. The RP program had the highest administrative and operating costs (Figure 2.2), but because it supported a larger number of beneficiaries over a longer period of time, its cost per project was nearly the lowest (Figure 2.3). The opposite is true for the SIIF program. It incurred relatively low administrative and operating costs in absolute terms, but given the small number of

8 Detailed administrative data on expenditures were received for SIIF and STRIP and less detailed data for RP and IRP. For the other programs, data were not provided. Therefore, the administrative costs analysis is limited to IRP, RP, SIIF, and STRIP.

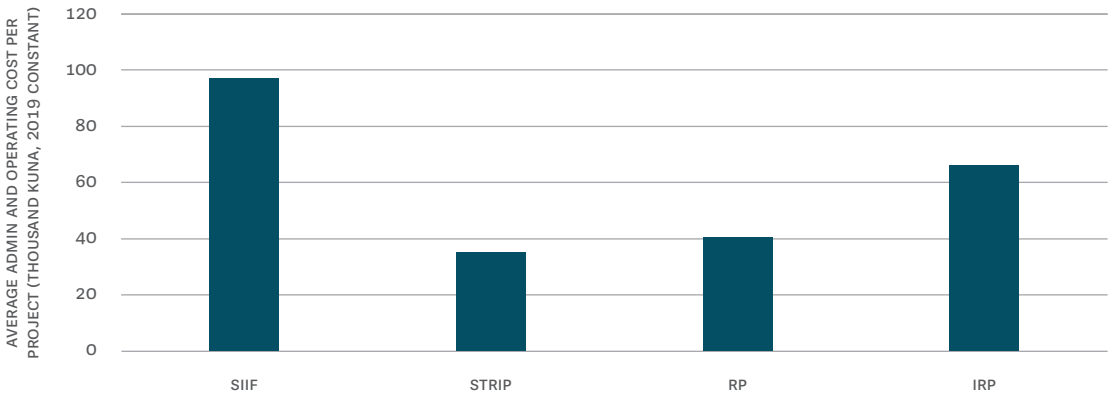
beneficiaries supported, its costs per project were the largest. In all programs, administrative and operating costs were driven by personnel costs, which made up around 75 percent of the costs in three out of four programs, followed by external experts hired to evaluate project proposals or monitor implementation progress. Fixed costs such as rent and office equipment made up a negligible portion of costs.

Figure 2.2 Programs with more beneficiaries and more calls accumulated higher operating costs over time...



Source: Programs' data and staff calculations.

Figure 2.3 ... but not when considering the number of projects supported.

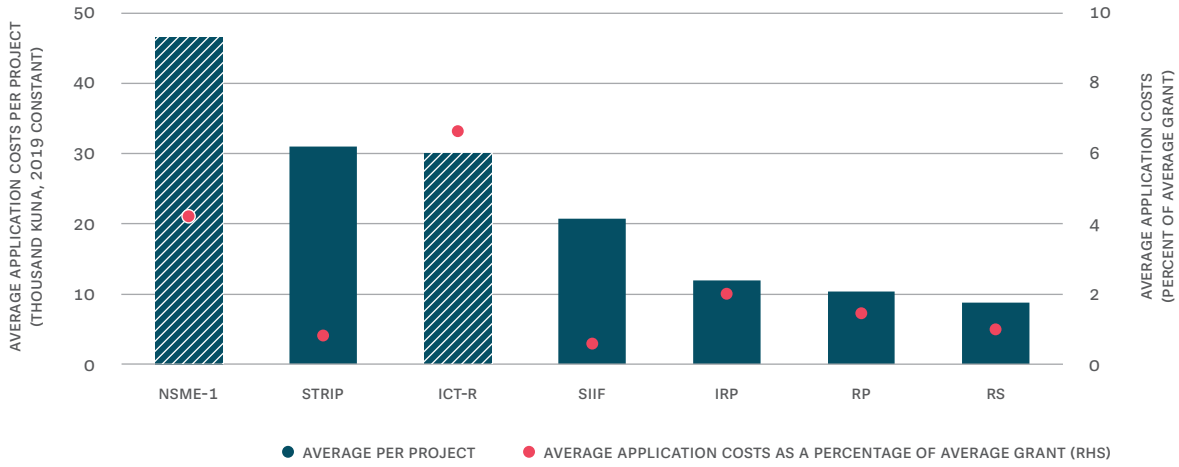


Source: Programs' data and staff calculations.

Costs covered by beneficiaries

Application costs per project vary widely between programs and are generally higher for programs targeting firms. Based on the beneficiary survey, average application costs per project ranged from HRK 9,000 to 47,000, and they represented between 1 and 7 percent of the average grant value (Figure 2.4). Among programs targeting researchers, application costs for SIIF and STRIP were higher than for IRP, RP, and RS. However, SIIF and STRIP also provided higher-value grants per project (Figure 2.10), which could justify the higher upfront investment by applicants. Average application costs for beneficiaries of the ICT-R and NSME-1 programs were relatively high, at HRK 30,000 and HRK 47,000 per project, respectively, and they were also high relative to the average grant amount (4 and 7 percent of the average grant amount, respectively). Such high costs are a significant barrier to application, particularly for younger and smaller firms, which have limited financial and human resources to invest in an application. Such high costs may be related to the use of consultants and experts to help prepare the application and could be a sign that the process is overly demanding and bureaucratic.

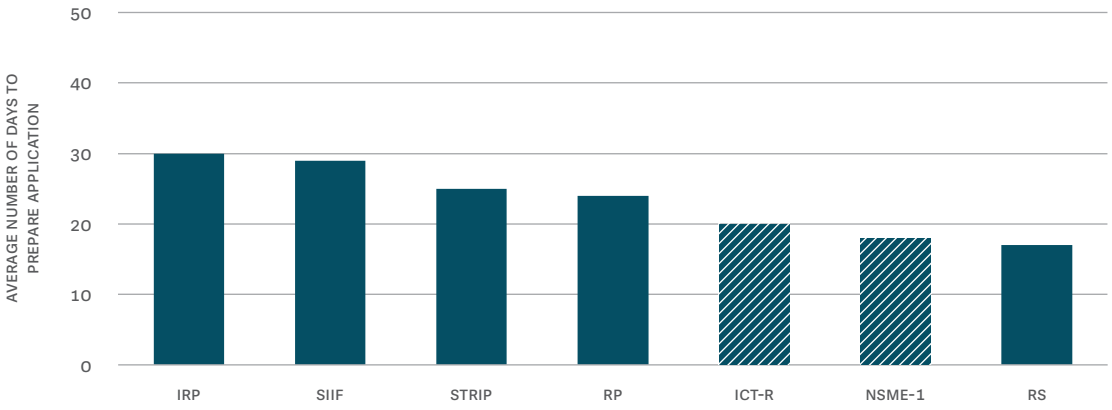
Figure 2.4 Application costs are generally higher for programs tareting firms...



Source: Beneficiary surveys. Note: Bars filled with a diagonal pattern denote programs targeting firms.

On average, applications to programs targeting researchers take more time to prepare. It takes around four weeks on average for project leaders of researchers' programs to prepare their applications, compared to less than three weeks for project leaders of firms' programs (Figure 2.5). The exception is the RS program, which took less time than other programs targeting researchers (17 days on average). This may be a result of the fact that this program supported simpler research projects of individual researchers or research teams of up to five people, whereas other programs supported more complex projects of higher monetary value and larger research teams. Overall, the time needed to prepare the application is positively associated with application costs, and this correlation is significant at the 95 percent confidence level.

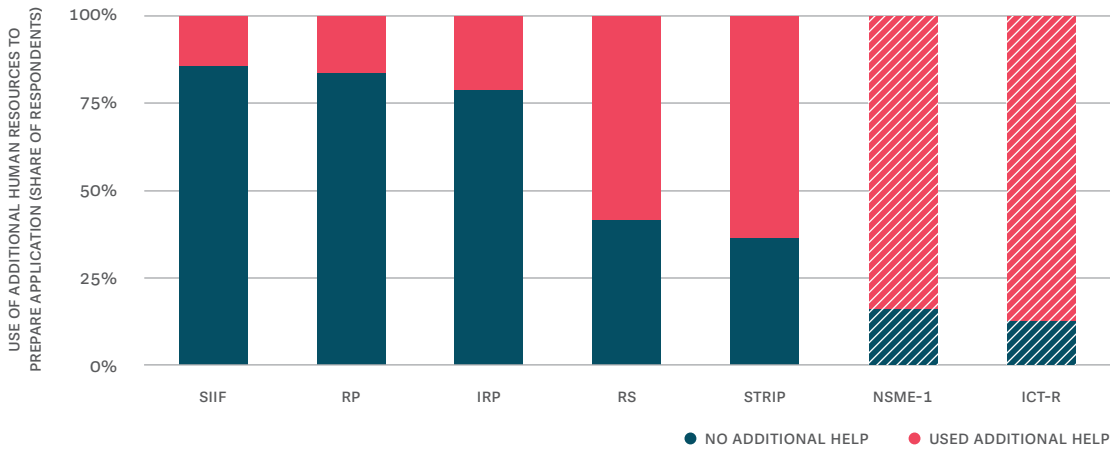
Figure 2.5 ... but researchers tend to invest more time in the preparation of their applications



Source: Beneficiary surveys. Note: Bars filled with a diagonal pattern denote programs targeting firms.

Respondents supported by programs targeting firms required more external assistance to prepare their applications. SIIF had the highest share of respondents (86 percent) reporting completing their application without any help other than the project team (Figure 2.6). The RP and IRP programs also had very high shares of respondents indicating that they did not need any additional help to complete their applications. However, most of the STRIP respondents (64 percent) and RS respondents (58 percent) used the help of experts, lawyers, accountants, and administrative assistants to complete their application. Similarly, over 80 percent of the respondents of both programs targeting firms hired external professionals to aid in the application process, and over 50 percent in both programs hired an accountant. Extensive use of consultants by applicants may be a sign of unwarranted complexity of the program, which creates barriers to participation for firms with more limited resources. The information required in application forms should not be so complex as to require intermediaries to navigate the process (World Bank 2020a).

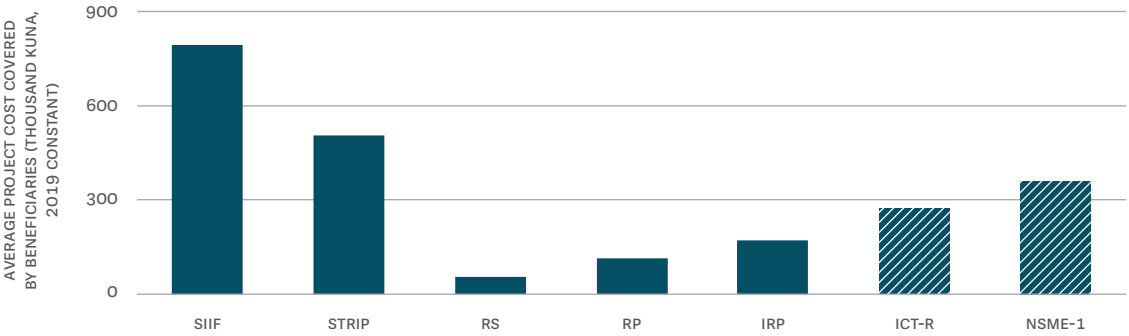
Figure 2.6 In programs supporting firms and two programs supporting researchers, most respondents required external assistance to prepare their applications



Source: Beneficiary surveys. Note: Additional human resources included experts, lawyers, accountants, and administrative assistants. Bars filled with a diagonal pattern denote programs targeting firms.

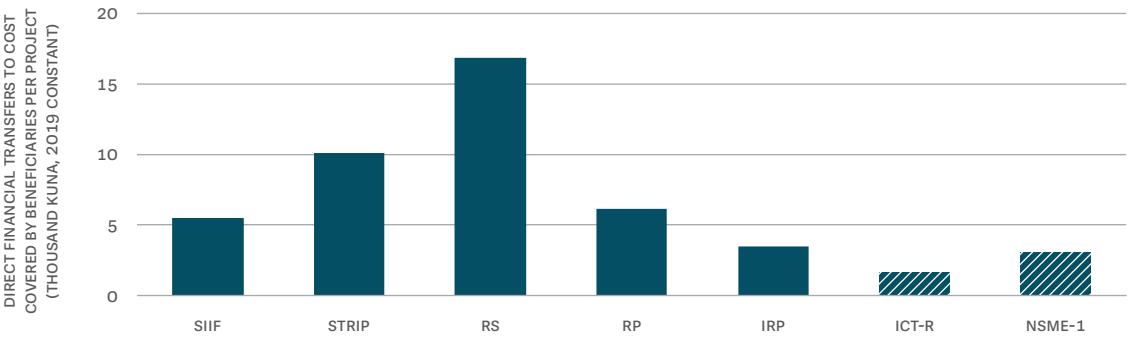
In general, researchers get more funding relative to the investment they make in application costs and matching contributions. In absolute terms, respondents from SIIF and STRIP invested more in their projects than respondents from other programs, reflecting higher project values in these programs. Individual grant amounts were higher for these two programs, so matching contributions and costs to prepare the application were also higher (Figure 2.7). However, on average, the beneficiaries of the RS and STRIP programs received more funding for the same amount of investment (Figure 2.8). Beneficiaries of the RS program, on average, received 17 HRK for each HRK invested in participation, while the beneficiaries of the STRIP program received 10 HRK. In contrast, beneficiaries of programs targeting the private sector received only two to three times more in grants than they invested in their participation. While to some extent this reflects the difference in state aid intensity between private and public sector, as well as between research and commercialization, policymakers should at least aim to reduce application costs for firms, which are comparatively quite high.

Figure 2.7 In absolute terms, beneficiaries of the SIIF and STRIP programs invested the most in their projects



Source: Programs' data and staff calculations. Note: Costs covered by beneficiaries include application costs as well as the contributions made by home research institutions or companies. Bars filled with a diagonal pattern denote programs targeting firms.

Figure 2.8 Researchers get more funding than firms relative to the costs they cover



Source: Programs' data and staff calculations. Note: Costs covered by beneficiaries include application costs as well as the contributions made by home research institutions or companies. Bars filled with a diagonal pattern denote programs targeting firms.

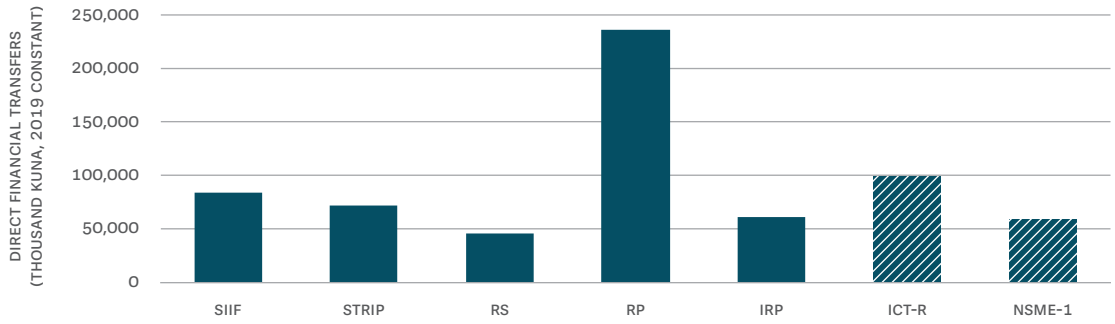
2.2 Efficiency in the generation of outputs

Investments in beneficiaries

The RP program disbursed the highest amount of direct financial transfers to researchers, but STRIP had the highest average grants per project. The RP program also supported the highest number of researchers over three calls and therefore disbursed the most funding in absolute terms (Figure 2.9). However, STRIP and SIIF had the highest amount of direct financial transfers per project, which amounted to an average of almost HRK 3.8 million and HRK 3.5 million per project, respectively (Figure 2.10). Other programs targeting researchers transferred between HRK 600,000 and 882,000 per project.

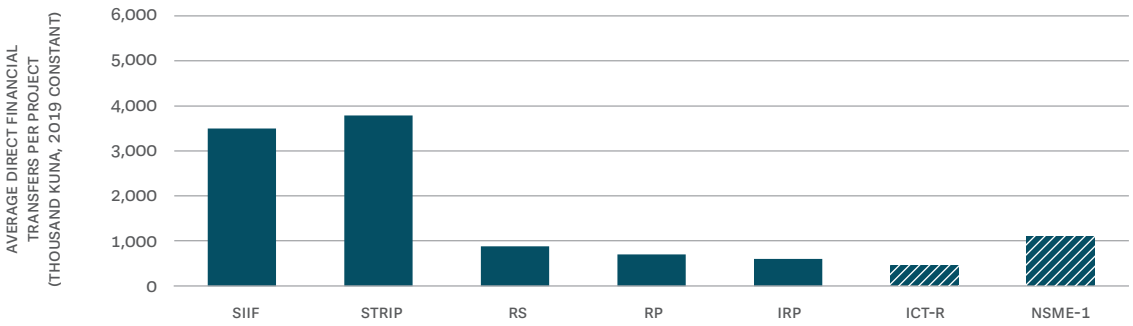
In programs targeting firms, ICT-R distributed the most funding in total, but NSME-1 provided larger grants per project. On average, the amount of direct financial transfers per project in the NSME-1 program was more than 2 times higher than that of the ICT-R program. As shown in Figure 2.10, the NSME-1 program transferred about HRK 1.1 million per project, while the ICT-R program transferred about HRK 453,000 per project.

Figure 2.9 The RP program disbursed the most funding of the analyzed programs in absolute terms...



Source: Programs' data and staff calculations. Note: Bars filled with a diagonal pattern denote programs targeting firms.

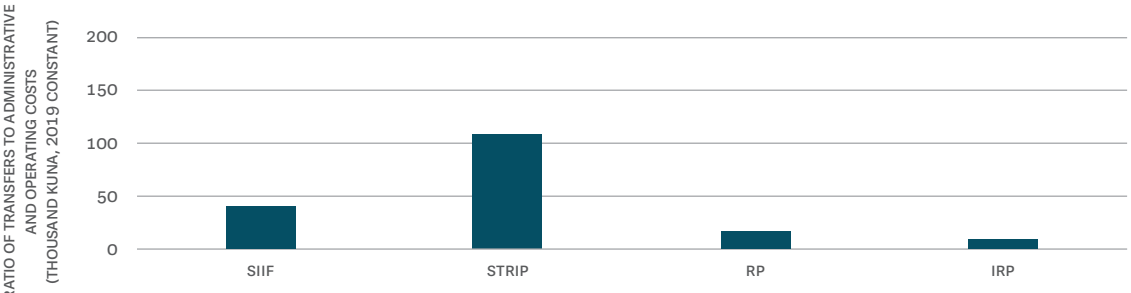
Figure 2.10 ...but when controlling for the number of projects, SIIF and STRIP distributed the largest grants



Source: Programs' data and staff calculations. Note: Bars filled with a diagonal pattern denote programs targeting firms.

STRIP provided the most transfers to beneficiaries relative to the administrative and operating costs needed to run the program. Figure 2.11 shows that under STRIP, for every HRK the program spent in administrative and operating costs, beneficiaries received HRK 108. In contrast, for every HRK spent in administrative and operating costs under the IRP, beneficiaries received HRK 9. These differences are likely influenced by differences in the number of projects supported—the higher the number of projects, the more resources are needed to administer and operate a program.

Figure 2.11 Relative to administrative and operating costs, STRIP distributed the most funding



Source: Programs' data and staff calculations.

Outputs achieved

The SIIF and RP programs created the greatest number of outputs per project. Given that the specific outputs may differ from program to program, the average number of outputs achieved per project is a useful indicator for comparing the efficiency in converting inputs to outputs across programs. SIIF and RP had the highest number of outputs achieved per project (34 and 33, respectively), while the NSME-1 program had the lowest (Figure 2.12).[9] This section includes details about the few outputs related to capacity building and collaborative projects that were common across programs targeting researchers. Outputs for programs targeting firms were different for each program and are therefore presented in their individual sections.

Figure 2.12 Respondents of SIIF and RP programs had the highest number of outputs per project

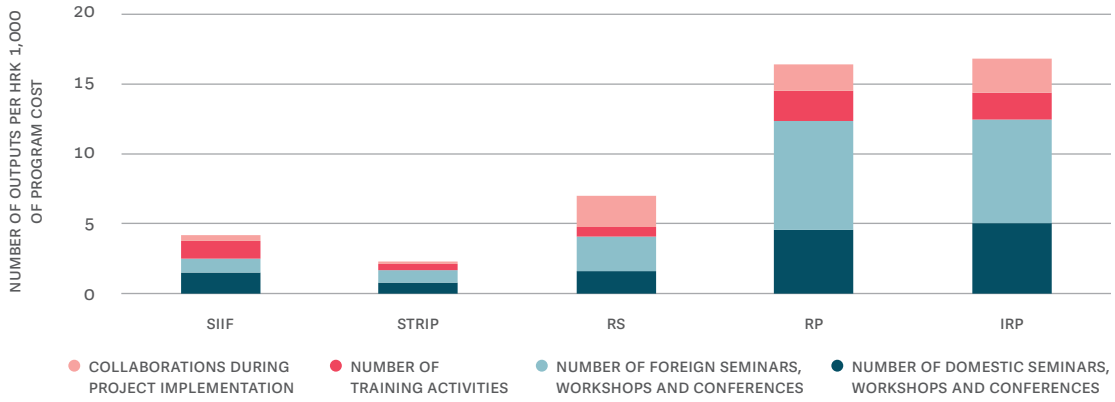
Source: Beneficiary surveys. Note: Bars filled with a diagonal pattern denote programs targeting firms.

9 Due to limited data availability the ICT-R program is not included in Figure 2.12. However, data on the number of firms that improved capabilities of employees were collected as is presented in Figure 2.14 and Section 8.2.

Among programs targeting researchers, RP and IRP produced the highest number of outputs relative to program costs. Training activities, domestic and foreign seminars, workshops and conferences, as well as collaborations during project implementation with researchers and industry, domestically and abroad, were common across all five programs targeting researchers. Respondents of RP and IRP programs reported achieving 16 and 17 such outputs per HRK 1,000 of total program costs, most of which refer to domestic and foreign seminars, workshops, and conferences (Figure 2.13).

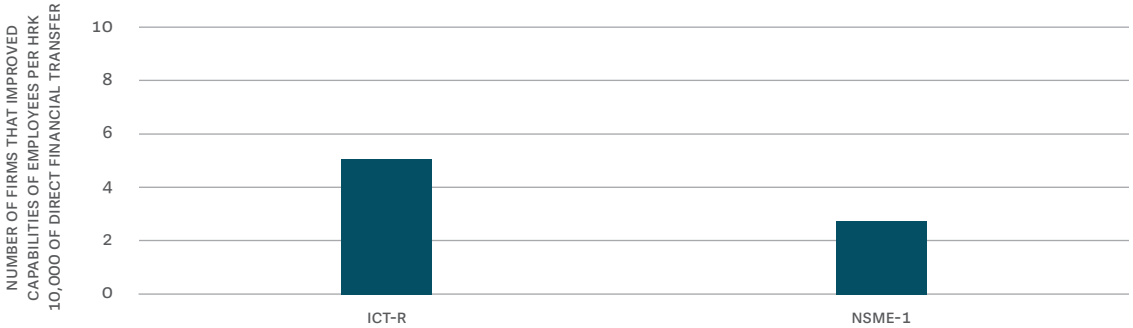
The ICT-R had more capacity-building outputs per cost than NSME-1, but NSME-1 respondents also reported greater variety of other outputs. The ICT-R program was more cost efficient in terms of the number of firms that improved capabilities of employees, yielding 5 firms that improved capabilities of employees for each HRK 10,000 of program cost (Figure 2.14). In the NSME-1 program this was not an intended output. However, the NSME-1 program also yielded a variety of other outputs, including market-oriented research, IPR registration (patents, copyrights, trademarks, and industrial designs), and additional full-time and part time employees.

Figure 2.13 In programs targeting researchers, RP and IRP recorded the most outputs per cost



Source: Beneficiary surveys, MSE and HRZZ data, and staff calculations. Other outputs refer to collaboration with researchers and industry, domestically and abroad, during project implementation

Figure 2.14 The ICT-R program produced more capacity building outputs per unit of cost



Source: Beneficiary surveys and staff calculations.

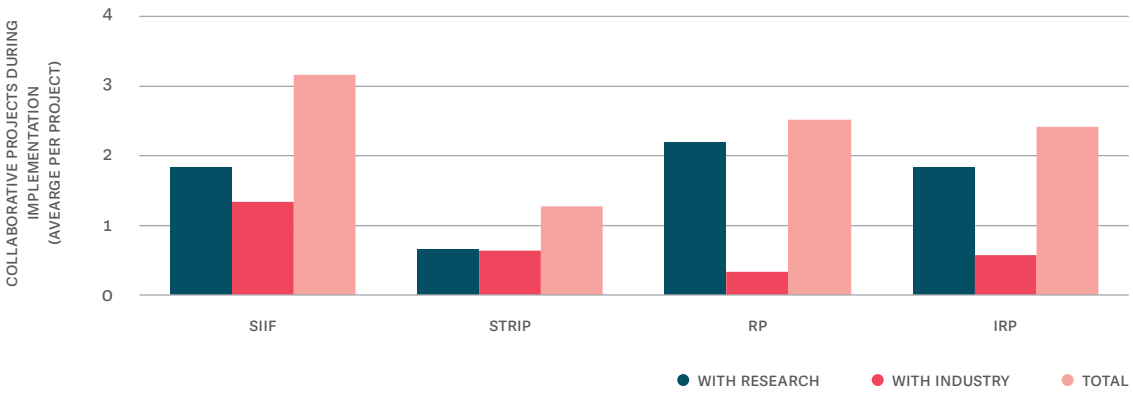
SIIF and RP also yielded the most capacity building outputs per project. Capacity building outputs tracked in the beneficiary surveys were relevant for all the programs that targeted researchers, with workshops, seminars, and conferences being more popular than training events. Respondents from the SIIF program attended the highest number of seminars, conferences, and workshops per project and attended the highest number of training events per project (Figure 2.15). The RP program followed SIIF with 16 seminars, conferences, or workshops attended per respondent on average, while respondents from the RS program attended only 11 per project.

Figure 2.15 All programs targeting researchers achieved capacity building outputs

Source: Beneficiary surveys.

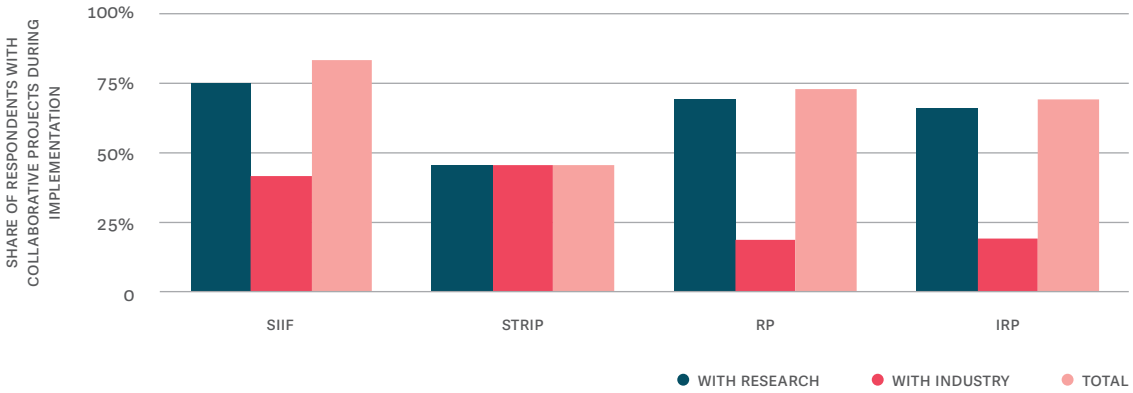
RP resulted in more collaborative projects within the research sector, but SIIF had the most projects with industry. Among researchers, most respondents pursued collaborative projects during implementation, averaging between 1 and 3 collaborative projects per beneficiary (Figure 2.16 and Figure 2.17). Partnerships were mandatory under the SIIF and STRIP programs; therefore, a minimum of one collaborative project per beneficiary was expected. Collaborative projects with industry were more common in SIIF than in other programs, which makes sense given its focus on commercialization of research in PROs. Collaborative projects with industry were less common among respondents in the RP and IRP programs. For STRIP, respondents had the same number of collaborative projects with researchers as with industry, although an industry partner was mandatory.

Figure 2.16 SIIF, RP and IRP had the highest average number of collaborative projects per grant



Source: Beneficiary surveys.

Figure 2.17 Fewer respondents pursued collaborative projects with other researchers



Source: Beneficiary surveys.

2.3 Efficiency in the generation of outcomes

Programs targeting research and programs targeting firms have different sets of intended outcomes. Those targeting research expect to achieve outcomes related to graduate theses, collaborative projects after implementation, scientific publications, and intellectual property. Those targeting firms expect to achieve outcomes related to new and upgraded products, processes, and services; new technologies and software developed; business models developed; expansion to new markets; and increased sales and employment (Table 2.1). This section compares the programs' results for those outcomes that were identified as intended for at least three programs. Results for all intended outcomes and several other results are presented in the individual program sections.

Table 2.1 Overview of outcomes tracked for analyzed programs

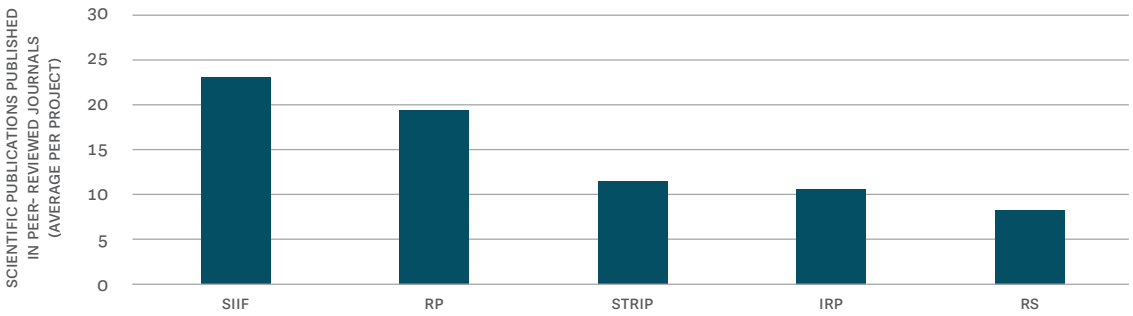
OUTCOMES TRACKED IN BENEFICIARY SURVEYS	SIIF	STRIP	RS	RP	IRP	ICR-R	NSME-1
Scientific publications in peer-reviewed journals	●	●	●	●	●		
Doctoral or masters titles or theses			●	●	●		
Collaborative projects after implementation, partners	●	●		●	●		
Market-oriented research	●						
Intellectual Property (patents, industrial designs, copyrights)	●	●	●	●	●		
Technology transfer (agreements, new enterprises or spin-offs)	●	●					
New design for a product, process, or service		●					
New products, processes, or services		●				●	●
Upgraded products, processes, or services		●				●	●
New software development		●				●	●
New technology development		●				●	●
*Companies that adopted a new technology						●	●
*Companies that developed a new business model						●	●
*Companies that expanded to new markets							●
*Companies that increased sales						●	●
*Companies that improved their export performance							●
*Additional workers hired						●	

Source: Beneficiary surveys.
Note: Intended outcomes for each program shaded in dark green (programs targeting researchers) and red (programs targeting firms). *Outcomes tracked in beneficiary survey for firms only.

Scientific publications and doctoral or master's titles or theses

The most productive programs in terms of scientific publications are SIIF and RP. SIIF respondents published the highest number of scientific papers in peer-reviewed journals per project, 23 of them (Figure 2.18). While this is a commendable achievement, policy-makers should also consider the core purpose of the program which, at the time, was to encourage commercialization of research in PROs. As elaborated further on in the analysis, the program was not as successful in achieving outcomes related to technology transfer and intellectual property rights (IPR) protection. The second highest average was the RP program, whose respondents published 19 scientific papers per project. Box 2.1 provides more detail on the quality of publications in the RP and IRP programs. The RS program had the lowest number of publications per project, with 8 scientific papers published per project.

Figure 2.18 SIIF and RP yielded the most peer-reviewed scientific publications per project



Source: Beneficiary surveys.

Box 2.1 Quality of scientific publications supported by RP and IRP

Achieving research excellence has been one of the central missions of policymakers in Croatia, but with limited results until now. Croatia features as one of the lowest-performing EU member states when it comes to research excellence metrics. Over the 1996–2017 period, Croatia had the highest share of uncited papers per researcher in the EU. With only 3.55 percent of the country's publications in the top 10 percent of most cited publications globally, the country is 27th in the EU, ahead of only Bulgaria. Therefore, achieving research excellence features as one of Croatia's strategic objectives formalized through its Smart Specialization Strategy. Public support programs that target researchers frequently track the number of scientific papers published in peer-reviewed journals as an outcome metric, but the impact of such papers, measured through citations, is often neglected. The analysis presented in this box focuses on the quality of publications produced within the RP and IRP programs, the two most important programs funded from the national budget that support basic and applied research projects.

The most productive fields of science supported by the RP and IRP grants are natural and technical sciences. Based on the records available in the Croatian Scientific Bibliography CROSBI, 398 grants awarded through the RP and IRP programs[10] resulted in 12,165 outputs, out of which close to 80 percent are articles, 9 percent are doctoral theses, 6 percent are book chapters, close to 2 percent are books, and 3 percent are unknown. Only 12 patents resulting from the RP and IRP programs are recorded in the CROSBI database. In absolute terms, the most outputs funded by these two programs are recorded in natural sciences (33 percent of them), followed by technical sciences, humanities, and social sciences. When controlling for the number of grants provided in each field, however, the picture changes slightly. Natural sciences and technical sciences are still the most productive, with a median of 23 and 19 outputs per grant respectively, while biotechnical sciences come in third place, with a median of 15.5 outputs.

Among publications supported by the RP and IRP grants, those in natural sciences and biomedicine and health are the most cited. Out of 12,165 outputs, only 21 percent could be matched to SCOPUS citation records. Projects in the natural, biomedicine and health sciences yielded publications with a median of 1 citation per year, those in biotechnical sciences had a median of 0.75 citations per year, and technical sciences had 0.5 citations per year (Figure 2.19).[11] In terms of citations, in most years and scientific fields, outputs produced as part of projects financed from RP and IRP outperform the population of all journal articles published by Croatian researchers, and the difference is statistically significant for most of them. Another comparison could be made with another program which aimed to raise research excellence—the Unity through

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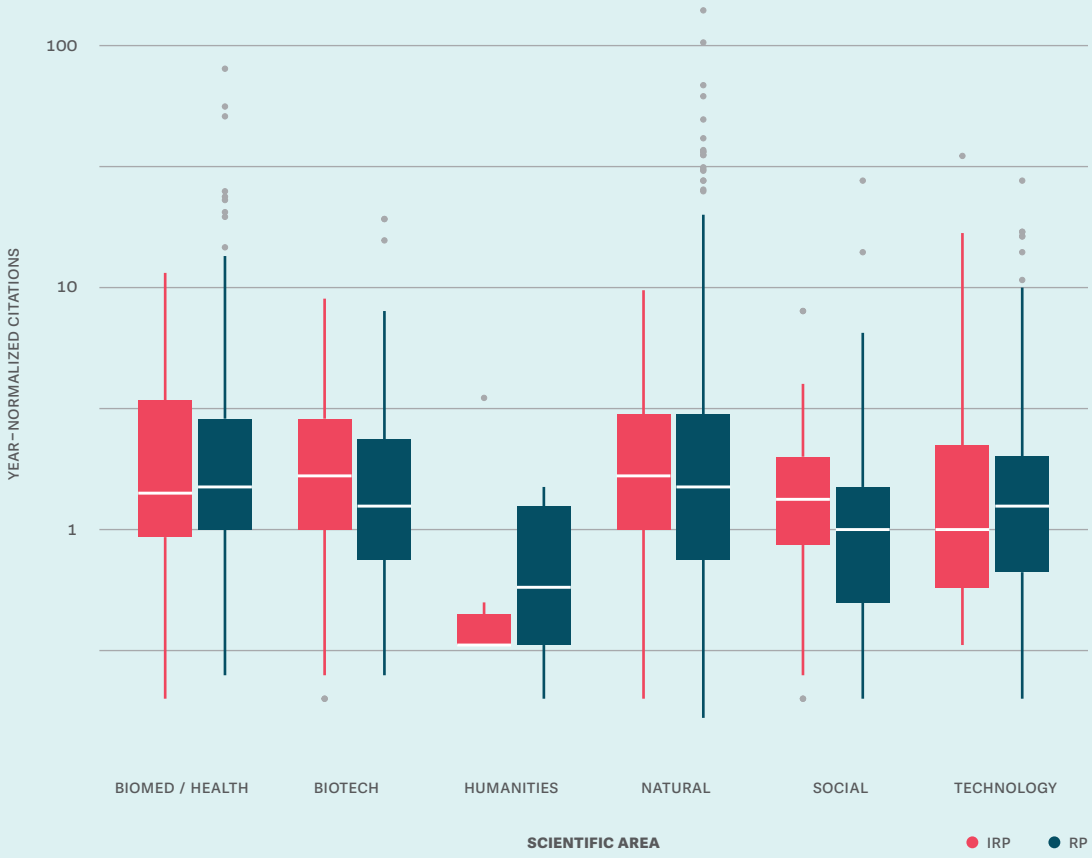
10 This analysis covers calls for which all projects were completed, that is, three calls in the RP program (2013, 2014, and 2016) and two calls in the IRP program (2013 and 2014).

11 Median year-normalized citations are calculated as the number of citations divided by publication age (in years). This allows comparison of publications across years.

Knowledge Fund (UKF).[12] When compared to publications produced within the UKF program, the RP and IRP projects underperform in most fields and years. However, the difference is statistically significant only in a few fields such as immunology and medicine in 2015, physics in 2016, and chemistry, biochemistry, and physics in 2018.

Figure 2.19 Publications in natural sciences and biomedicine and health are the most impactful

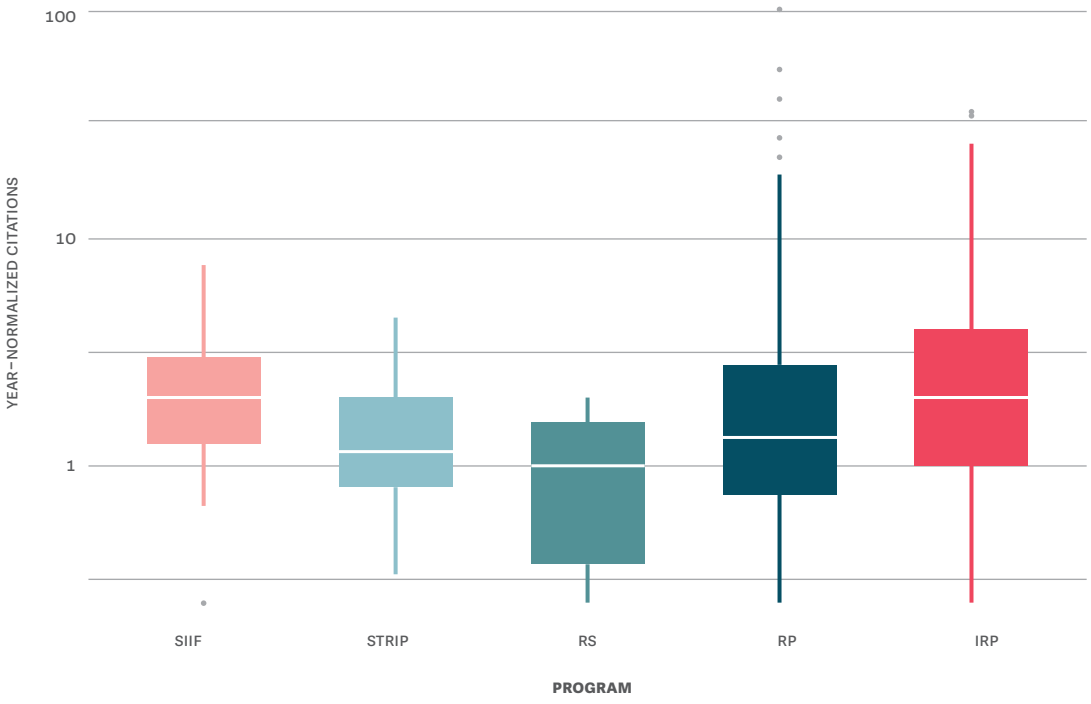


Source: SCOPUS, CROSBI, and staff elaboration.

12 The data on the UKF program includes 70 grants and 455 papers associated with those grants. To account for the difference in the number of supported projects and papers between UKF, IP and IRP, we compared the distribution of citations and highlighted only statistically significant differences. For more details on the UKF program, see Functional and Governance Analysis report (World Bank 2020b).

Of the five analyzed programs targeting researchers, SIIF, RP and IRP on average produced the highest-impact publications. The survey of beneficiaries required researchers to list up to five most important publications related to their projects. The 275 respondents reported a total of 1,267 publications, of which 53 percent were found in SCOPUS. Most publications were listed as related to RP and IRP programs, but these programs also had the most beneficiaries and respondents. IRP and SIIF had the highest median citations (controlling for the age of the publication), equivalent to 2 citations per year (Figure 2.20). Publications associated with projects financed through the RP program had somewhat lower median citations than IRP and SIIF, but this program also had more positive outliers. The most cited publication was funded by the RP program and had a total of 412 citations. In all programs, around 60 percent of publications take about one year to get cited, though in the RP and IRP programs about 10 percent of publications remain uncited after two years, and roughly 5 percent are uncited after four years.

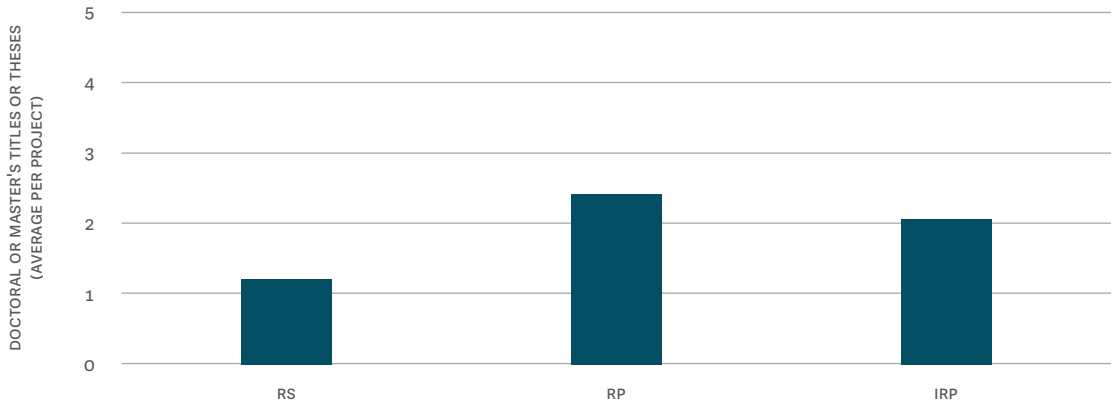
Figure 2.20 SIIF, RP and IRP on average produced the most cited publications



Source: Beneficiary surveys, SCOPUS, and staff elaboration.

Programs that intended to achieve doctoral or master's theses accomplished one or two per project on average. These results are somewhat low given the objectives of these programs and the number of researchers supported by them. Stimulating the education of young researchers (doctoral students and postdocs) was listed as an explicit objective in the RP program, and research teams were fairly large (19 researchers per team on average). However, only two titles per project were achieved on average (Figure 2.21). Similarly, in the RS program, young researchers who had not yet obtained a PhD were the main target beneficiaries, and research teams could be composed of up to five members. However, on average only one title was earned per project.

Figure 2.21 RS, RP and IRP contributed to only one to two master's or doctoral theses per project



Source: Beneficiary surveys.

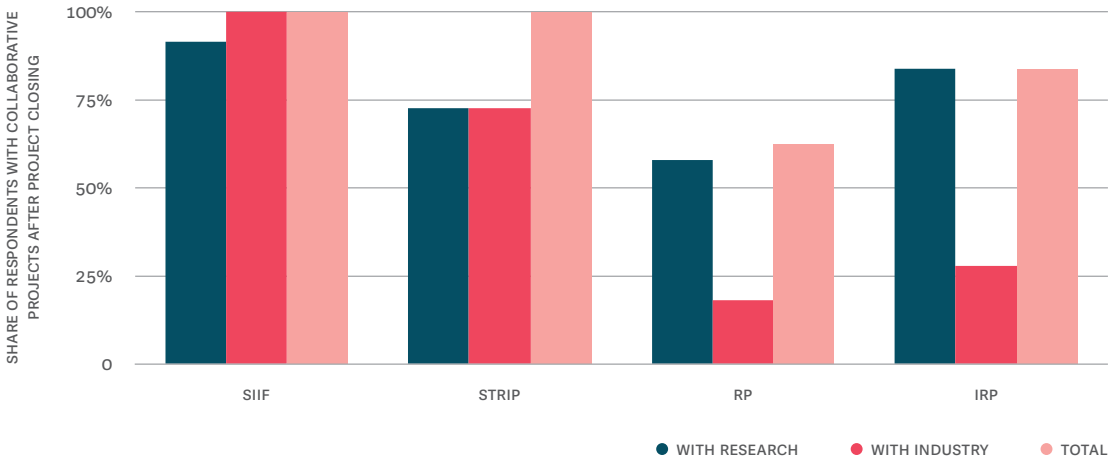
Collaborations

Collaborations were an intended outcome for most programs targeting researchers, and SIIF respondents achieved the most in this respect. All respondents under SIIF and STRIP engaged in collaborations after project closing, and a large share of respondents in these programs engaged in collaborations with industry (Figure 2.22). SIIF respondents engaged in an average of about 11 total collaborative projects per beneficiary after closing, the highest across programs (Figure 2.23). Of these, an average of about five per beneficiary were collaborative projects with industry. STRIP respondents engaged in an average of five collaborative projects per project. In contrast, those in the RP program achieved about two collaborative projects per project, the lowest of all four programs. Both RP and IRP respondents engaged in very few collaborative projects with industry. Given that collaboration is associated with higher quality of scientific outputs,[13] these two programs could consider stimulating more collaboration with other researchers (especially international researchers) as well as with industry. It is interesting to note that longer tenures of project leaders in the research institution linked to the project are associated with fewer

13 For more evidence of this, see report on Analysis of Quality and Coherence of the Policy Mix (World Bank 2019). See also Box 2.2.

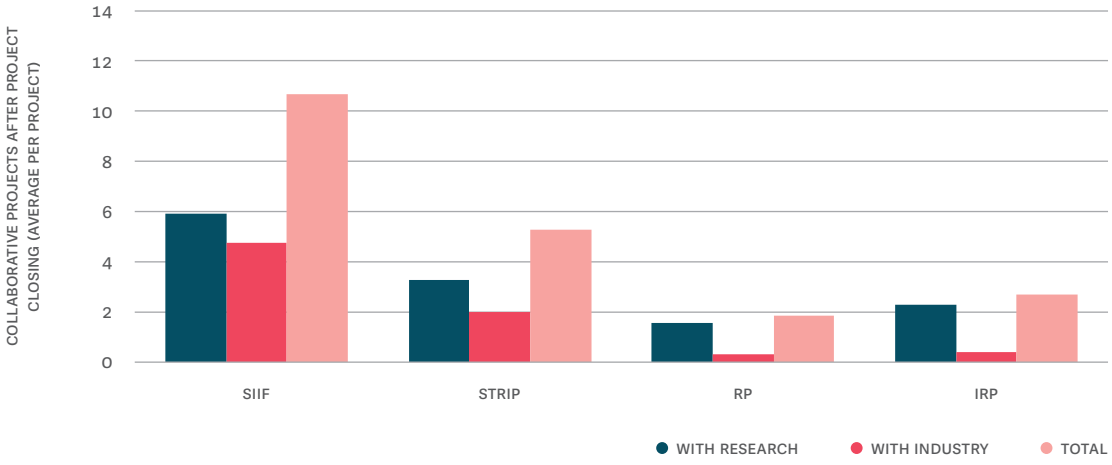
collaborative projects with other researchers after project completion, and this correlation is significant at the 95 percent confidence level. In other words, researchers with longer tenures appear to be less motivated to seek out collaborations. This strengthens the argument for improving the researcher career advancement framework, which should incentivize researchers to remain active in the research community.

Figure 2.22 All respondents under SIIF and STRIP engaged in collaborations, many of them with industry



Source: Beneficiary surveys.

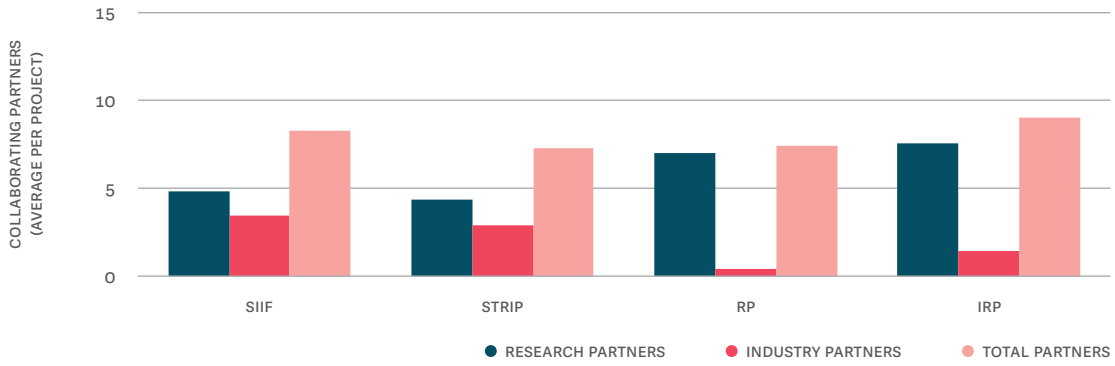
Figure 2.23 SIIF resulted in the most collaborative projects after project completion



Source: Beneficiary surveys.

SIIF and STRIP respondents had more industry partners than RP and IRP respondents, which reflects the different focus of these programs. All programs had a roughly similar number of partners, between seven and nine per project (Figure 2.24). However, research partners were more common than industry partners, even for programs encouraging collaborations with enterprises, such as STRIP. Since SIIF and STRIP aimed to foster market-oriented research and industry-science collaboration, these two programs had much higher numbers of industry partners than RP and IRP and also a larger share of respondents with industry partners (Figure 2.25). Encouraging more partnerships of researchers with the private sector would help bridge the gap between academic research and the needs of the economy. While the RP and IRP programs cover a broader range of scientific fields, including social sciences and humanities, all fields have the potential to cultivate more linkages with industry.

Figure 2.24 SIIF and STRIP had higher numbers of industry partners per project



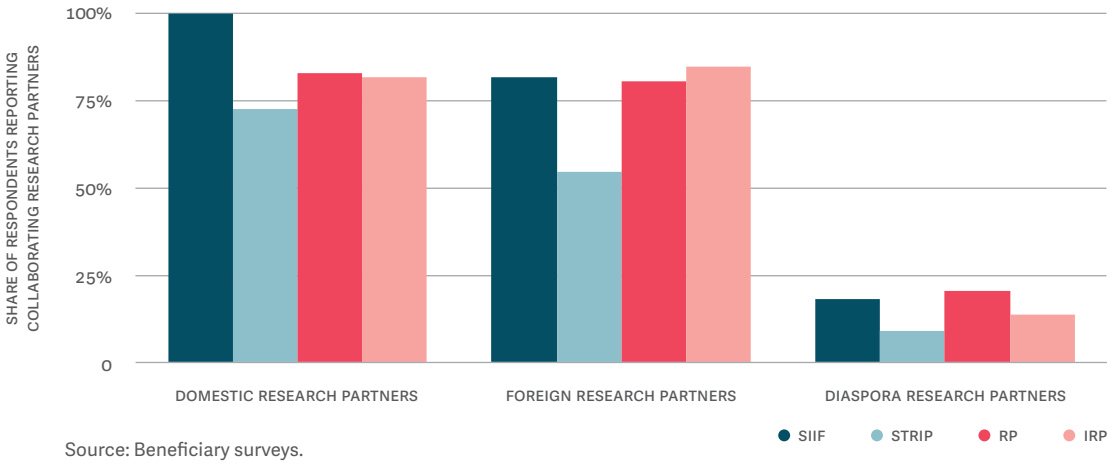
Source: Beneficiary surveys.

Figure 2.25 SIIF and STRIP also had a larger share of respondents with industry partners

Source: Beneficiary surveys.

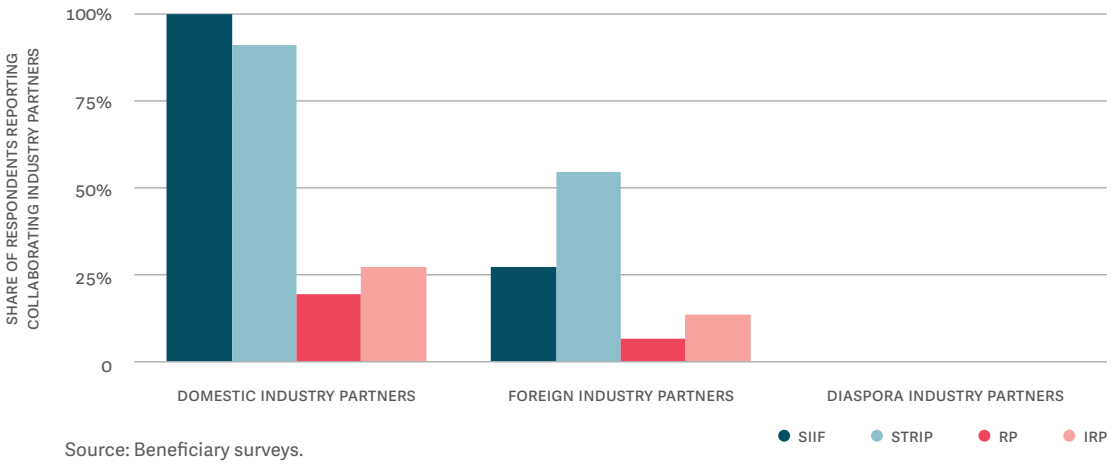
Domestic partners are most prevalent among respondents, while diaspora partners are underutilized. In SIIF, STRIP, and RP, more respondents had domestic partners than foreign partners, both in the research sector and in industry (Figure 2.26 and Figure 2.27). In the IRP program, slightly more respondents had foreign research partners than domestic research partners. It is also notable that many fewer respondents in the STRIP program (55 percent) had foreign research partners, compared to the other three programs, in which over 80 percent had foreign research partners. Very few respondents had diaspora research partners, and none had diaspora industry partners.

Figure 2.26 More respondents had domestic research partners



Source: Beneficiary surveys.

Figure 2.27 Among industry partners, domestic ones are also more prevalent



Source: Beneficiary surveys.

Box 2.2 Success factors for becoming an excellent researcher in Croatia

Semi-structured interviews were conducted with seven excellent Croatian researchers in order to examine the factors behind their outstanding results. The researchers were selected based on their excellent track record in terms of producing influential publications in their field, attracting competitive international research grants, and implementing successful research commercialization projects. Researchers were selected from a diverse set of scientific fields, including physics, oceanography, material sciences, biology, genetics, pharmacology, immunology, and humanities. The interviews focused on the researchers' education and career path, framework conditions in the research sector, funding opportunities, and areas for improvement within the system.

Researchers indicated international experience and collaboration as a key factor for boosting their research skills. International mobility was an important milestone in the formative years and early career of all interviewed researchers. Later on, this translated to strong working collaborations and networking opportunities. While abroad, researchers had the opportunity to fully focus on research, without distractions such as extensive teaching or administration, which allowed them to produce their most influential work. At the same time, they were able to upgrade their skills in project writing, management and dissemination, all in a highly competitive international environment. Interviewed researchers typically worked in international research groups under successful and well-connected mentors. Researchers credited their mentors for introducing them to a competitive research field and for integrating them into already successful research teams. Networking with experts in industry and academia helped with not only knowledge transfer but also visibility of research. All interviewed researchers emphasized the importance of participating in internationally visible research activities and collaborations in order to get recognized by grant selection panels at competitive funding bodies.

Attracting competitive funding, including from private sources, is important for ensuring continuity in research activities. The majority of interviewed researchers stated that their success in securing competitive international funding (e.g. Horizon 2020, ERC or comparable grant) helped them establish their own research team and secure an independent research position at their home institution. Competitive national funds are also an important resource, but researchers found them to be burdensome. Researchers reported unclear and contradictory institutional rules, bylaws and policies, extensive administrative burden, lack of administrative support within the home institution (legal, finance, IP), and slow and lengthy decision processes in the home institution resulting in negative impact on project execution and timelines. Securing funds from private sources is especially important for commercialization activities. For commercialization activities it was more rational and cost effective to finance all relevant R&D activities mainly from private sources.

A better institutional environment is needed to sustain outstanding research results. Although there are some positive supporting activities (i.e. lump-sum university support), institutional management in general does not leverage the experience and know-how of outstanding researchers. Cooperation within institutions is limited by high administrative

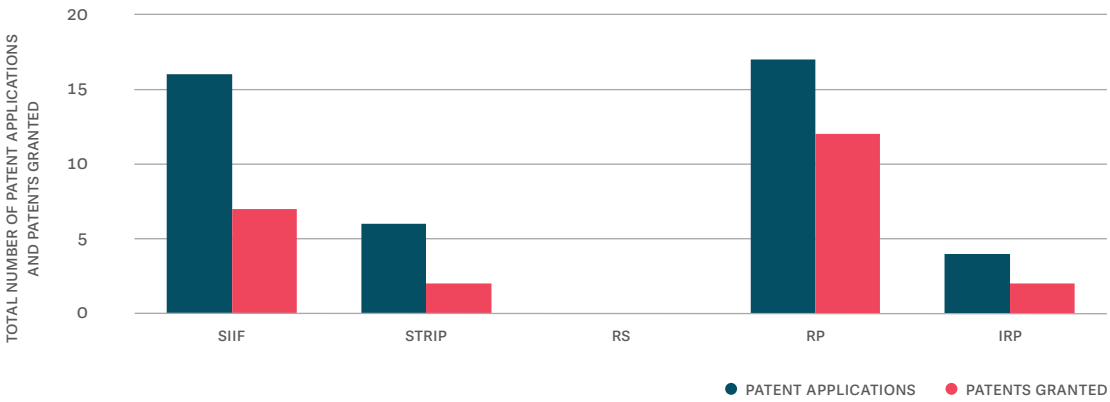
and legal fragmentation of most Croatian public research and higher education institutions, resulting in fragmentation and inefficiency of human and material resources. When deciding whether to continue their research career in Croatia, one key factor was institutional support for independent research, freedom to develop the research team and to apply for grants. However, this support was often difficult to secure and maintain at public institutions, and most interviewees identified unfavorable legislative framework and institutional inertia as key obstacles. In some cases, private sector companies provided better prospects for excellent researchers to continue their independent research.

Source: Staff elaboration.

Intellectual Property

In general, results related to intellectual property were limited in programs for which they were expected. Regarding patents, SIIF respondents submitted 1.3 patent applications per project on average, and 0.6 patents were granted per project on average, for a total of 16 patent applications and 7 granted (Figure 2.28). It appears that beneficiaries were less committed to achieving outcomes related to intellectual property, because few of them invested in these activities and those that did invested relatively few project resources.[14] The program with the highest number of patent applications and patents granted was RP, with 17 and 12 respectively. However, this program had a much higher number of beneficiaries. Therefore, the average per project was lower than the average per project achieved by SIIF. Interestingly, having collaborative projects with researchers or firms during implementation is associated with a higher number of patents filed and this correlation is significant at the 95 percent confidence level.

Figure 2.28 RP and SIIF had the highest number of patent applications and patents granted



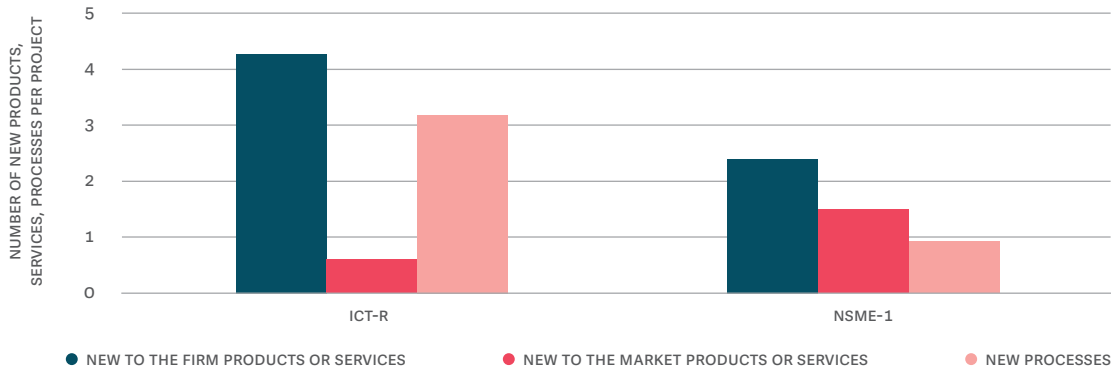
Source: Beneficiary surveys.

14 More details on the share of respondents investing in IPR protection and share of the budget allocated are provided in sections 3.2, 4.2, 5.2, 6.2 and 7.2.

New or upgraded products, processes, or services

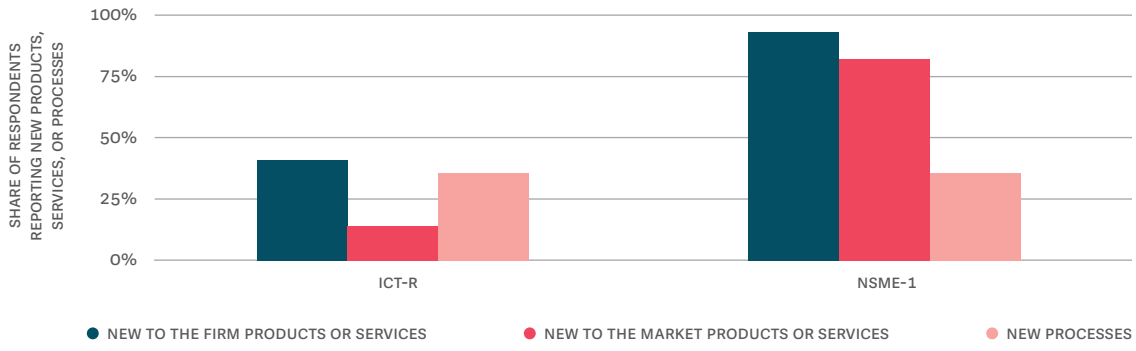
New-to-the-firm products, processes, or services were achieved more frequently than new-to-the market outcomes. Respondents in the ICT-R and NSME-1 programs developed an average of 1 to 4 new products, services, or processes per project. On average, respondents from the ICT-R program developed four products or services per project that were new to the firm, two times the number developed by respondents of the NSME-1 program. But when it comes to the number of products or services that were new to the market, respondents from the NSME-1 program developed two times as many per project as respondents from the ICT-R program (Figure 2.29). This reflects the differences in the design of the two programs, the former being more focused on commercializing new products or services, while the latter supported technology upgrades. The ICT-R program developed, on average, three new processes per project, while respondents from the NSME-1 program developed only one per respondent. For the STRIP program, a slightly different indicator was collected combining number of new products, services, or processes developed. Forty-five percent of STRIP's respondents developed a total of seven new products, processes or services, an average of 0.6 per project.

Figure 2.29 The ICT-R program resulted in more new products, processes, or services per project...



Source: Beneficiary surveys.

Figure 2.30 ...but a higher share of respondents achieved those outcomes in the NSME-1 program



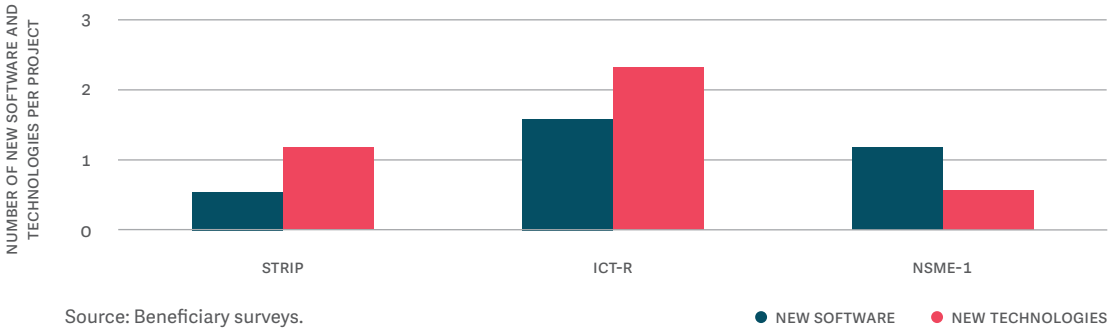
Source: Beneficiary surveys.

The generation of new products, processes or services was more common among respondents in the NSME-1 program. Despite achieving more results per project, fewer than half of the ICT-R respondents achieved results on these outcomes. At the same time, over 80 percent of NSME-1 respondents developed products or services that were new to the firm or new to the market (Figure 2.30). This result was expected, since the NSME-1 program put a greater emphasis on radical innovations.

Development of new software and technologies

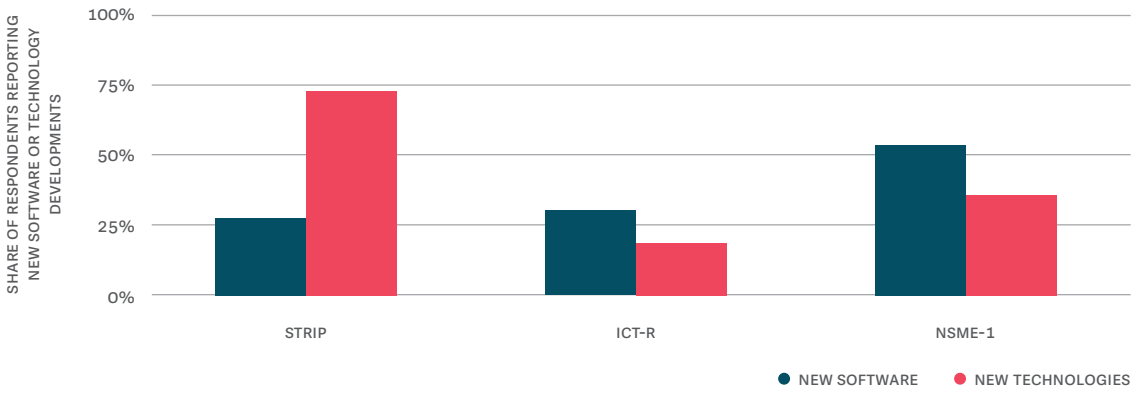
Programs differ in terms of achievements of new software or technologies related to the supported projects. The ICT-R program developed the largest number of software and technologies per project (Figure 2.31). However, these were achieved by a relatively small number of respondents (Figure 2.32). In contrast, respondents from the STRIP and NSME-1 programs developed a relatively lower amount of software and technologies, but these were developed by a relatively larger share of beneficiaries.

Figure 2.31 ICT-R respondents developed the highest number of new software and new technologies



Source: Beneficiary surveys.

Figure 2.32 A higher share of respondents developed a new technology in the STRIP program than in the ICT-R and NSME-1 programs



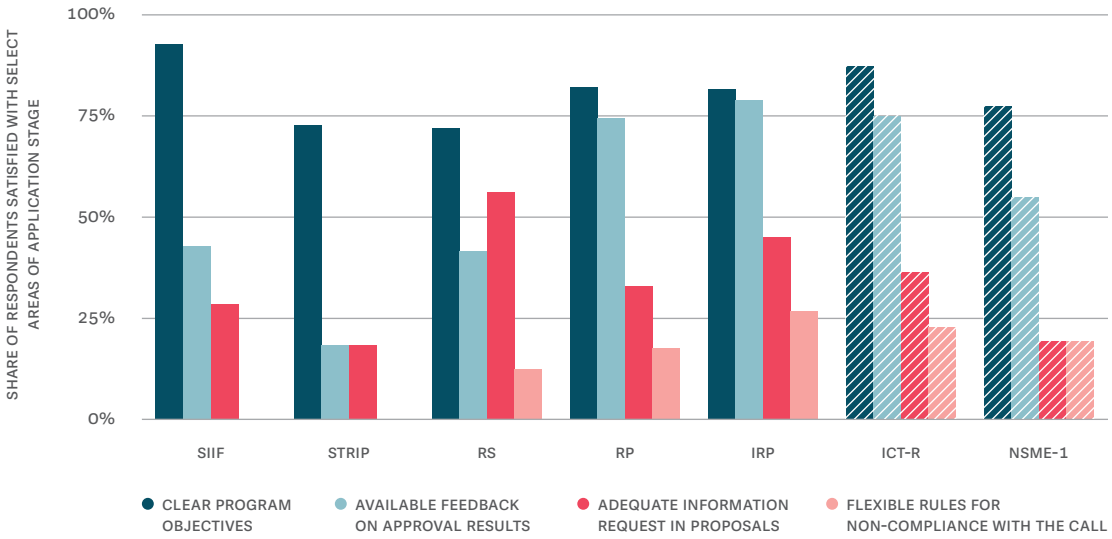
Source: Beneficiary surveys.

2.4 Perceived program quality

Quality of program contributions

While respondents were satisfied with various aspects of the application process, many were less satisfied with program flexibility and information requirements. About 20 areas of programs' contributions at application stage were assessed by respondents. The level of satisfaction was measured on a scale of 1-5, where 1 is strongly disagree and 5 strongly agree. An area of success is defined as one in which 75 percent or more of the respondents agree or strongly agree with the statement, and an area for improvement is one in which fewer than 30 percent of respondents agree or strongly agree with the statement. Figure 2.33 presents respondents' assessment for a select group of four areas. The clarity of objectives was an area of success with more than 75 percent of respondents satisfied across most programs. About 75 percent of respondents in RP, IRP, and ICT-R were satisfied with the availability of feedback on approval results, but this is an area for improvement for STRIP, as only 18 percent of respondents were satisfied. The adequacy of information requested in proposals had the lowest share of respondents satisfied in all programs except for RS. The area with the lowest share of respondents satisfied in all programs was the flexibility of rules for non-compliance with the call. None of the SIIF and STRIP respondents were satisfied with this area, and only a few were satisfied in the rest of the programs. In general, the IRP program had the highest share of respondents satisfied with program elements at the application stage, having the highest number of areas of success (10) and the lowest number of areas for improvement (1). In contrast, STRIP did not have any areas of success and had the highest number of areas for improvement (7).

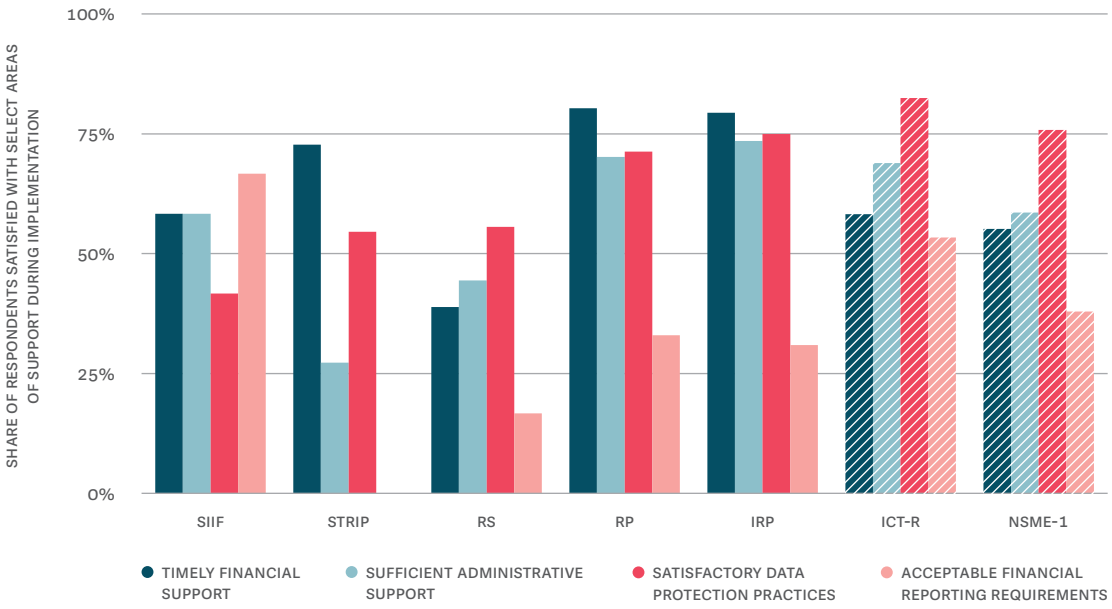
Figure 2.33 At the application stage, respondents were most satisfied with program objectives and least satisfied with flexibility and information requirements in project proposals



Source: Beneficiary surveys. Note: The figure shows the percentage of respondents who agreed or strongly agreed with the statements. Bars filled with a diagonal pattern denote programs targeting firms.

Respondents had different levels of satisfaction with various aspects of program implementation, with the exception of financial reporting requirements. Figure 2.34 presents satisfaction for a select group of four areas. Over 70 percent of respondents of STRIP, RP, and IRP were satisfied with the timeliness of financial support, while only 39 percent of RS respondents were satisfied with it. Also, the majority of respondents of the SIIF, RP, IRP, ICR-R, and NSME-1 programs thought the administrative support was sufficient, but fewer than 30 percent of STRIP respondents were satisfied with this area. Some variation in satisfaction across programs can also be seen with the acceptability of financial reporting requirements. This was the area with which respondents of all programs, except SIIF, were the least satisfied.

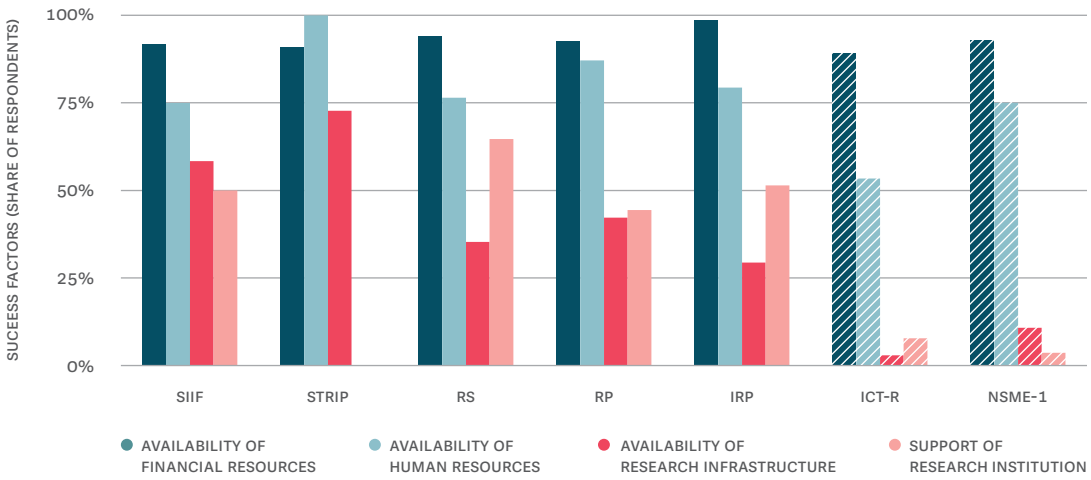
Figure 2.34 In program implementation, respondents were least satisfied with financial reporting requirements



Source: Beneficiary surveys. Note: The figure shows the percentage of respondents who agreed or strongly agreed with the statements. Bars filled with a diagonal pattern denote programs targeting firms.

The availability of human resources and the availability of financial resources were the most commonly cited success factors by respondents in all programs. Survey respondents were asked to select and rank up to three most important factors that contributed to the achievement of the results. The availability of research infrastructure was a success factor for most respondents in SIIF and STRIP, but not for as many respondents in the rest of the programs (Figure 2.35). The support from research institutions was a factor of success for most respondents from SIIF, RS, and IRP, but not a success factor for STRIP, ICT-R, or NSME-1. In sum, these results point towards the importance of financial and human resources for the results of these projects and the relatively smaller relevance of other areas of program support during implementation.

Figure 2.35 The availability of financial and human resources were cited as the most important success factors

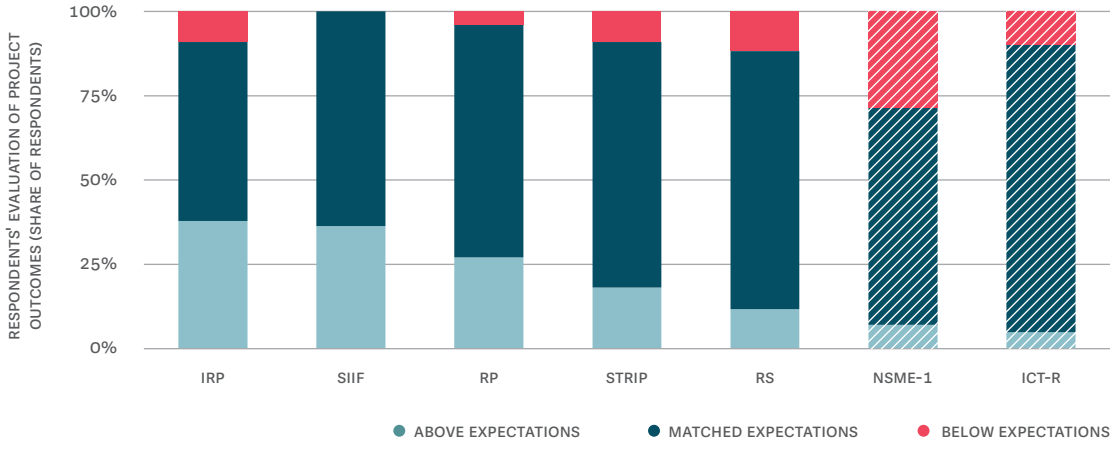


Source: Beneficiary surveys. Note: Bars filled with a diagonal pattern denote programs targeting firms.

Overall project quality

Overall, respondents in all programs evaluated their project outcomes as matching their expectations. The IRP program had the largest share of respondents evaluating their project outcomes above their expectations (38 percent), followed by SIIF (36 percent) (Figure 2.36). SIIF was also the only program with no respondents evaluating their project outcomes as below their expectations. The NSME-1 and RS programs had the highest share of respondents evaluating their project outcomes as below expectations and a rather small share evaluating the outcomes above their expectations.

Figure 2.36 IRP, SIIF and RP had the highest share of respondents for whom project outcomes exceeded their expectations



Source: Beneficiary surveys. Note: Bars filled with a diagonal pattern denote programs targeting firms.

3 Science and Innovation Investment Fund

Science and Innovation Investment Fund

The Science and Innovation Investment Fund program aims to increase market-oriented R&D activities in Public Research Organizations (PROs). The program is designed and implemented by MSE, and provides funding for collaborative research projects of PROs. The first two editions of the grant scheme (SIIF I and SIIF II) provided financing for technology transfer activities, product development, and intellectual property rights protection. The calls were financed through the Operational Program Regional Competitiveness (OPRC) 2007–2013 with a total allocation of EUR 11.7 million and were implemented between 2009 and 2016. Projects received grants and technical assistance for collaborative projects implementing applied research and technology transfer. The third and most recent edition of the program (SIIF-OPCC) was financed through Operational Program Competitiveness and Cohesion (OPCC) 2014–2020 and supports 30 projects with an allocation of EUR 21.9 million. This analysis focuses on SIIF I and SIIF II because the projects financed under those two rounds have been completed.

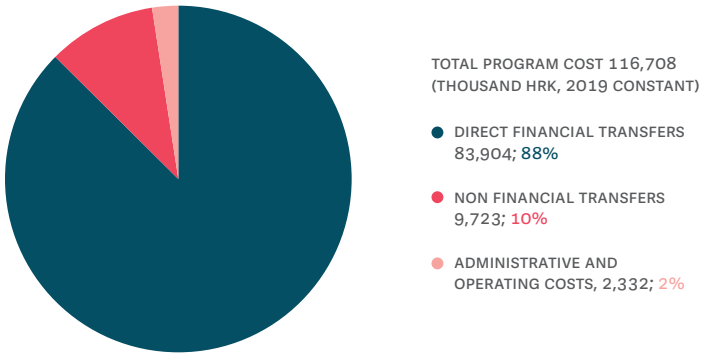
The final response rate for the SIIF survey, calculated as those that completed over 50 percent of the survey, was 61 percent. Beneficiaries that responded to the survey correspond to 61 percent of the funding disbursed and they received an average grant of HRK 3.7 million, which is slightly above the average grant of all SIIF beneficiaries (HRK 3.5 million). Of the 24 beneficiaries, 23 received the survey, while for one a valid contact could not be found. The cooperation rate was high, as 16 beneficiaries (70 percent) opened the survey. It is important to note that, due to the small number of beneficiaries, even with a high response rate, the survey results presented for this program should be interpreted with caution, as indications rather than robust representatives of the entire population of beneficiaries.

3.1 Efficiency in the use of inputs

Costs covered by the program

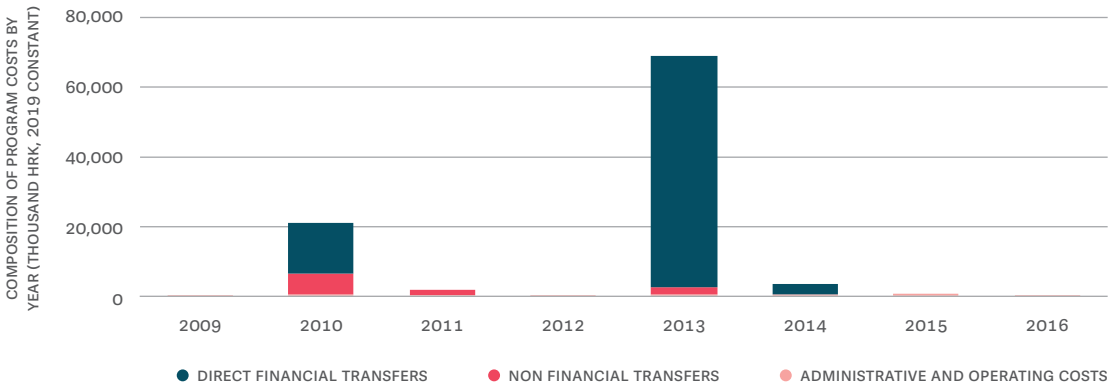
Direct financial and non-financial transfers to beneficiaries represented 98 percent of the total program costs in the 2009–2016 period. According to data provided by the program, administrative and operating costs accounted for 2 percent of the total program costs (Figure 3.1). Non-financial transfers to beneficiaries consisted of a technical assistance contract made by the program to provide expert support to beneficiaries during implementation, including face to face counseling, assistance with public procurement, visibility, and reporting, among others. Most transfers and costs were incurred in 2010 and 2013 (Figure 3.2). These were the years following the calls for proposals when most of the transfers to beneficiaries occurred. Under this program, there were no indirect financial transfers (such as tax deductions or discounts).

Figure 3.1 Direct financial transfers make up the largest portion of total program costs



Source: MSE data and staff calculations.

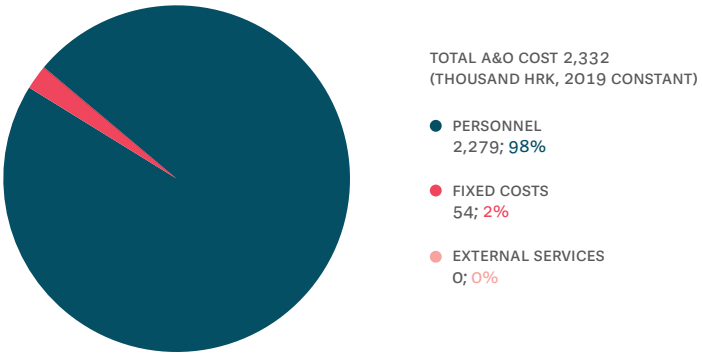
Figure 3.2 Program costs were concentrated in years following the calls for proposals



Source: MSE data and staff calculations.

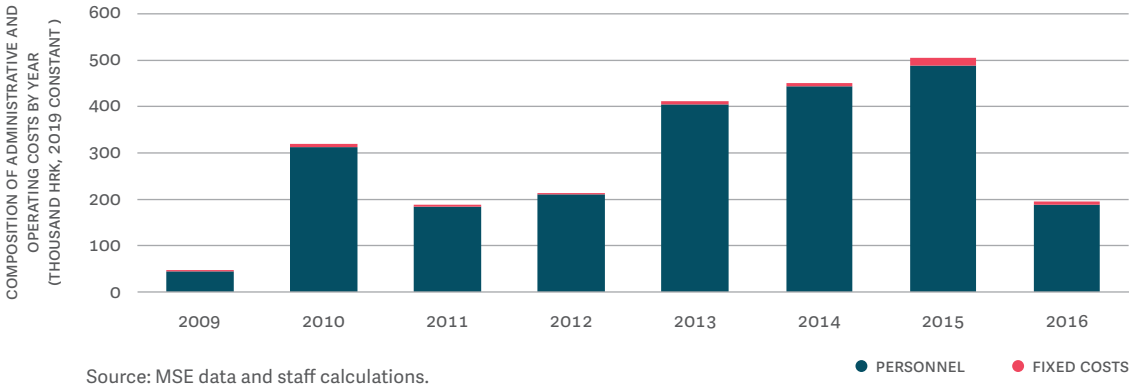
Administrative and operating costs were mostly driven by personnel salaries. Personnel salaries account for 98 percent of administrative and operating costs. In contrast, fixed costs, including goods and services, office space, furniture, equipment, and IT licenses, represented only 2 percent (Figure 3.3). Personnel costs were higher in the 2013–2015 period, coinciding with an increase in number of beneficiaries supported (Figure 3.4). The administrative data received did not include any expenses for external services contracted such as consultants, experts, firms supporting program staff in implementation, marketing, or travel expenses.

Figure 3.3 Administrative and operating costs are driven primarily by personnel costs



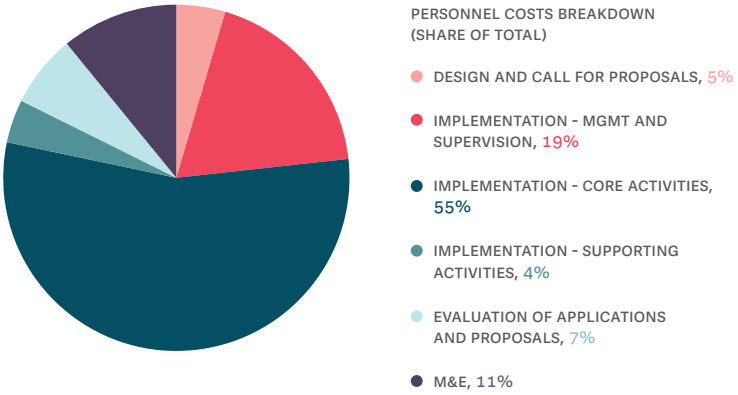
Source: MSE data and staff calculations.

Figure 3.4 Personnel costs were higher in the 2013–2015 period



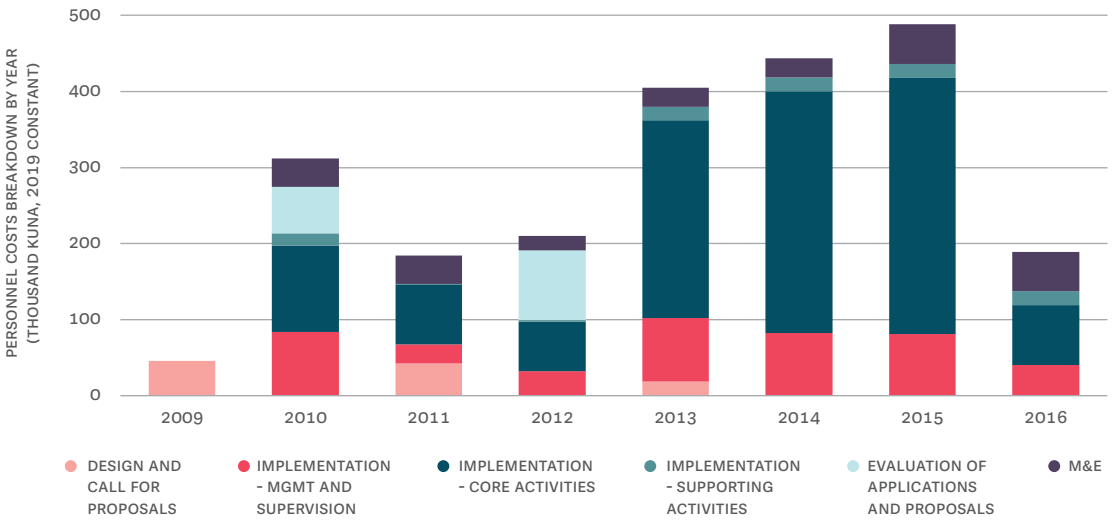
Source: MSE data and staff calculations.

Figure 3.5 Personnel expenses are concentrated in core implementation activities



Source: MSE data and staff calculations.

Figure 3.6 Personnel costs for design were stable between calls, but implementation costs increased in the 2013-2015 period

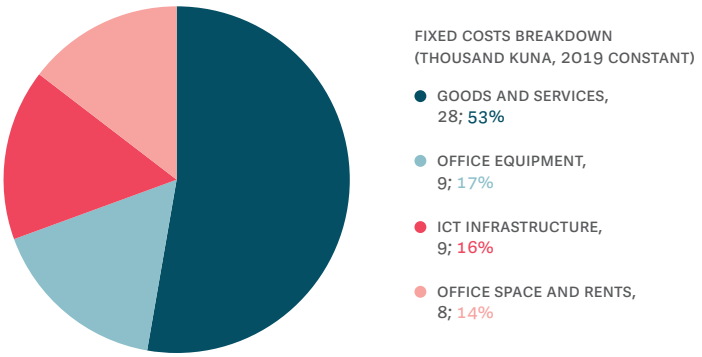


Source: MSE data and staff calculations.

Personnel expenses were driven by costs mainly related to the implementation of core activities, and to a lesser degree by management and supervision during implementation. In total, HRK 2.3 million were spent on personnel. Staff working on the implementation of core activities accounted for 55 percent of personnel costs, and staff in charge of management and supervision during implementation accounted for 19 percent (Figure 3.5). Personnel costs for program design were relatively similar in 2009 and 2011, corresponding to the first and second editions of the program (Figure 3.6). While a reduction in personnel costs for program design could be expected in the second call, it is important to note that the second call was not a mere replication of the first one. Eligible activities were somewhat different from the first call. The second call also introduced a separate allocation for lagging regions, with a separate list of eligible activities. Personnel costs

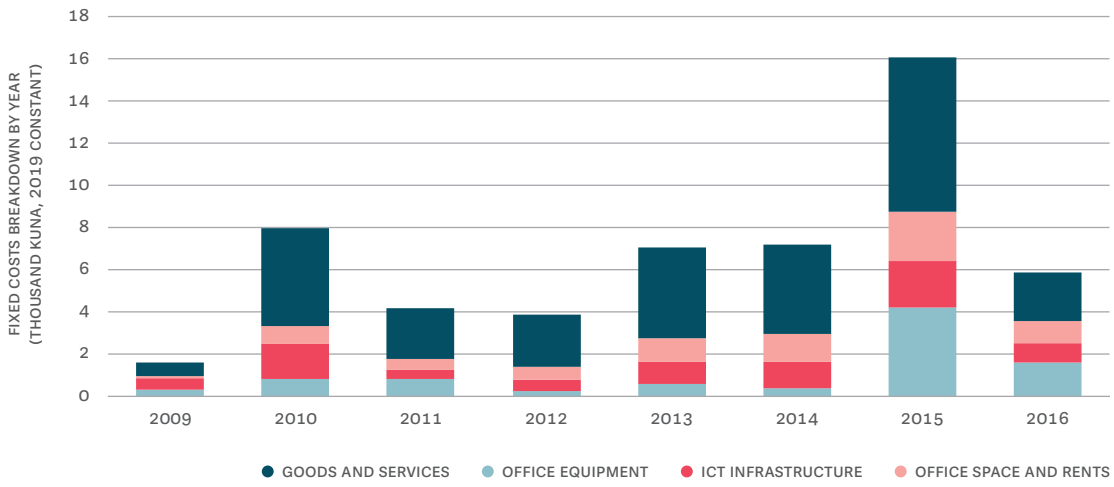
for implementation were considerably higher between 2013 and 2015 than in all previous years. This may be explained by the higher number of beneficiaries served in that period.

Figure 3.7 Around half of the fixed costs pertain to goods and services



Source: MSE data and staff calculations.

Figure 3.8 Fixed costs surged in 2015



Source: MSE data and staff calculations.

In contrast to personnel costs, fixed costs represented only 2 percent of the administrative and operating costs of the program. Fixed costs are estimated at HRK 54,000, of which 53 percent were expenses for services such as utilities, postal service, and transport (Figure 3.7). Fixed costs were the highest in 2015 (Figure 3.8). The data on fixed costs for this program were available for the whole institution only. Fixed costs pertaining to the program were estimated by calculating the ratio of personnel expenses related to SIIF over the institutional personnel expense and applying that ratio to total fixed costs for the institution.

Cost efficiency measured as administrative and operating costs per project dropped in the second SIIF call. Almost HRK 73,400 were spent on administrative and operating costs per project of SIIF I, while the average expenditure of SIIF II was around HRK 103,450 per project, driven mostly by increased personnel costs. On average, the program spent HRK 97,183 per project on administrative and operating costs. Of these, almost HRK 56,100 per project were spent on average on personnel for implementation and over HRK 17,700 per project on management and supervision (Table 3.1).

Table 3.1 Administrative and operating costs per project in the SIIF program

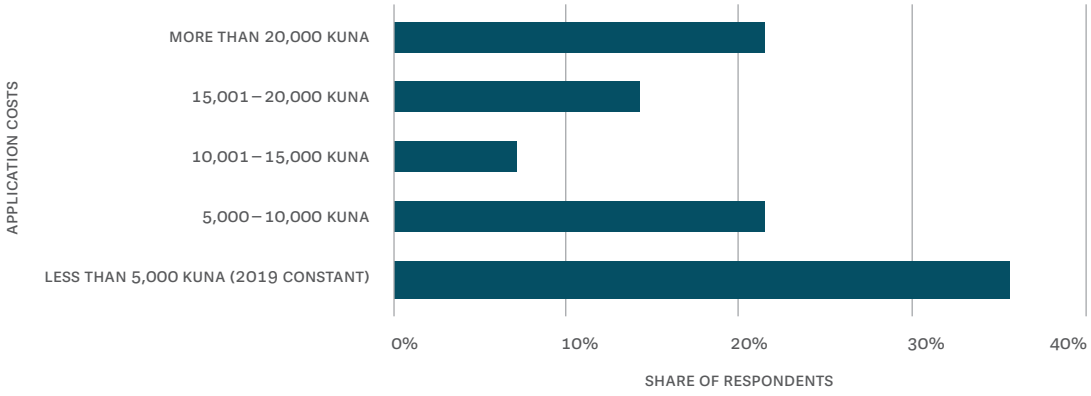
COST CATEGORY	TOTAL (CONSTANT 2019 - THOUSAND HRK)	AVERAGE PER PROJECT (CONSTANT 2019 - THOUSAND HRK)
Personnel – Design and call for proposals	104	4
Personnel – Implementation - mgmt. and supervision	426	18
Personnel – Implementation - core and support	1,346	56
Personnel – Evaluation of applications/ proposals	154	6
Personnel – Monitoring and evaluation	248	10
Fixed costs (offices, materials, equipment, services)	54	2
Total administrative and operating costs	**2,332**	**97**

Source: MSE data and staff calculations.

Costs covered by beneficiaries

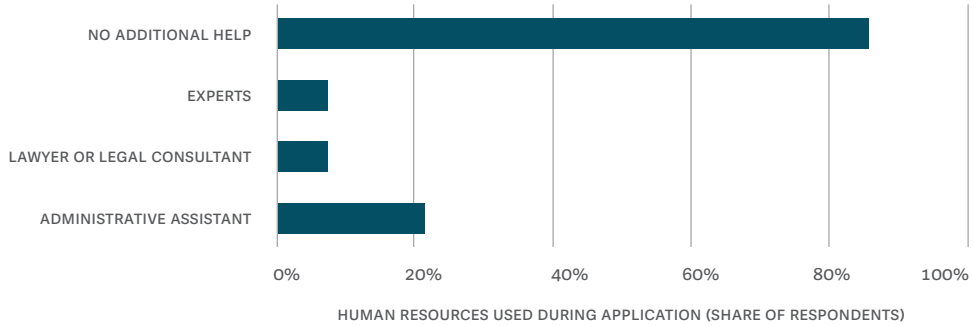
Average application costs were moderately high, but most respondents did not require assistance from professionals outside of the research team. The average application cost per project was HRK 20,718, with 57 percent of respondents reporting application costs of HRK 10,000 or less. However, 21 percent of respondents had application costs of more than HRK 20,000 (Figure 3.9). This variation may be partially driven by the human resources and time needed to prepare the application or the complexity of the project. Eighty-six percent of respondents completed the application without additional help, while the rest needed one or more people to assist with the application (Figure 3.10). In particular, 21 percent used an administrative assistant, 7 percent used a lawyer, and 7 percent used experts.

Figure 3.9 Estimated application costs vary widely among respondents, possibly due to varying project complexity



Source: Beneficiary surveys. N=14.

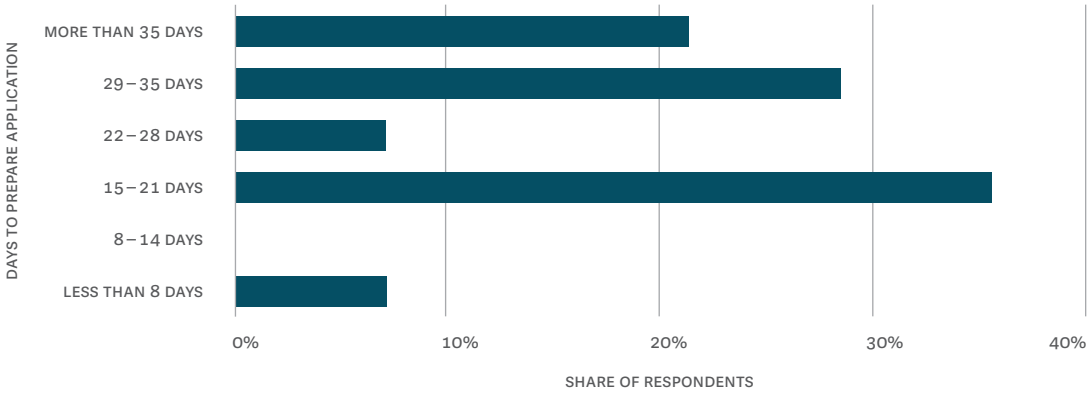
Figure 3.10 Most respondents required no additional help to prepare an application to the SIIF program



Source: Beneficiary surveys. N=14.

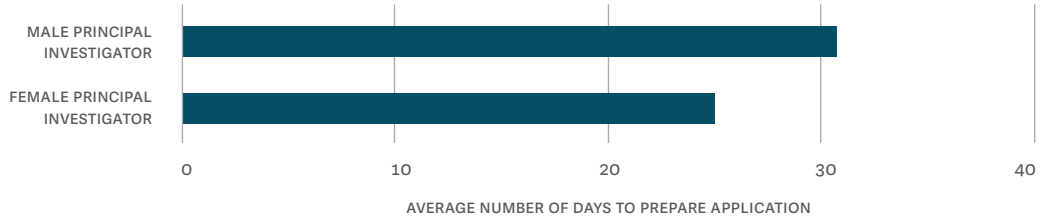
A significant share of applicants invested substantial time in their applications. Although a good number of respondents, 36 percent, were able to complete their application in 2 to 3 weeks (or 15–21 days), half of them took more than 4 weeks to complete it (Figure 3.11). On average, projects with female principal investigators took 25 days to prepare and projects with male principal investigators took 31 days (Figure 3.12), but this difference is not statistically significant.

Figure 3.11 Half of the respondents needed over four weeks to complete their applications



Source: Beneficiary surveys. N=14.

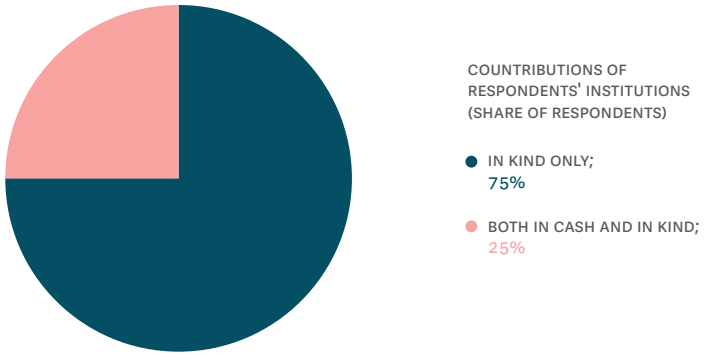
Figure 3.12 The difference in the time needed to prepare the application between male and female principal investigators is not statistically significant



Source: Beneficiary surveys. N=14.

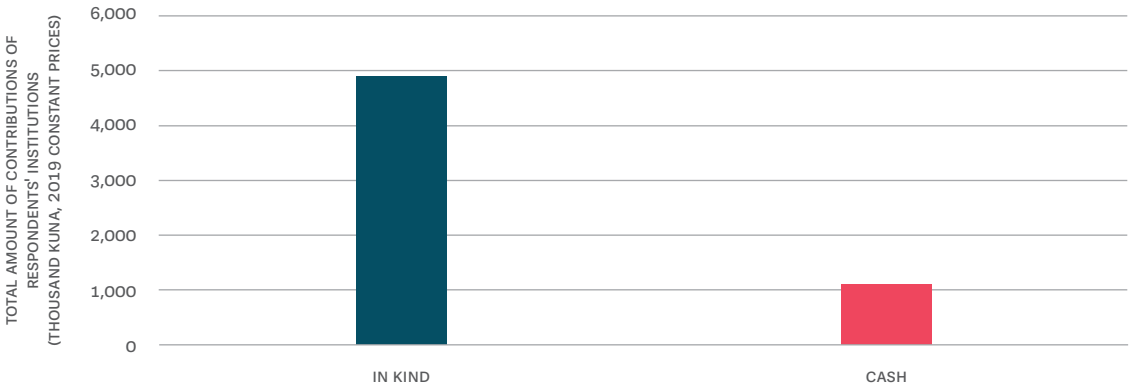
All respondents' projects received in-kind contributions from their home research institution, and some also received cash contributions. Twenty-five percent of respondents' projects received cash in addition to an in-kind contribution (Figure 3.13). The total amount of contributions received in kind were valued by respondents at HRK 4.9 million, while the total amount of cash contributions was HRK 1 million (Figure 3.14). The average in-kind contribution per project was about HRK 409,000, and the average cash contribution per project was HRK 365,000.

Figure 3.13 All respondents received in-kind contributions from their institution, and some also received cash



Source: Beneficiary surveys. N=12.

Figure 3.14 The estimated value of in-kind contributions was higher than the value of cash contributions



Source: Beneficiary surveys. N=12.

On average, the costs covered by the program were five times higher than the costs covered by beneficiaries. Accounting for the application costs as well as the contributions made by institutions, the average cost covered by beneficiaries amounts to HRK 794,365 per project. On the other hand, the average cost covered by the program was HRK 3,998,316 per project. Therefore, the ratio of costs covered by the program to costs covered by beneficiaries is 6. In other words, on average, the program spent 6 HRK for every HRK that beneficiaries invested in their projects.

3.2 Efficiency in the generation of outputs

Investments in beneficiaries

On average, the program transferred a total of HRK 4.8 million per project directly to beneficiaries. Of total transfers per project, 91 percent, or HRK 3.5 million per project, were direct financial transfers, while 9 percent, or HRK 405,000 per project, were non-financial transfers (Table 3.2)**.** Non-financial transfers included technical assistance to beneficiaries on issues such as project preparation, implementation, and visibility. This program did not provide indirect financial transfers, such as taxes or discounts, to beneficiaries.

Table 3.2 Program expenditures per project in the SIIF program

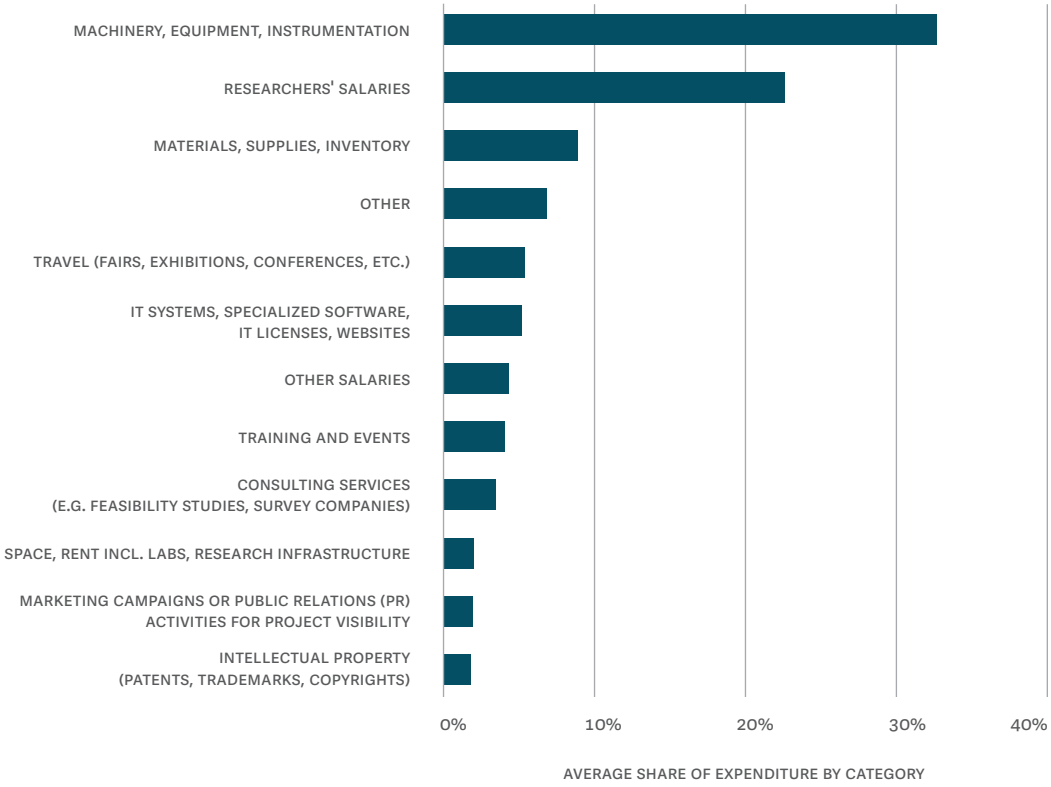
EXPENDITURE TYPE	TOTAL (CONSTANT 2019 - THOUSAND HRK)	AVERAGE PER PROJECT (CONSTANT 2019 - THOUSAND HRK)
Total transfers to beneficiaries	93,627	3,901
Direct financial transfers	83,904	3,496
Non-financial transfers	9,723	405
Administrative and operating costs	2,332	97
Total program cost	**95,960**	**3,998**

Source: MSE data and staff calculations.

For each HRK invested in program administration and operation, beneficiaries received approximately HRK 40 in financial and non-financial resources. As described above, the program transferred a total of HRK 94 million to beneficiaries and incurred HRK 2.3 million of administrative and operating costs. Therefore, the ratio of transfers to administrative and operating costs is about 40. For each HRK the program invested in its administration and operation, beneficiaries received 36 HRK on average in direct financial transfers and 4 HRK in non-financial transfers.

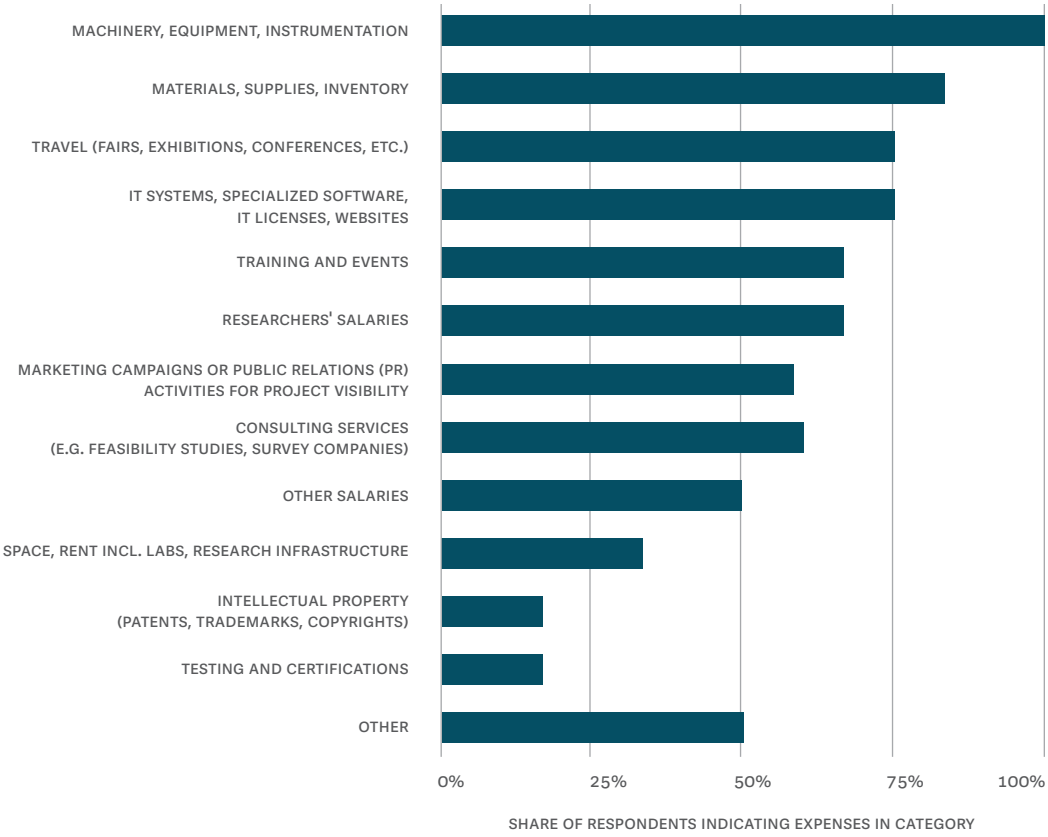
According to the survey data, on average, beneficiaries allocated the largest share of project funding to machinery, equipment, and instrumentation, while investments into intellectual property were low. On average, respondents allocated an average of 33 percent of funding to machinery, equipment, and instrumentation (Figure 3.15). This category was followed by researchers' salaries, which, on average, accounted for 23 percent of funding. Despite the focus of the program on fostering technology transfer capabilities and developing intellectual property in public research organizations, only 17 percent of respondents invested in patents, trademarks, and copyrights (Figure 3.16). A negligible portion of the budget (2 percent) was dedicated to intellectual property. If the program is to generate tangible outcomes related to technology transfer in public research organizations, it should encourage more investment in intellectual property by its beneficiaries.

Figure 3.15 Respondents invested most of the funding into equipment and salaries



Source: Beneficiary surveys. N=12. Multiple selection question. Other includes administrative costs, implementation costs; catering, brochures, fieldwork, indirect costs, project revision, and publication of scientific papers in open access journals.

Figure 3.16 Relatively few respondents invested in intellectual property rights

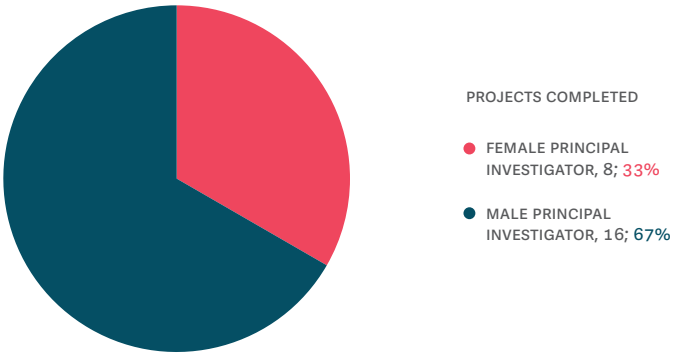


Source: Beneficiary surveys. N=12. Other includes administrative costs, implementation costs; catering, brochures, fieldwork, indirect costs, project revision, and publication of scientific papers in open access journals.

Outputs achieved

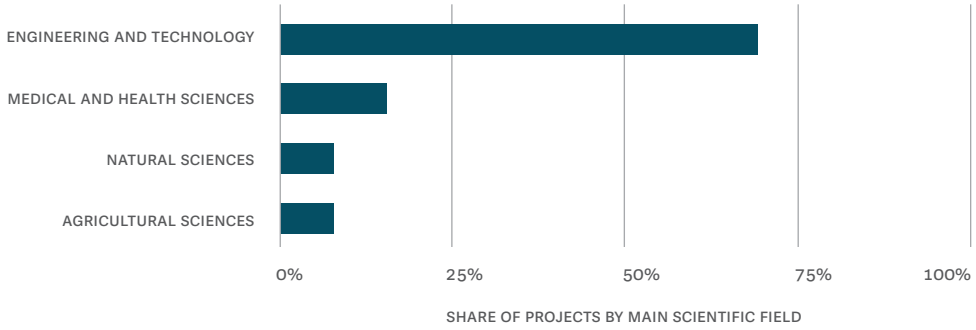
In total, 24 projects were completed under SIIF I and SIIF II, mostly in the field of engineering and technology. The program disbursed a total of HRK 105 million as direct financial transfers to beneficiaries. Of the 24 projects, 33 percent had a female principal investigator, corresponding to 33 percent of the total funding disbursed (Figure 3.17). Most of the projects in the first edition were completed in 2012, and only one was completed in 2011. All but one project in the second edition were completed in 2015; the other one was completed in 2016. For 69 percent of respondents, engineering and technology was the main scientific field of their projects, followed by 15 percent in medical and health sciences (Figure 3.18).

Figure 3.17 Two-thirds of principal investigators are male



Source: MSE data. N=24.

Figure 3.18 Most respondents pursued projects in the field of engineering and technology

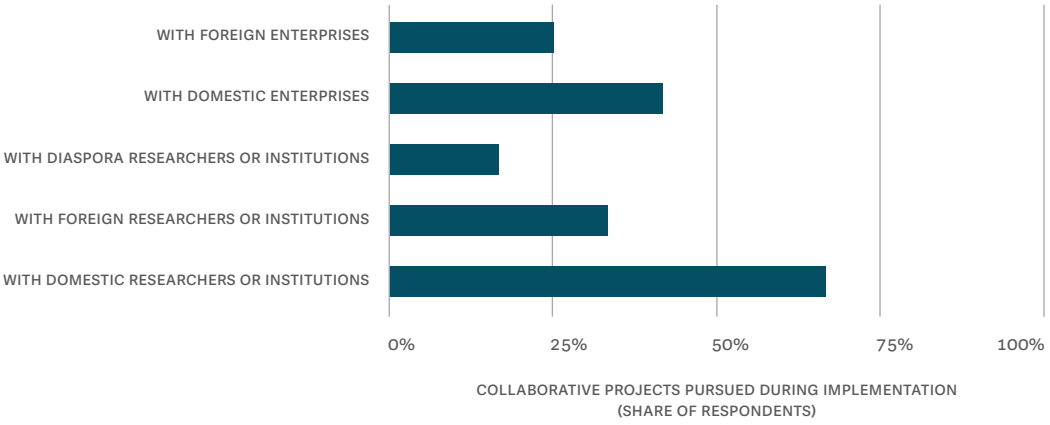


Source: Beneficiary surveys. N=12.

On average, respondents achieved 34 outputs per project, corresponding to 4 outputs per HRK 1,000 of program costs. Three output indicators were tracked based on the ToC for this program: the number of collaborative projects during implementation; the number of seminars, workshops, and conferences; and the number of training activities. In total, 402 outputs were achieved by 12 respondents.

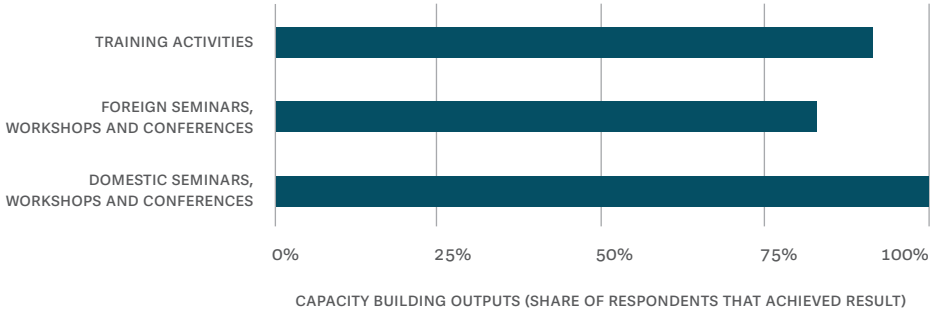
Most survey respondents pursued a variety of collaborations during the implementation period, including collaborations with foreign researchers and industry. Eighty-three percent of respondents had collaborative projects with research institutions or enterprises during the project. There were a total of 38 collaborative projects during implementation. Two-thirds of respondents had collaborative projects with domestic researchers or institutions, but some also had collaborative projects with foreign researchers and diaspora researchers (Figure 3.19). Despite the fact that collaborations with enterprises were not mandatory in this program, 42 percent of respondents had collaborative projects with domestic enterprises and 25 percent with foreign enterprises.

Figure 3.19 A minority of respondents established collaborations with foreign entities during the project



Source: Beneficiary surveys. N=12. Multiple selection question.

Figure 3.20 All respondents had at least one type of capacity building output



Source: Beneficiary surveys. N=12. Multiple selection question.

All respondents achieved outputs related to capacity building for innovation, including seminars, workshops, and conferences, as well as training activities. Survey respondents attended a total of 145 domestic and 96 foreign seminars, workshops, and conferences related to the project. Also, 92 percent of respondents attended a total of 123 training activities (Figure 3.20).

3.3 Efficiency in the generation of outcomes

In total, respondents achieved a total of 680 outcomes (including both intended and other results) which represent 57 outcomes achieved per project, on average. Intended outcomes include collaborative projects after project completion, scientific publications in peer-reviewed journals, market-oriented research, intellectual property (patent applications, patents granted), and technology transfer outcomes such as spin-offs. Other outcomes include doctoral or master's titles or theses, prototypes, new or upgraded products, processes, and services, and new software and technology development.

Intended outcomes achieved

All respondents pursued domestic collaborations and published scientific papers after project completion, but very few had outcomes related to patents or transfer agreements. Intended outcomes for this program include collaborative projects pursued after implementation, scientific publications, market-oriented research, technology transfer agreements, new enterprises formed, patent applications, and patents granted (Table 3.3). The most common achievements were collaborations with researchers and enterprises after the project, published scientific papers, and market-oriented research. Consistent with the low investment in intellectual property activities presented in Figure 3.15 and Figure 3.16, only two respondents completed transfer agreements, and only four respondents submitted patent applications or obtained patents. Four projects also started a new business based on the project results. This stands in stark contrast with the design of the program, in which development of capacity for technology transfer and intellectual property featured more prominently than, for example, scientific publications.

Table 3.3 Few respondents achieved outcomes related to knowledge or technology transfer

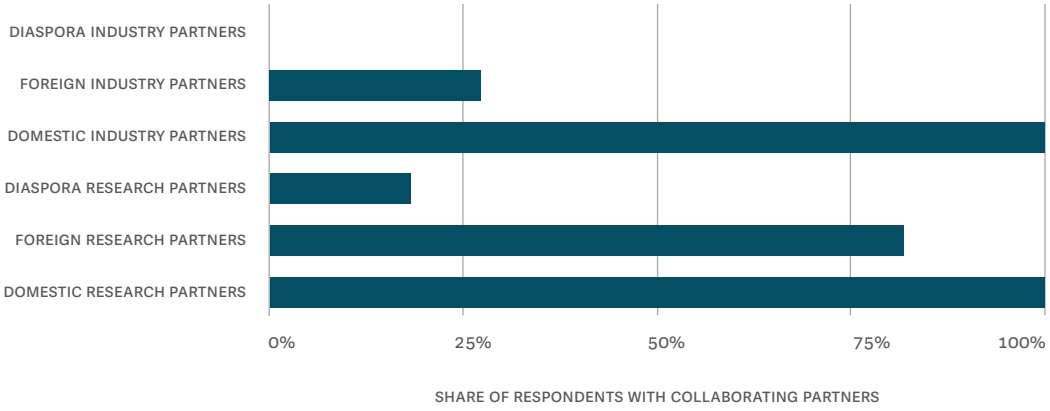
INTENDED OUTCOME	SHARE OF RESPONDENTS THAT ACHIEVED RESULT	NUMBER OF RESPONDENTS THAT ACHIEVED RESULT	TOTAL NUMBER OF RESULTS REPORTED
Collaborative projects with domestic researchers or research institutions after the project	83%	10	38
Collaborative projects with foreign researchers or research institutions after the project	75%	9	25
Collaborative projects with diaspora researchers or research institutions after the project	25%	3	8
Collaborative projects with domestic enterprises after the project	100%	12	35
Collaborative projects with foreign enterprises after the project	17%	2	22
Scientific publications in peer-reviewed journals	100%	12	277
Market-oriented research	75%	9	40
Transfer agreements	17%	2	31
New enterprise, business or spin-off	33%	4	4
Patent applications	33%	4	16
Patents granted	33%	4	7

Source: Beneficiary surveys. Multiple selection question. N=12.

While only two respondents pursued collaborative projects with foreign enterprises, they achieved a relatively high number of collaborations. Two respondents achieved a total of 22 collaborative projects with foreign enterprises, while 12 respondents had 35 collaborative projects with domestic enterprises. Respondents also had collaborative projects with researchers or research institutions after the funded project. Domestic researchers or research institutions were the type of collaborative partners pursued by the highest percentage of respondents (83 percent). Going forward, the program should encourage a stronger focus on international collaboration, since international collaboration is associated with more impactful scientific outputs (World Bank 2019).

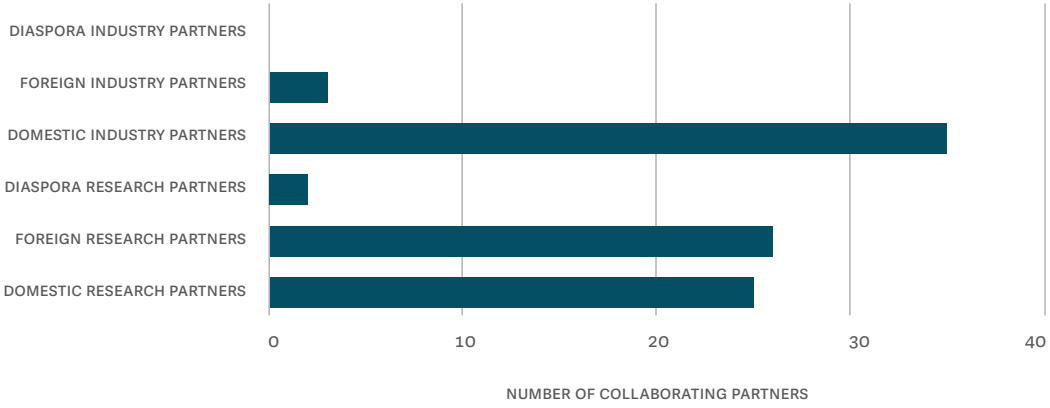
Because partnerships were mandatory for this program, all respondents had domestic industry and research partners in the context of their projects. In addition, a high percentage of respondents (82 percent) collaborated with foreign research partners, while only 27 percent collaborated with foreign industry partners (Figure 3.21). On average, each respondent had two domestic research partners and three domestic industry partners, for a total of 25 and 35 partners, respectively (Figure 3.22)

Figure 3.21 All respondents had domestic research and industry partners after project completion



Source: Beneficiary surveys. N=11. Multiple selection question.

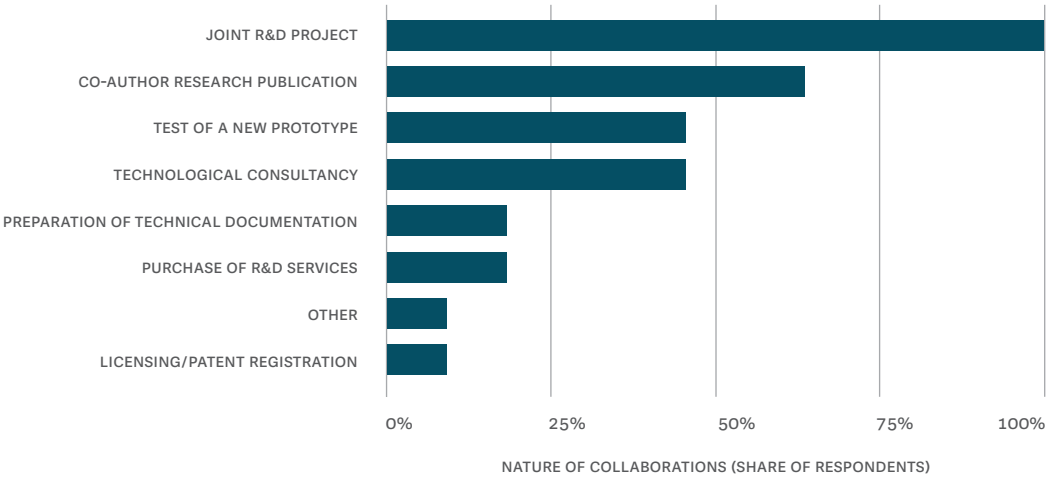
Figure 3.22 Respondents had more domestic industry than research partners



Source: Beneficiary surveys. N=11.

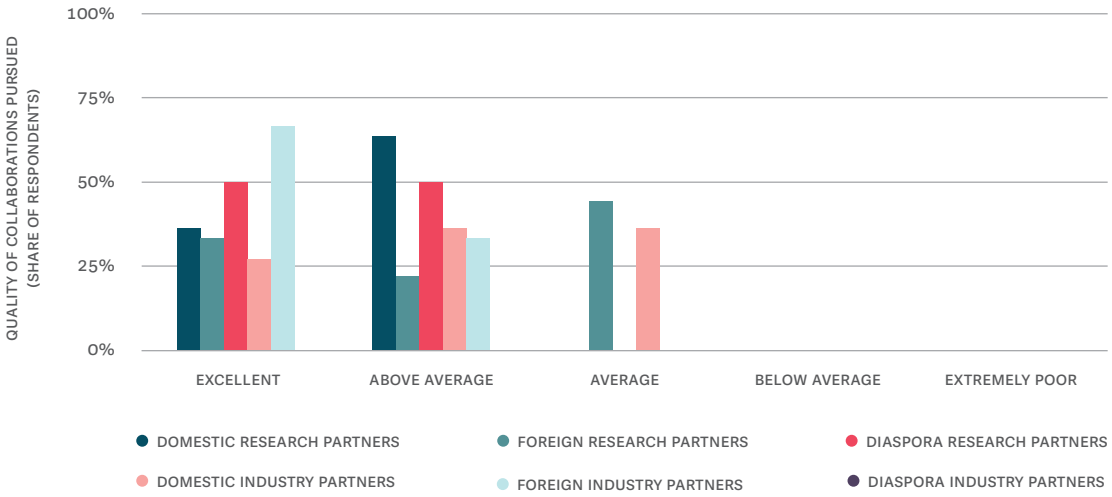
All respondents pursued collaborations in the context of a joint R&D project, and 64 percent collaborated for the purpose of co-authoring a publication. A smaller share collaborated for testing a new prototype or technological consultancy (45 percent). The least pursued type of collaboration was for licensing or patent registration, which was pursued by 9 percent of respondents (Figure 3.23). Considering the focus of the program on technology transfer and intellectual property, it appears that the program was not as successful in encouraging collaborations in these areas.

Figure 3.23 All respondents used collaborations to work on joint R&D projects



Source: Beneficiary surveys. N=11. Multiple selection question.
Other includes development of new functional products based on cereals.

Figure 3.24 While collaborations with foreign industry partners were rare, they were rated best

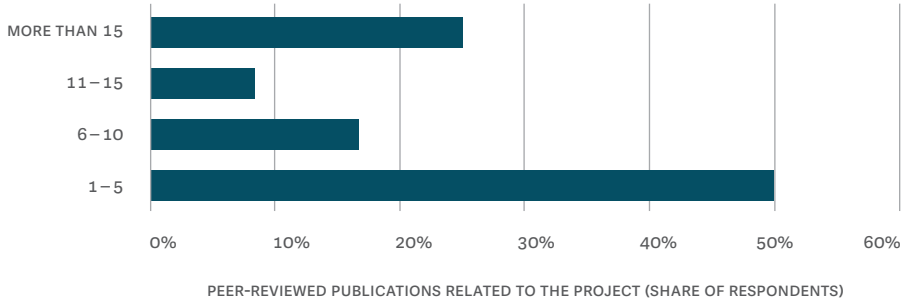


Source: Beneficiary surveys. N=11.

SIIF beneficiaries were also asked to evaluate the quality of the collaborations, and they rated most collaborations above average. Collaborations with foreign industry partners were the rated best, with 67 percent of respondents evaluating them as excellent and 33 percent as above average. On the contrary, domestic industry partners and foreign research partners had the lowest ratings, being the only type of partners that were evaluated as average (Figure 3.24).

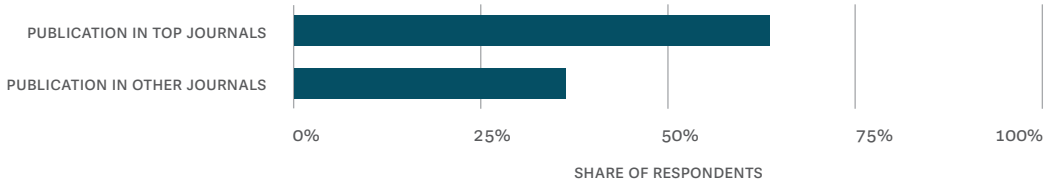
Survey respondents published a total of 277 scientific papers in peer-reviewed journals and completed 40 market-oriented studies. An important result of the program is that all respondents published papers in peer-reviewed journals and 75 percent produced market-oriented research. Half of respondents published between 1 and 5 papers related to the project in journals, and 25 percent published more than 15 (Figure 3.25).

Figure 3.25 Half of the respondents published up to five papers related to the project



Source: Beneficiary surveys. N=11.

Figure 3.26 Two-thirds of respondents reported publications in top journals

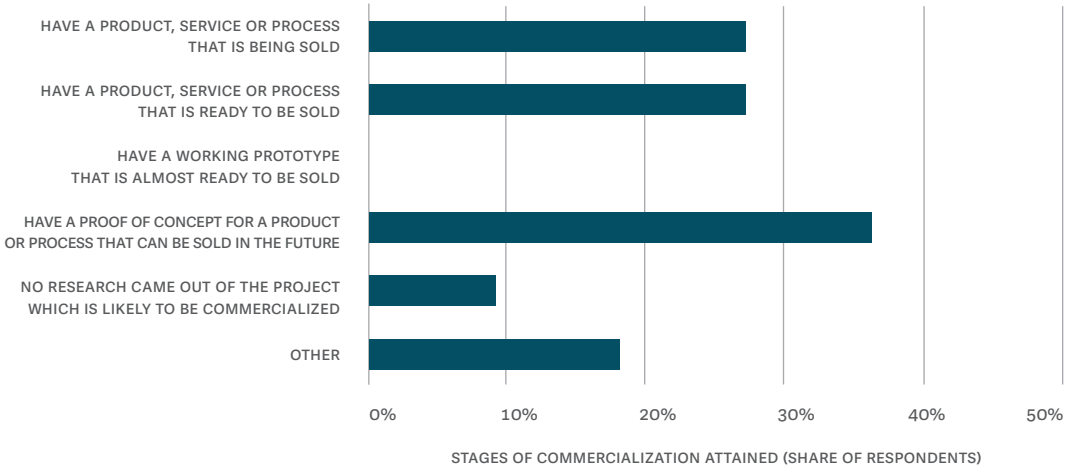


Source: Beneficiary surveys. N=11.

Two-thirds of respondents reported publications in top journals. Because publishing is one of the most relevant results for STI programs targeting researchers, it is important to shed light on the quality of publications related to the projects supported. One way to do so is through the quality of the journals in which the publications appear. All publications listed by respondents were classified into those published in top journals and those published in other journals.[15] 64 percent of respondents published in top journals (Figure 3.26), and on average they had two publications in such journals. Respondents reported a total of 50 publications, of which 16 were published in top journals.

In contrast with publications and market-oriented research, only 17 percent of respondents completed transfer agreements. In total, 31 transfer agreements related to projects were achieved (Table 3.3). Beneficiaries were asked about the stages of commercialization attained for research related to their projects as well as about the steps taken towards selling their products. Thirty-six percent of respondents had a proof of concept for a product or process that can be sold in the future and 27 percent had a product, service or process that was already being sold (Figure 3.27). Among those that have a product that can be commercialized, half of them had discussions or negotiations with a vendor or firm to sell their product, and 40 percent had presented their product in the domestic market or in trade fairs (Figure 3.28).

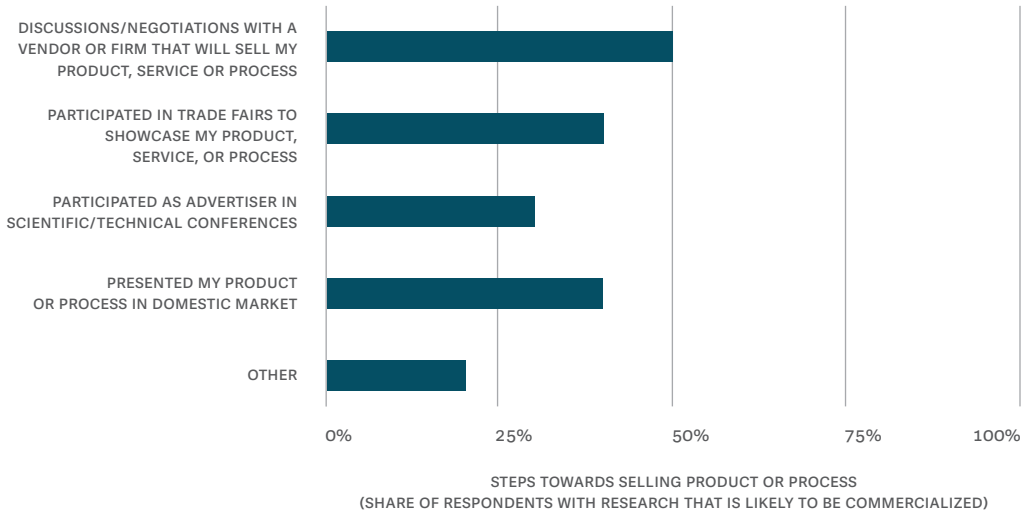
Figure 3.27 Where the results of the project can be commercialized, some respondents had a product or service that was already being sold



Source: Beneficiary surveys. Multiple selection question. N=11. Other includes products launched into the market, but discontinued production, product cannot be commercialized, product given for free.

15 For the purpose of this report, the classification of journals is based on the number of citations of publications divided by publication age, accumulated by Croatian-affiliated authors between 2008 and 2020, as reported in the SCOPUS database. Top journals were defined as those with the top 10 percent of age-normalized citations in each SCOPUS subject area.

Figure 3.28 Respondents had negotiations with vendors, participated in trade fairs, or presented their products in the domestic market or in conferences



Source: Beneficiary surveys. Multiple selection question. N=10. Other includes product is given free of charge and commercialization is not relevant for project.

Other results

Results achieved in terms of development of new and upgraded products, processes, or services suggest that beneficiaries were active contributors to innovation. Despite relatively low investment in intellectual property, many respondents managed to achieve the development of new products, processes, or services (83 percent) and upgraded products, processes, or services (50 percent, Table 3.4).

Table 3.4 Many respondents achieved doctoral or master's titles or theses and new products, processes, or services

OTHER PROJECT RESULTS ACHIEVED DURING OR AFTER THE PROJECT	SHARE OF RESPONDENTS THAT ACHIEVED RESULT	NUMBER OF RESPONDENTS THAT ACHIEVED RESULT	TOTAL NUMBER OF RESULTS REPORTED
Doctoral or master's titles or theses	83%	10	55
Prototype	42%	5	21
New products, processes, or services	83%	10	40
Upgraded products, processes, or services	50%	6	40
New design for a product, process, or service	25%	3	6
New software development	25%	3	9
New technology development	42%	5	6

Source: Beneficiary surveys. N=12.

3.4 Perceived quality

Quality of program contributions

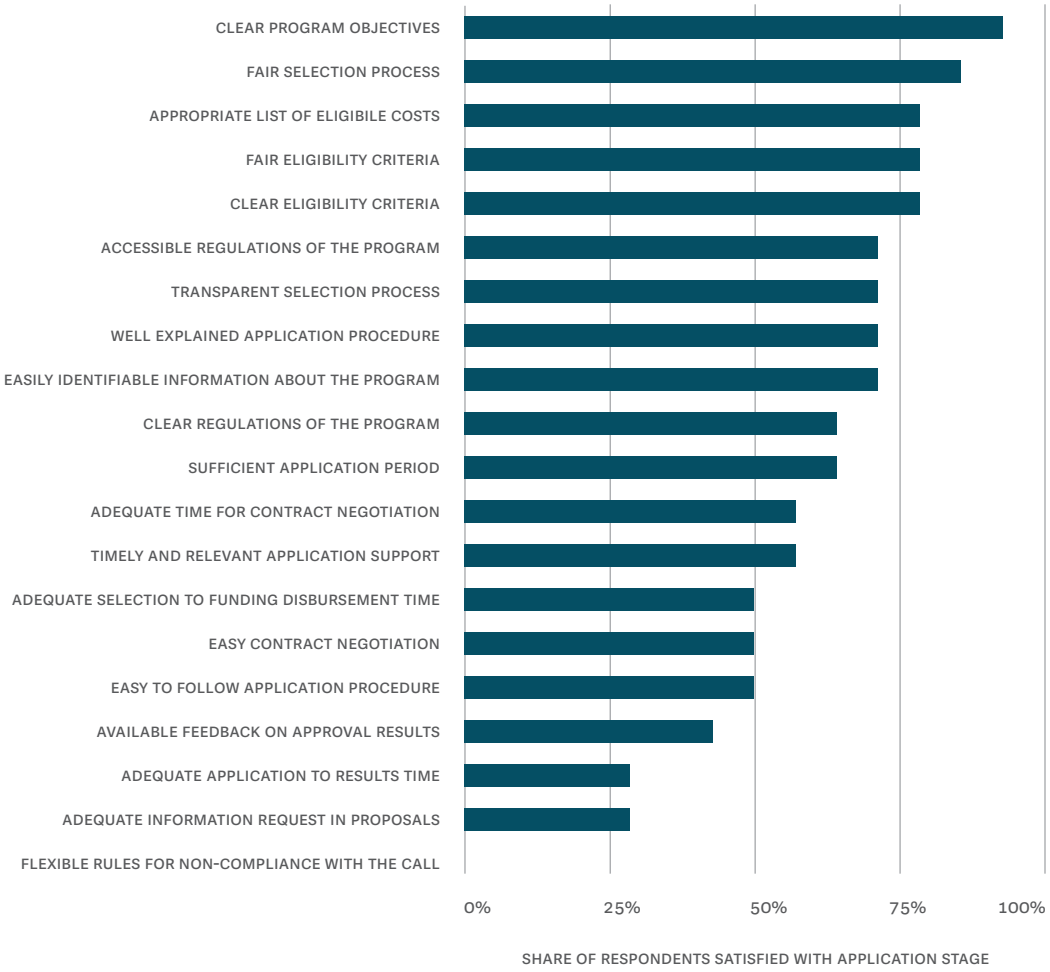
Beneficiaries expressed satisfaction with most aspects of the application process, most notably the clarity of program objectives, fairness of the selection process, eligibility criteria, and eligible costs. Figure 3.29 shows the survey respondents' level of satisfaction with different aspects of the application process. According to them, the program was successful in making the objectives clear, having a fair selection process, clear and fair eligibility criteria, and an appropriate list of eligible costs. Over 75 percent of respondents were satisfied with these areas of the program. A few respondents made suggestions with respect to the selection criteria, including to remove additional points for lagging regions, put greater emphasis on research excellence, and capacity of individual researchers instead of research institutions.

Over half of respondents were also satisfied with the time for contract negotiation and the application support. Regarding the regulations of the program, 71 percent of the beneficiaries found them accessible, and 64 percent found them clear. Respondents were also quite satisfied with the transparency of the selection process. Other areas where over half of the respondents were satisfied were the application period and procedure, as well as the ease of identifying information about the program.

Respondents were less satisfied with the time needed to complete the selection process, the information requested in applications, and feedback provided throughout the process. These are clear areas for improvement for the program. Fewer than 30 percent of respondents were satisfied with the time between the application and the announcement of results and the information requested in the proposals. Forty-three percent of respondents were satisfied with the feedback received, and around half were satisfied with the ease of following the application procedure, ease of contract negotiation, and time elapsed between selection and disbursement of funds. The experiences of SIIF should be used to make things better for the future, but selection under SIIF 3 has deteriorated. Because of the complexity of the selection process and bureaucracy in the way the ESIF system is set up, the selection process has taken over two years to complete (World Bank 2020b).

The provision of funding according to the contract, amount of financial support, and amount of time allowed for project implementation were satisfactory for a large share of respondents. First, the funding was delivered according to the terms of the contract signed with the program for every respondent. Second, the amount of financial support the program provided was sufficient to successfully complete the project objectives of more than 90 percent of respondents. For those few for whom the amount of financial support was insufficient, an increase in funding of up to 10 percent would have been enough to complete their project objectives. Third, the amount of time the program allowed for project implementation, including any extensions, was sufficient to successfully complete the projects of all respondents.

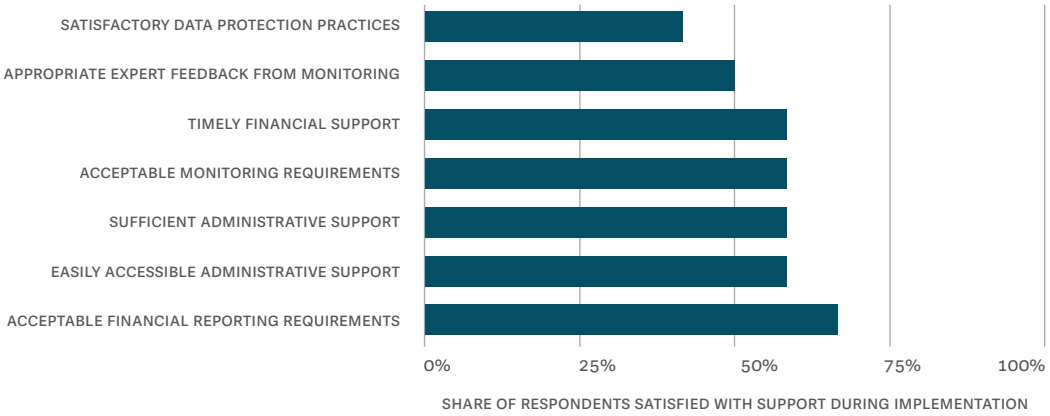
Figure 3.29 Respondents were satisfied with most aspects of the application process, except the time needed to complete the selection, information requirements in applications, and feedback provided in the process



Source: Beneficiary surveys. N=14. The level of satisfaction was measured on a scale of 1-5, where 1 is strongly disagree and 5 strongly agree. The figure shows the percentage of respondents who agreed or strongly agreed with the statements.

With respect to satisfaction with program contributions during implementation, about 70 percent of survey respondents were satisfied with the program's administrative and financial support. Also, most respondents, about 60 percent, agreed or strongly agreed that the financial support provided by the program was timely, monitoring requirements acceptable, and the administrative support sufficient and easily accessible (Figure 3.30). However, only 42 percent of respondents agreed or strongly agreed that data protection practices were satisfactory.

Figure 3.30 Respondents were largely satisfied with most aspects of implementation support

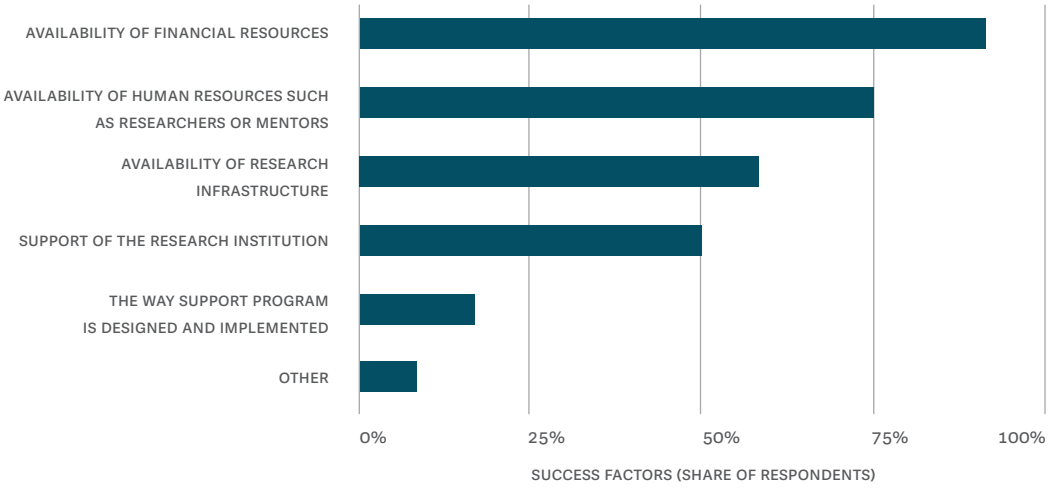


Source: Beneficiary surveys. N=12. The level of satisfaction was measured on a scale of 1-5, where 1 is strongly disagree and 5 strongly agree. The figure shows the percentage of respondents who agreed or strongly agreed with the statements.

Among the factors that contributed to the achievement of results, the availability of financial resources was the most prominent. It was followed by the availability of human resources, highlighted by 74 percent of respondents, and the availability of research infrastructure, cited by 58 percent (Figure 3.31).

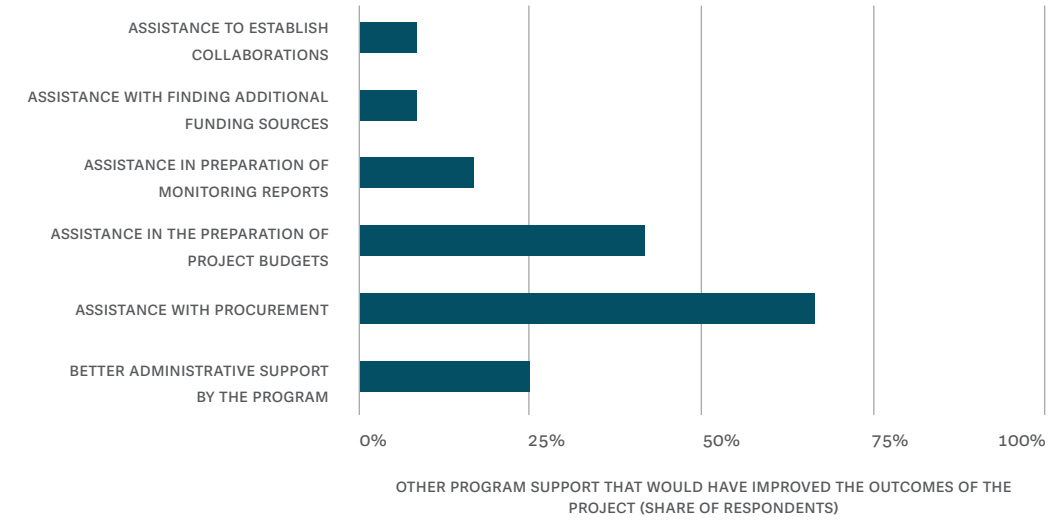
Beneficiaries need assistance with procurement and project preparation. Respondents reported areas of program support that were not available during implementation but would have improved the outcomes of their projects. Among these, the areas that stand out are assistance with procurement, which 67 percent of respondents could have used, and assistance in the preparation of project budgets, which 42 percent could have used (Figure 3.32). This supports the findings of the Functional and Governance Analysis, which found that procurement rules impose a high burden on beneficiaries of ESIF support programs (World Bank 2020b). Also, 92 percent of the respondents would prefer to get support and services in the future through both provision of technical experts by the leading institution and making eligible activities more flexible to allow for hiring experts for program support.

Figure 3.31 Financial and human resources were the most common project success factors



Source: Beneficiary surveys. N=12. Multiple selection question. Other includes "The project has been ongoing since 2019."

Figure 3.32 More assistance with procurement and preparation of project budget would have improved the outcome of projects

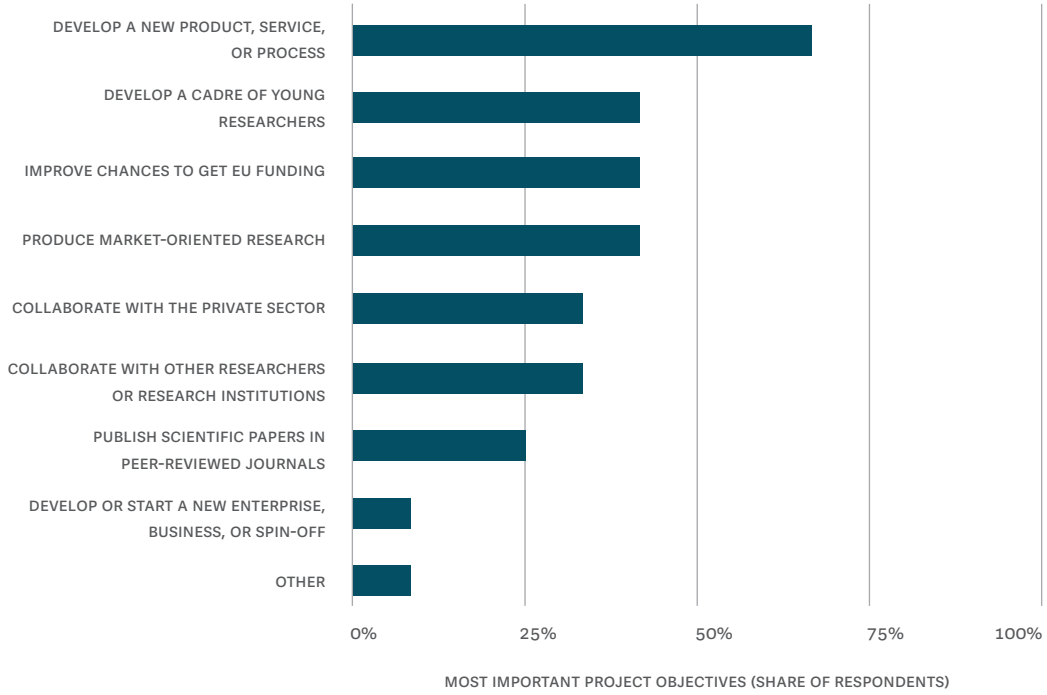


Source: Beneficiary surveys. N=12. Multiple selection question.

Overall project quality

There are some significant discrepancies in terms of the alignment of self-reported project objectives with the program's objectives. About 67 percent of respondents' projects aimed to develop a new product, service or process, which was one of the main activities funded by the program (Figure 3.33). The production of market-oriented research was one of their most important objectives for 42 percent of respondents, and 42 percent also had improving chances to get EU funding as one of their most important objectives. Only about a third of respondents aimed to collaborate with research institutions and with the private sector, and about a quarter aimed to publish papers in peer-reviewed journals. The first two editions of the program put a lot of emphasis on technology transfer and raising the capacity to launch university start-ups and spin offs, but only 8 percent of respondents' projects had the development of a new enterprise or spin-off as a main goal. The program also aimed to support the pursuit of intellectual property, but this was not a main objective of any of the respondents' projects. No respondents had as a main objective the presentation of scientific publications in seminars and conferences, even though the program encouraged knowledge diffusion and networking activities, especially in the second call.

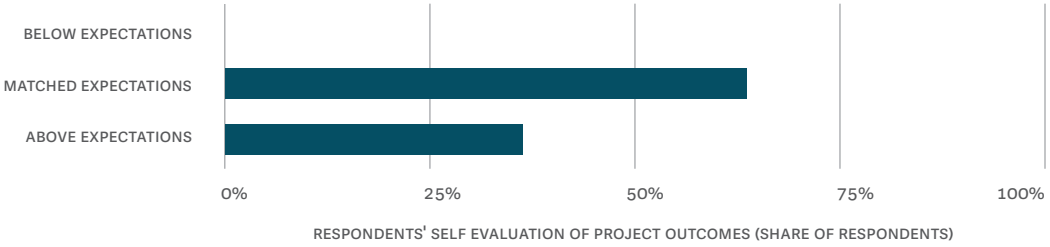
Figure 3.33 Developing a new product or service was the most important objective for the majority of respondents



Source: Beneficiary surveys. N=12. Multiple selection question.
Other includes "Strengthening the research and technical capacity of higher education institutions."

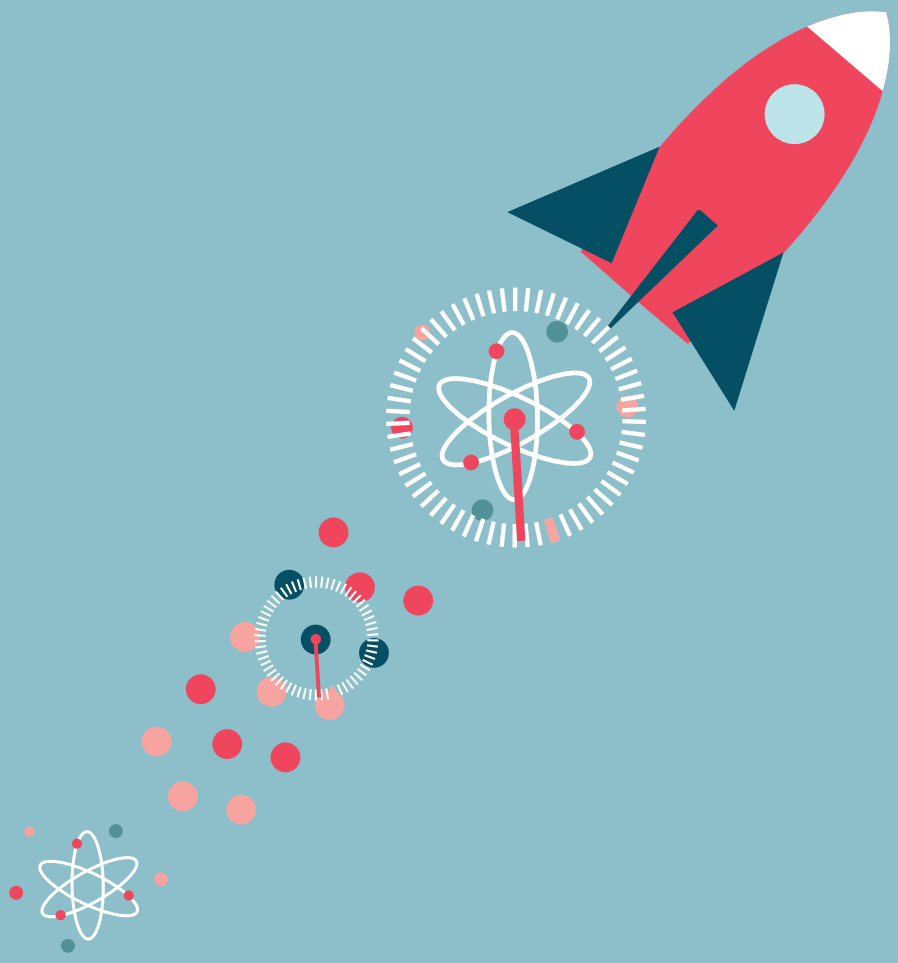
Overall, respondents provided positive assessments of their projects' outcomes based on their own expectations. For the majority of them, 64 percent, the outcome obtained matched their expectation, while for 36 percent, the outcome was above their expectation (Figure 3.34).

Figure 3.34 Respondents rated the outcome of their project positively



Source: Beneficiary surveys. N=11.

4 Strengthening Capacities for Research, Development and Innovation



Strengthening Capacities for Research, Development and Innovation

The program Strengthening Capacities for Research, Development and Innovation supports collaborative RDI projects of research organizations with the business sector. The program is part of the MSE portfolio and provides grant support to collaborative applied research activities of research organizations, implemented in partnership with enterprises. The first edition of the STRIP program was designed under OPRC 2007–2013 and launched in January 2014. A total of 19 projects received grants and were implemented between 2014 and 2016. The second and most recent edition of the program was launched in May 2018 under OPCC 2014–2020, with an allocation of HRK 181 million. The following analysis refers to the first edition of the STRIP program.

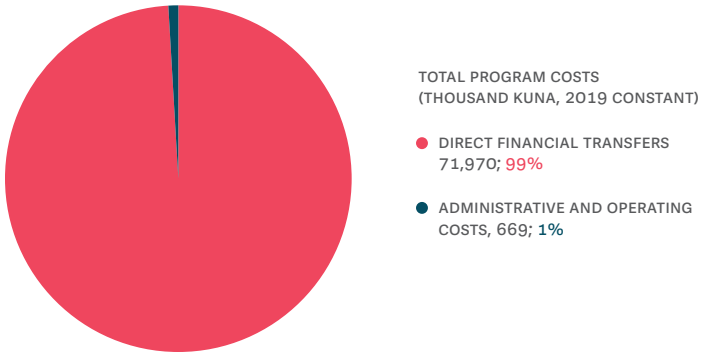
The survey response rate for STRIP was 61 percent, calculated as those that completed over 50 percent of the survey. Beneficiaries that responded to the survey received 58 percent of the funding disbursed. On average, respondents received a lower grant (HRK 3.3 million) compared to all STRIP beneficiaries (HRK 3.8 million). The survey cooperation rate was 67 percent, meaning that 12 of the 18 beneficiaries who received the survey opened it. One beneficiary participated in the pilot and did not receive the final survey. It is important to note that, due to the small number of beneficiaries, even with a high response rate, the survey results presented for this program should be interpreted with caution, as indications rather than robust representatives of the entire population of beneficiaries.

4.1 Efficiency in the use of inputs

Costs covered by the program

Direct financial transfers to beneficiaries reached almost HRK 72 million, 99 percent of the total program costs. In contrast, administrative and operating costs accounted for only 1 percent in the period 2013–2016 (Figure 4.1). Under this program, there were neither indirect financial transfers (such as tax deductions or discounts), nor non-financial transfers to beneficiaries such as facilities or equipment lent.

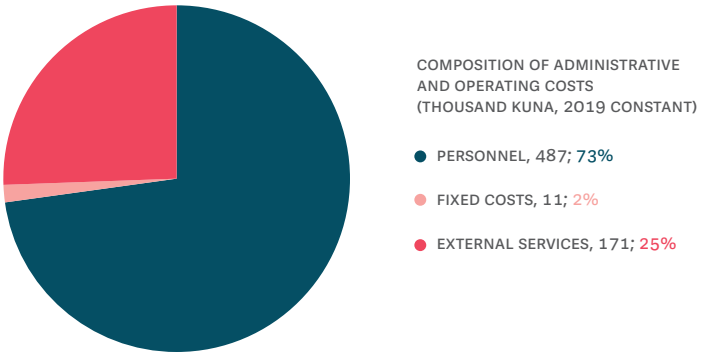
Figure 4.1 Program costs predominantly consist of direct financial transfers



Source: MSE data and staff calculations.

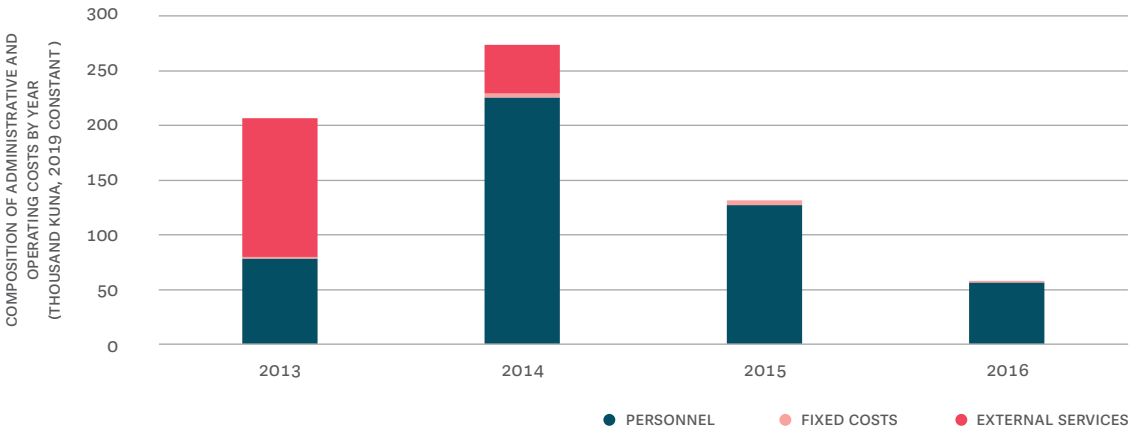
Administrative and operating costs were mostly driven by personnel salaries. Personnel costs accounted for 73 percent of administrative and operating costs. In contrast, fixed costs accounted for 2 percent of the total administrative and operating costs. Expenses for external services, which include experts for calls and dissemination and experts for the evaluation of proposals, accounted for 25 percent of total administrative and operating costs (Figure 4.2). Personnel costs were highest in 2014, but external services were highest the year before (Figure 4.3).

Figure 4.2 Personnel costs and external services make up the majority of administrative and operating costs



Source: MSE data and staff calculations.

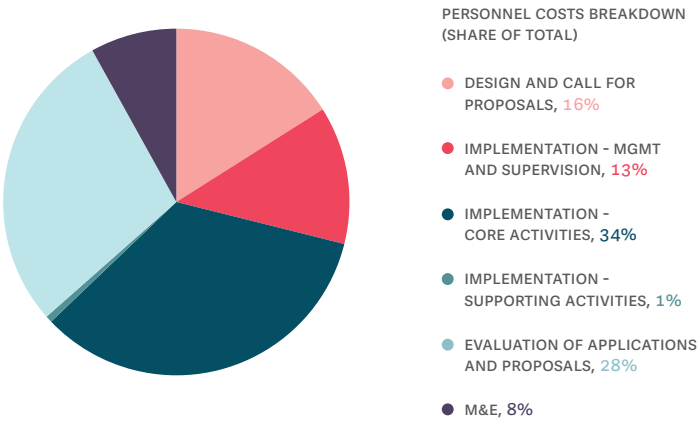
Figure 4.3 Administrative and operating costs peaked in the second year of the program



Source: MSE data and staff calculations.

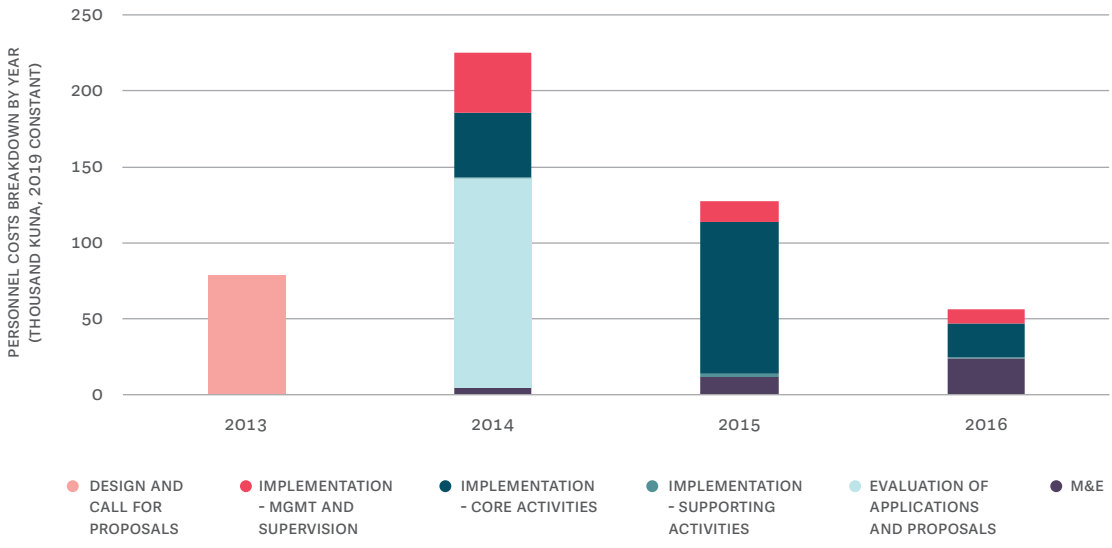
Approximately HRK 487,000 was spent on personnel, mainly driven by costs related to the implementation of core activities and the evaluation of applications and proposals. Expenses on staff for the implementation of core activities represented 34 percent of personnel costs in the 2013–2016 period, and staff for the evaluation of applications and proposals accounted for 28 percent (Figure 4.4). Personnel costs for implementation were the highest in 2015, one year after the grants were provided, while the cost of staff for evaluation of applications was highest in 2014. Monitoring and evaluation personnel costs were the highest in 2016, as expected, since it was the last year of the program (Figure 4.5).

Figure 4.4 Implementation-related activities dominate in the composition of personnel costs



Source: MSE data and staff calculations.

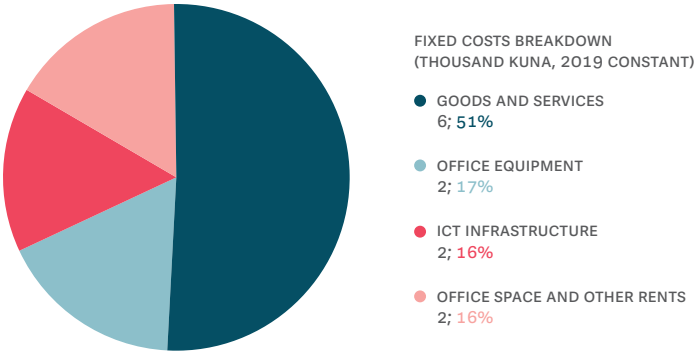
Figure 4.5 The increase in personnel costs in the second year of the program was driven by evaluation of applications



Source: MSE data and staff calculations.

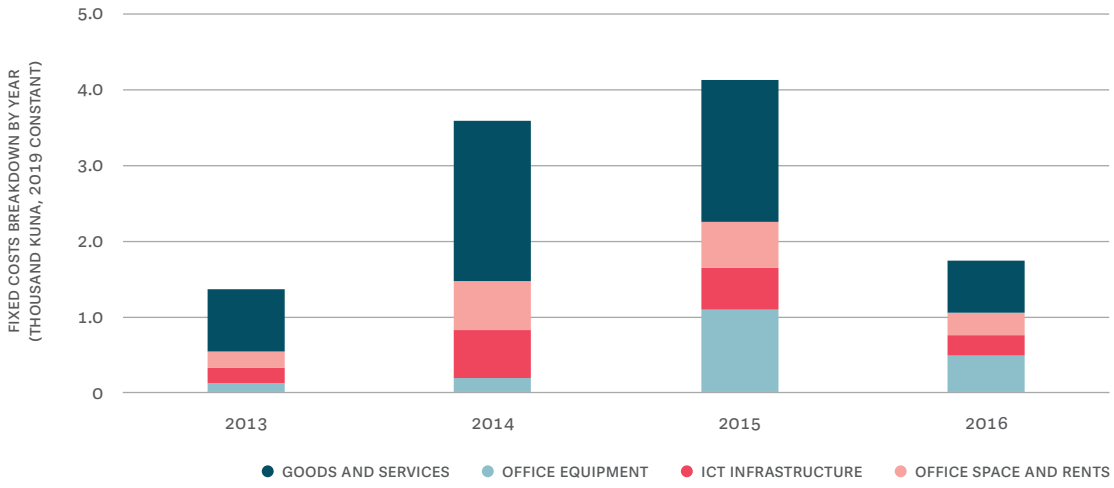
Fixed costs were the lowest expense category, totaling about HRK 11,000, which represented only 2 percent of the administrative and operating costs of the program. About half of the fixed costs were spent on goods and services, which included energy, telephone, post and transport services, and utilities (Figure 4.6). The first year of the program saw the lowest fixed costs, while 2014 and 2015, the years when the grants were disbursed, had the highest fixed costs, mainly driven by expenses in goods and services (Figure 4.7). The data on fixed costs for this program were available for the whole institution only. Therefore, the ratio of STRIP personnel to institution personnel was applied as a weight to estimate STRIP fixed costs.

Figure 4.6 Goods and services constitute around half of the fixed costs



Source: MSE data and staff calculations.

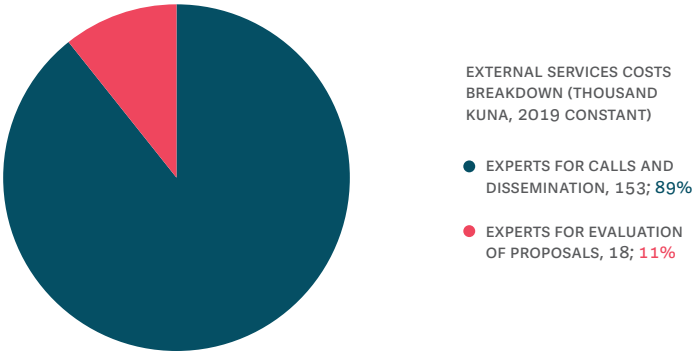
Figure 4.7 Fixed costs increased in the years when the grants were disbursed



Source: MSE data and staff calculations.

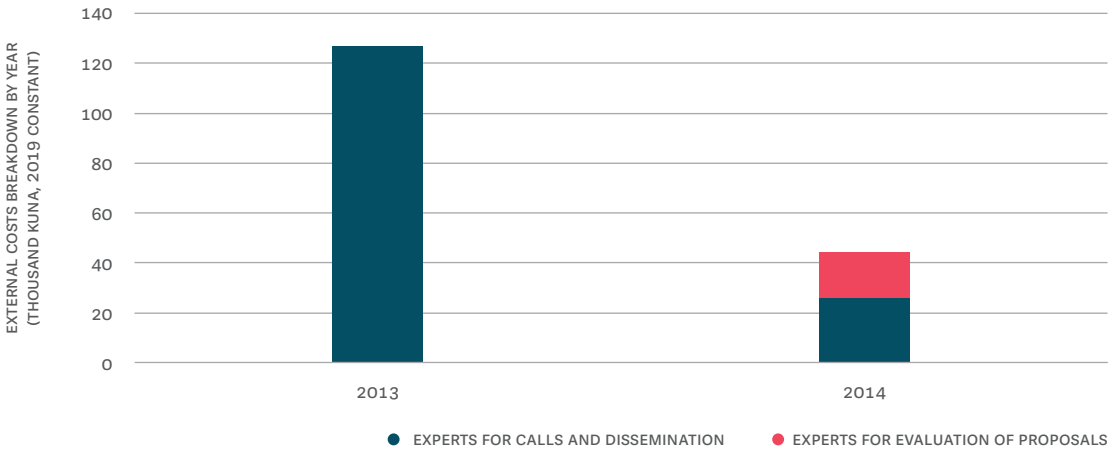
External services expenses amounted to HRK 171,000, the second largest category of program expenses after personnel. External services include experts for calls and dissemination as well as experts for the evaluation of proposals (Figure 4.8) that were engaged at the beginning of the program in 2013 and 2014 (Figure 4.9). In the preparation of the call, the program hired experts for procurement and state aid for R&D.

Figure 4.8 External services include experts related to the preparation of the call and evaluation of proposals.



Source: MSE data and staff calculations.

Figure 4.9 External costs occurred at the beginning of the program



Source: MSE data and staff calculations.

On average, the program spent about HRK 35,000 per project on administrative and operating costs. Of these, about HRK 9,000 per project was spent on personnel dedicated to core and support activities during implementation, and HRK 7,000 per project was spent on the evaluation of proposals. Expenses in other personnel categories were smaller. Also, the program spent HRK 9,000 per project on external services of experts for calls, dissemination, and evaluation of proposals (Table 4.1). The lowest expenditure category within administrative and operating costs was fixed costs, on which the program spent about HRK 1,000 per project.

Table 4.1 Administrative and operating costs per project in the STRIP program

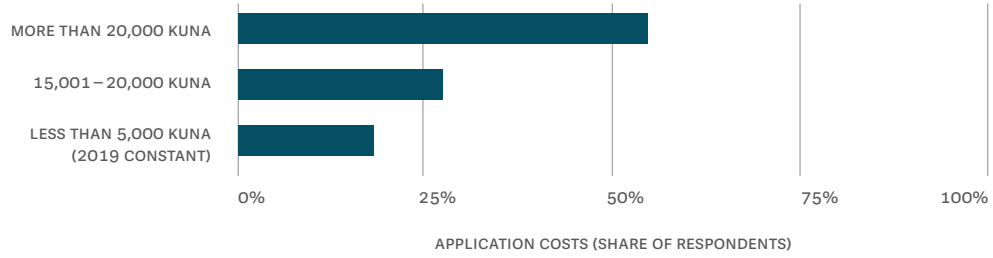
COST CATEGORY	TOTAL (CONSTANT 2019 - THOUSAND HRK)	AVERAGE PER PROJECT (CONSTANT 2019 - THOUSAND HRK)
Personnel – Design and call for proposals	78	4
Personnel – Implementation - mgmt. and supervision	63	3
Personnel – Implementation - core and support	168	9
Personnel – Evaluation of applications and proposals	139	7
Personnel – Monitoring and evaluation	39	2
Fixed costs (offices, materials, equipment)	11	1
External Services	171	9
Total administrative and operating costs	**669**	**35**

Source: MSE data.

Costs covered by beneficiaries

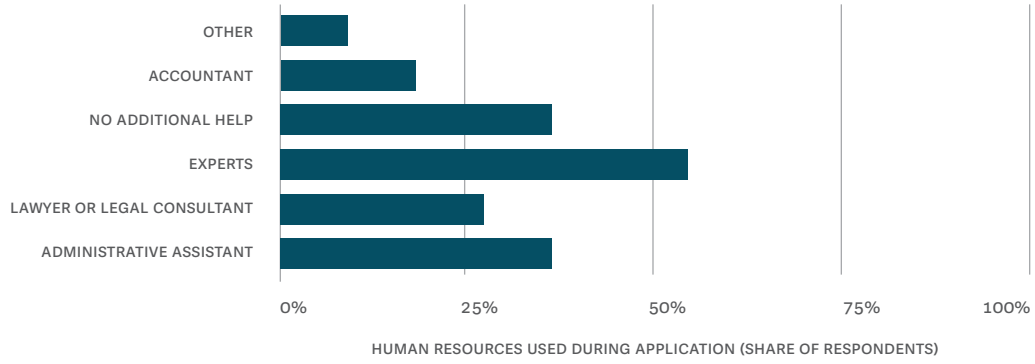
Most respondents had high application costs, and many required the help of experts, consultants, and assistants. The average application cost per project was HRK 31,022, with 55 percent of respondents reporting application costs of over HRK 20,000 (Figure 4.10). In contrast, about a quarter of the respondents spent between HRK 15,000 and HRK 20,000 preparing their applications, and 18 percent spent less than HRK 5,000. This variation may be explained, at least partially, by the high percentage of respondents using additional help (Figure 4.11). For this program, 55 percent of respondents were assisted by experts and 36 percent by an administrative assistant. Only 36 percent of the beneficiaries completed the application without any help.

Figure 4.10 Many respondents had high application costs



Source: Beneficiary surveys. N=11.

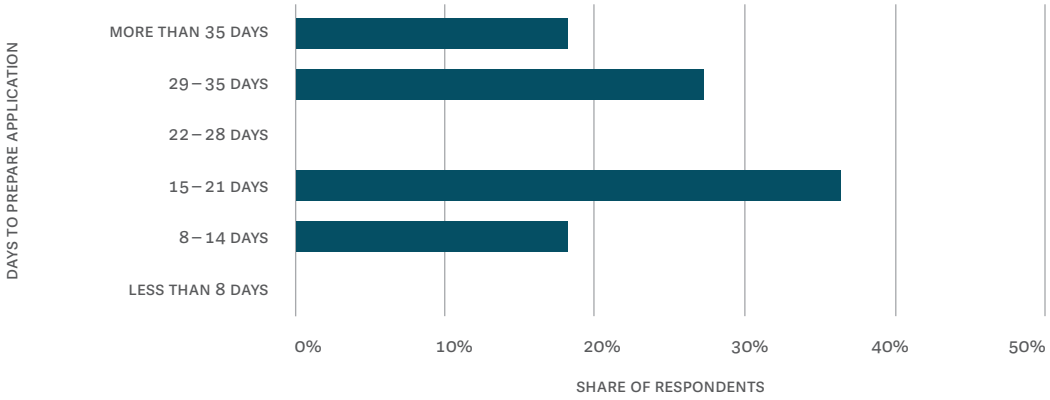
Figure 4.11 Respondents also required the help of experts, consultants, and assistants to prepare their applications



Source: Beneficiary surveys. Multiple selection question. N=11.

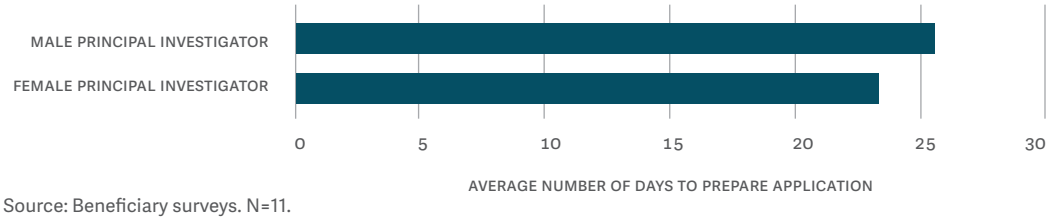
Beneficiaries also incurred costs in terms of the time it took them to apply for the program, which varied between respondents. For about half of respondents (54 percent), the application took less than three weeks (21 days of less), but for the other 45 percent, it took more than four weeks (29 days or more) (Figure 4.12). On average, it took projects with female principal investigators less time to prepare their applications (23 days) than those with male principal investigators (26 days), but this difference is not statistically significant (Figure 4.13). All respondents felt that the monetary and non-monetary costs of applying to the program were adequate when compared with the benefits.

Figure 4.12 For around half of the respondents, the preparation of the application took more than three weeks



Source: Beneficiary surveys. N=11.

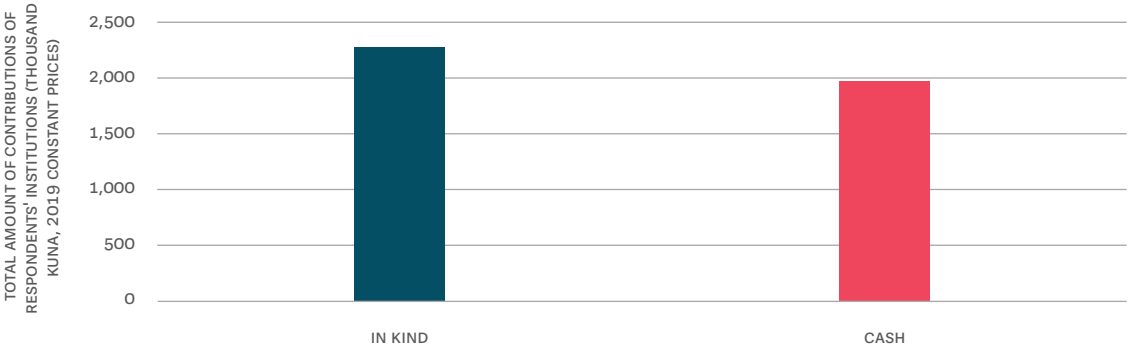
Figure 4.13 The difference in application preparation time between genders is not statistically significant



Source: Beneficiary surveys. N=11.

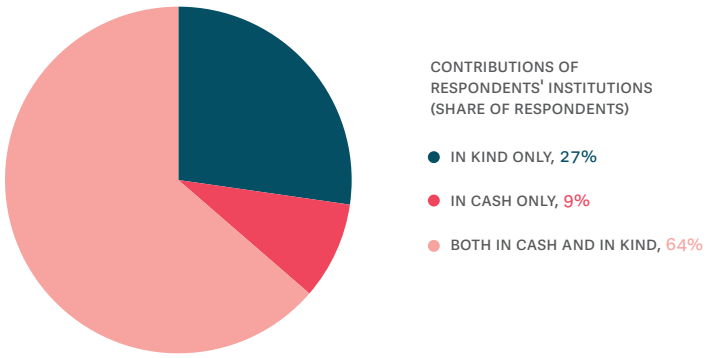
Respondents' home institutions made slightly higher in-kind contributions than cash contributions. The contributions were valued by respondents at approximately HRK 2.3 million for in-kind and HRK 2 million in cash (Figure 4.14). This puts the average in-kind contribution per project at about HRK 228,000 compared to an average cash contribution per project of almost HRK 247,000. The majority of beneficiaries (64 percent) received both in-kind and cash contributions, while 27 percent received in-kind only, and 9 percent cash only (Figure 4.15).

Figure 4.14 Respondents estimated in-kind contributions to be slightly higher than cash contributions



Source: Beneficiary surveys. N=11.

Figure 4.15 Most respondents received a combination of cash and in-kind contributions



Source: Beneficiary surveys. N=11.

On average, for every HRK contributed by beneficiaries (including application costs and contributions from institutions), the program contributed HRK 8. On average, each beneficiary covered costs in the amount of HRK 505,272 in application expenses and contributions made by their institutions.

4.2 Efficiency in the generation of outputs

Investments in beneficiaries

The program transferred to beneficiaries 108 times more funding than what was spent in administrative and operating costs. The program transferred, on average, HRK 3.8 million per project directly to beneficiaries (Table 4.2). All transfers to beneficiaries were direct financial transfers in the form of grants. This program did not provide indirect financial transfers, such as taxes or discounts, or non-financial transfers to beneficiaries. Given that the program transferred HRK 72 million and spent HRK 669,000 in administrative and operating costs, on average, beneficiaries received HRK 108 per HRK spent by the program in administrative and operating costs.

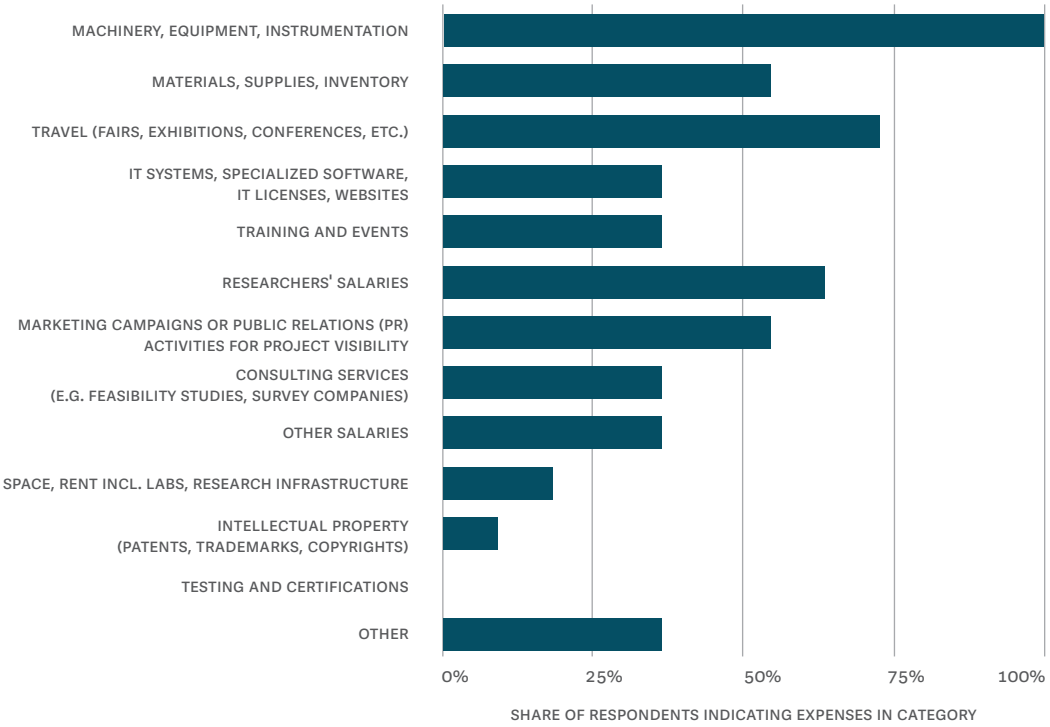
Table 4.2 Program expenditures per project in the STRIP program

EXPENDITURE TYPE	TOTAL (CONSTANT 2019 - THOUSAND HRK)	AVERAGE PER PROJECT (CONSTANT 2019 - THOUSAND HRK)
Total transfers to beneficiaries	71,970	3,788
Administrative and operating costs	669	35
Total program cost	**72,639**	**3,823**

Source: MSE data and staff calculations.

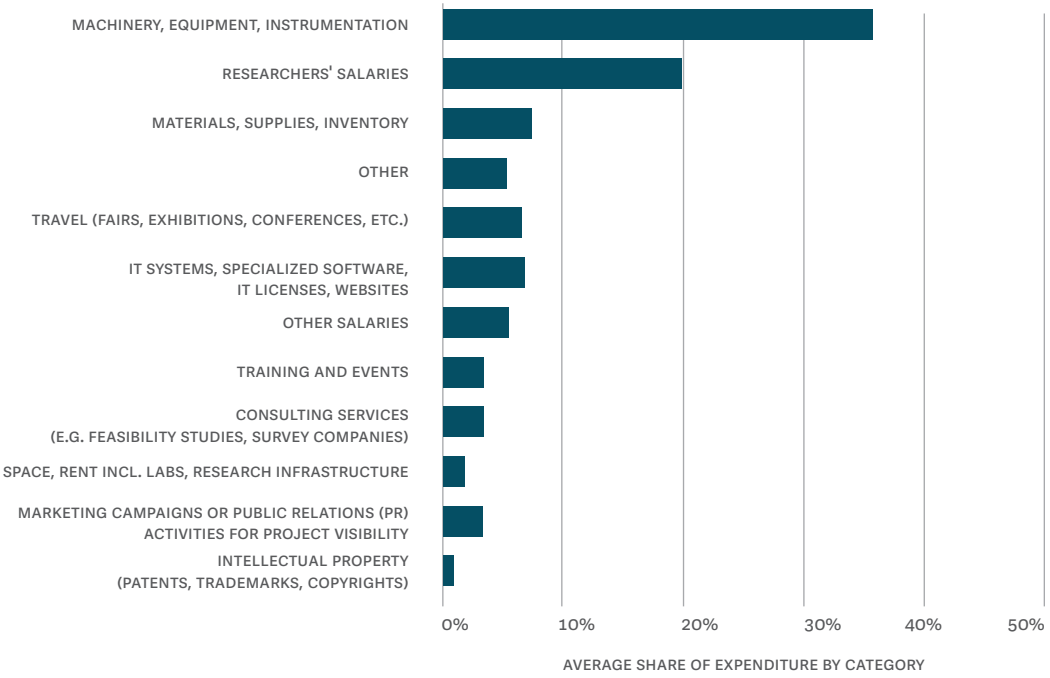
All respondents used funding to acquire machinery and equipment, which was also the largest cost category, while few of them invested in intellectual property protection activities. Only 9 percent of respondents used funds for intellectual property, including patents, trademarks, and copyrights (Figure 4.16). None of the respondents used the funding for testing and certifications. On average, 36 percent of funding received went to machinery, equipment and instrumentation, followed by researchers' salaries, which, on average, accounted for 20 percent of the funding (Figure 4.17). The smallest cost categories were intellectual property and marketing campaigns or public relations activities for project visibility.

Figure 4.16 All respondents invested in equipment, very few invested in intellectual property, and none had testing and certification costs



Source: Beneficiary surveys. N=11. Multiple selection question. Other includes construction of parts, data, and project management and administration.

Figure 4.17 Respondents invested most of the funding into equipment and salaries

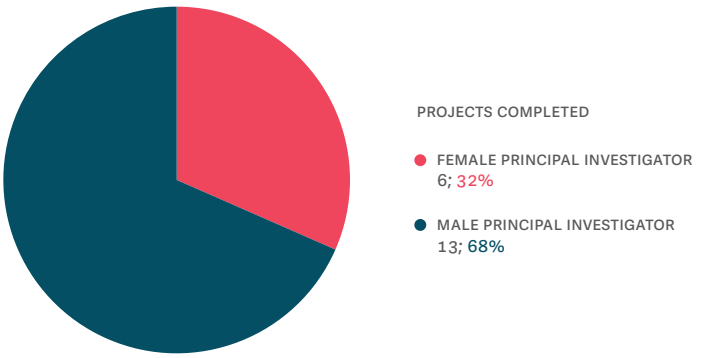


Source: Beneficiary surveys. N=11. Multiple selection question.

Outputs achieved

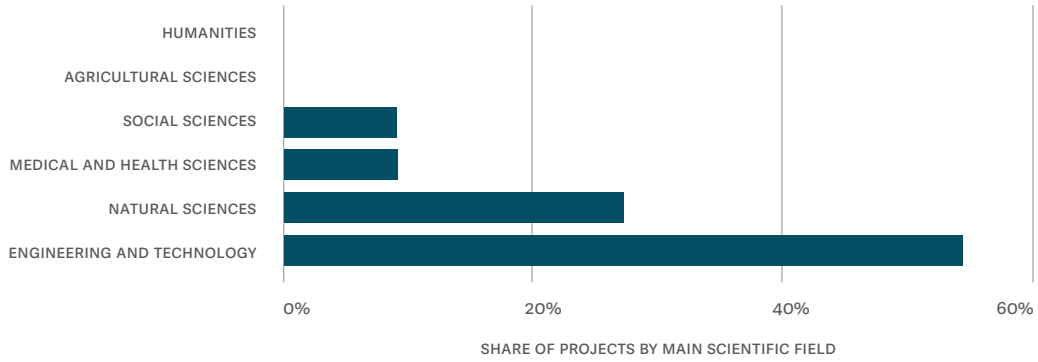
In total, the program supported 19 projects, mostly in engineering, technology, and natural sciences. The program disbursed HRK 97 million in financial transfers. All projects were completed in 2016. Around a third of projects were led by a female principal investigator (Figure 4.18), and projects led by a female principal investigator obtained 29 percent of the funding disbursed by the program. Engineering and technology was the main scientific field of over half of the survey respondents, followed by natural sciences (27 percent of respondents) (Figure 4.19).

Figure 4.18 Only one third of principal investigators in the program were women



Source: MSE data. N=19.

Figure 4.19 Most of the supported projects were in engineering, technology, and natural sciences

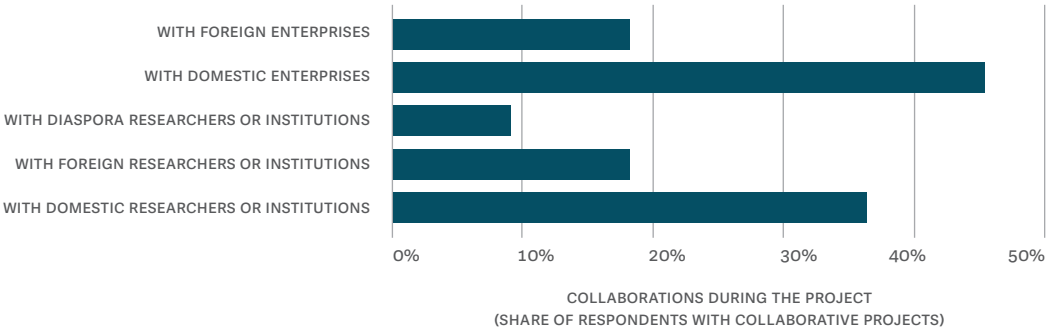


Source: Beneficiary surveys. N=11.

On average, 19 outputs were achieved per project, corresponding to 2 outputs per HRK 1,000 of program costs. Three output types were tracked for this program: the number of collaborative projects during implementation; the number of seminars, workshops, and conferences; and the number of training activities. In total, 11 respondents achieved 205 outputs.

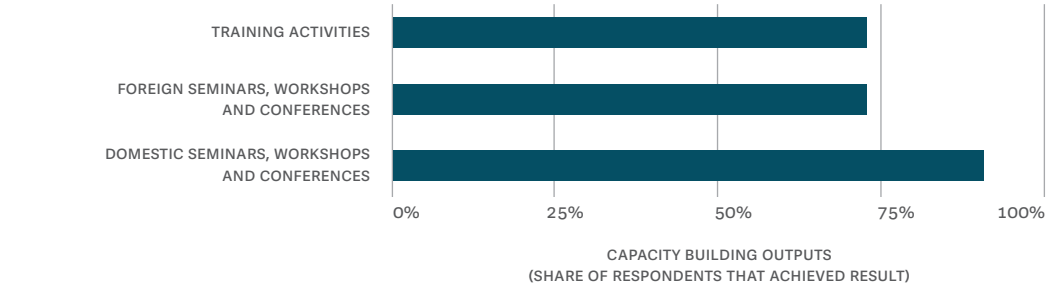
Domestic collaborative projects, either with enterprises or research institutions, were the prevalent type of collaboration. Forty-five percent of respondents undertook collaborative projects[16] with domestic enterprises and 36 percent with domestic researchers or research institutions (Figure 4.20). These were the most pursued types of collaboration. There were a total of 14 collaborative projects during the program. Respondents also collaborated with foreign researchers (18 percent), diaspora researchers (9 percent), and foreign enterprises (18 percent).

Figure 4.20 Domestic collaborations were prevalent among respondents with collaborative projects



Source: Beneficiary surveys. N=11.

Figure 4.21 Most respondents achieved capacity building outputs



Source: Beneficiary surveys. N=11.

Respondents also achieved capacity building outputs, namely, training activities and domestic and foreign seminars, workshops or conferences. Seventy-three percent of survey respondents attended a total of 40 training activities (Figure 4.21). Also, 73 and 91 percent of respondents attended foreign and domestic seminars, workshops, and conferences, respectively. They attended a total of 81 foreign and 70 domestic seminars, workshops, and conferences.

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16 For STRIP, collaborations were mandatory. Therefore, collaborations pursued during project implementation are considered intended outputs of the project.

4.3 Efficiency in the generation of outcomes

Respondents achieved a total of 271 outcomes (including both intended and other results) which represents 25 outcomes achieved per project, on average. Intended outcomes include collaborative projects after project completion, scientific publications in peer-reviewed journals, intellectual property (patent applications, patents granted, industrial designs, and copyrights), technology transfer outcomes such as spin-offs, new products, processes, and services, and new software and technology development. Other outcomes include doctoral or master's titles or theses, market-oriented research, and prototypes.

Intended outcomes achieved

All intended outcomes had achievements, with all respondents publishing scientific work and most pursuing collaborative projects and developing new technologies. Beneficiaries achieved a set of outcomes intended by the program, which included collaborative projects achieved after implementation, scientific publications, patent applications, patents granted, transfer agreements, new enterprises, new or upgraded products, new software, and new technologies developed (Table 4.3). The most frequent achievements include scientific publications in peer-reviewed journals, collaborative projects with researchers, and new technology development, achieved by over 70 percent of respondents, though only about half achieved collaborative projects with industry after project completion. Over 30 percent of respondents achieved results in terms of new or upgraded products, processes, or services. However, achievements of patents granted and transfer agreements were modest.

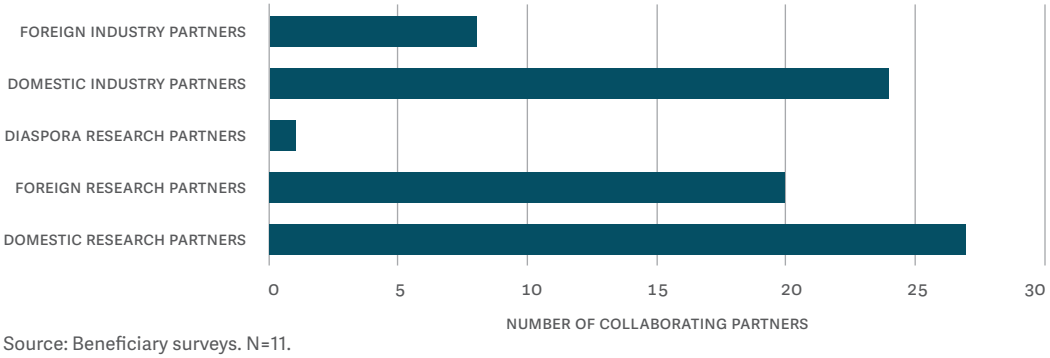
Table 4.3 Scientific publications in peer-reviewed journals, collaborative projects with researchers, and new technology development were the most frequent achievements

INTENDED OUTCOME	SHARE OF RESPONDENTS THAT ACHIEVED RESULT	NUMBER OF RESPONDENTS THAT ACHIEVED RESULT	TOTAL NUMBER OF RESULTS REPORTED
Collaborative projects with domestic researchers or research institutions after the project	73%	8	22
Collaborative projects with foreign researchers or research institutions after the project	54%	6	13
Collaborative projects with diaspora researchers or research institutions after the project	9%	1	1
Collaborative projects with domestic enterprises after the project	55%	6	13
Collaborative projects with foreign enterprises after the project	45%	5	9
Scientific publications in peer-reviewed journals	100%	11	126
Patent applications	36%	4	6
Patents granted	9%	1	2
Industrial designs	0%	0	0
Copyrights	0%	0	0
Transfer agreements	9%	1	1
New enterprise, business or spin-off	18%	2	2
New products, processes, or services	45%	5	7
Upgraded products, processes, or services	36%	4	9
New design for a product, process, or service	9%	1	2
New software development	27%	3	6
New technology development	73%	8	13

Source: Beneficiary surveys. N=11.

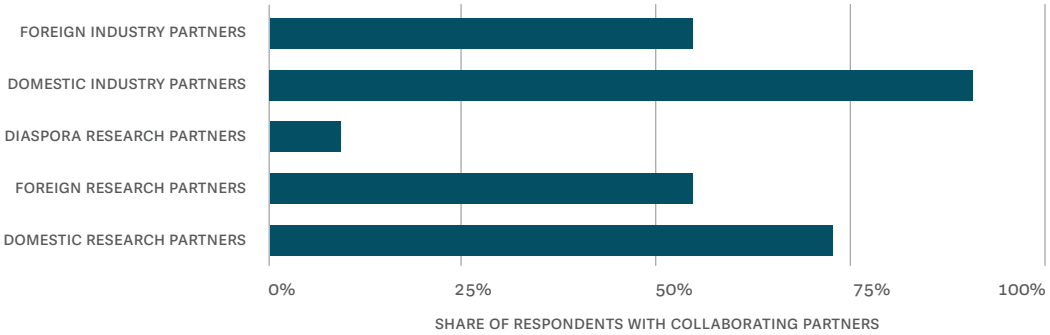
Beneficiaries collaborated extensively with both research and industry partners, usually to pursue joint R&D projects and publications. Overall, respondents collaborated with more partners from the research sector (48 partners) than from industry (32 partners) (Figure 4.22). However, the majority of respondents collaborated with domestic industry partners (91 percent) and foreign industry partners (55 percent). A slightly smaller share of respondents (73 percent) collaborated with domestic research partners and foreign research partners (55 percent) (Figure 4.23). The discrepancy in the number of partners compared to the number of collaborative projects may be due to the fact that not all partners are necessarily part of collaborative projects. Like in the SIIF program, the most common purposes for collaboration were joint R&D projects (pursued by 91 percent of respondents) and co-authoring scientific publications (55 percent). Only 9 percent of respondents collaborated for the purpose of selling a product or for licensing or patent registration (Figure 4.24).

Figure 4.22 Respondents collaborated with more partners from the research sector than from industry



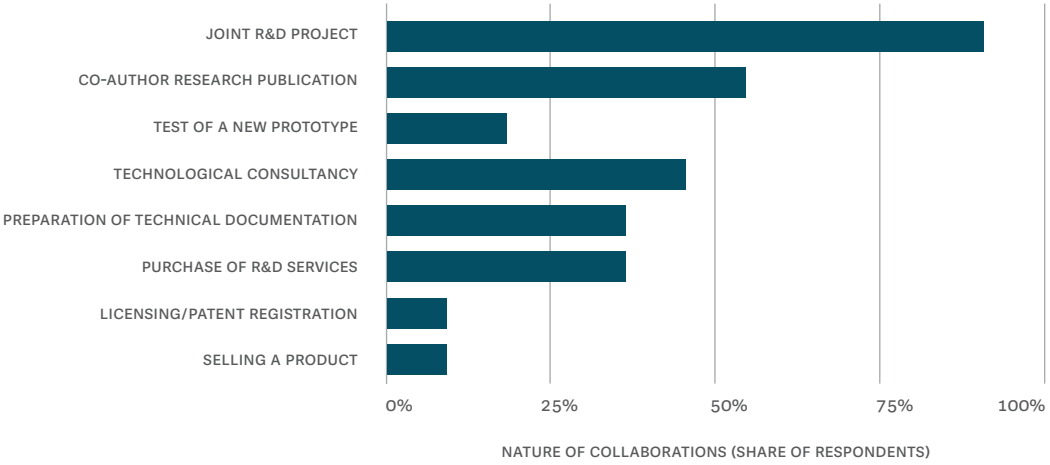
Source: Beneficiary surveys. N=11.

Figure 4.23 Most respondents had a domestic industry partner



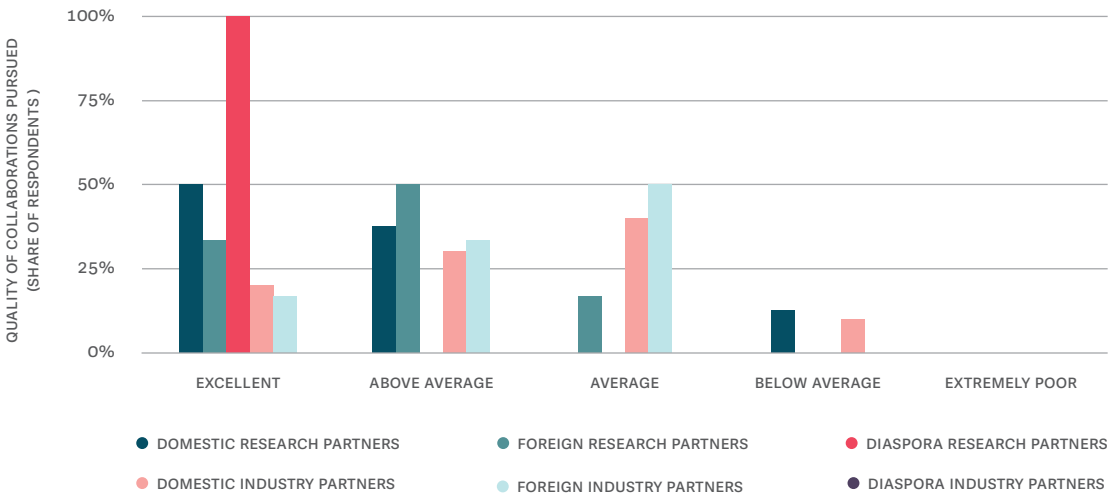
Source: Beneficiary surveys. N=11.

Figure 4.24 Most collaborations went towards a joint R&D project



Source: Beneficiary surveys. N=11.

Figure 4.25 Respondents were more satisfied with collaboration with researchers than with industry partners



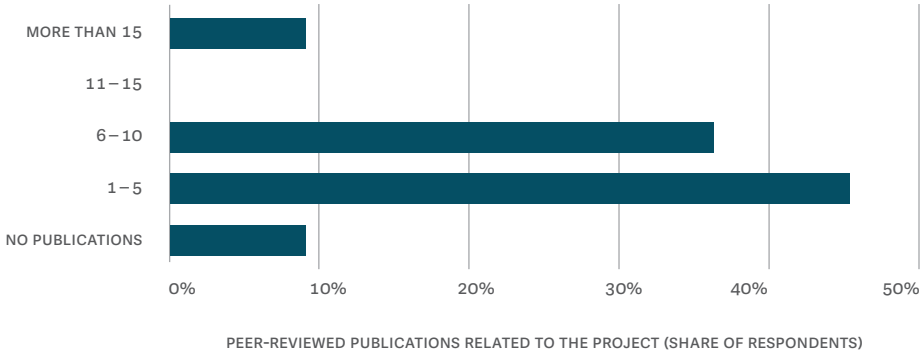
Source: Beneficiary surveys. N=11.

Respondents were more satisfied with the collaboration with researchers than with industry partners. Over 80 percent of respondents rated foreign and domestic research collaborations as excellent or above average, and one respondent who pursued a collaboration with diaspora researchers rated it as excellent. On the other hand, half of respondents evaluated collaborations with foreign industry partners as average, and only 17 percent rated them as excellent (Figure 4.25).

Survey respondents published 126 papers in peer-reviewed journals resulting from the projects, of which 21 percent were published during the project. Most respondents

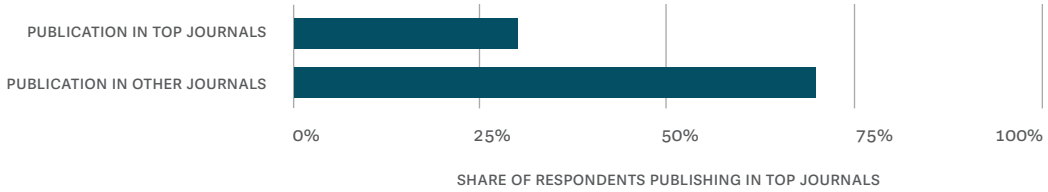
achieved between 1 and 10 publications related to the project: 45 percent of respondents published between 1 and 5 papers and 36 percent between 6 and 10 (Figure 4.26). Only one respondent published more than 15 scientific papers related to the project. The quality of publications appears to be somewhat lower for this program than for SIIF. 30 percent of respondents had a publication in top journals (Figure 4.27). When asked to list the names of the most important publications resulting from the project, respondents listed 40 publications, out of which only 10 percent were published in top journals. This is a somewhat expected result given that the focus on the program was more on applied research and collaboration with industry than on research excellence.

Figure 4.26 Most respondents completed up to ten peer- reviewed publications



Source: Beneficiary surveys. N=11.

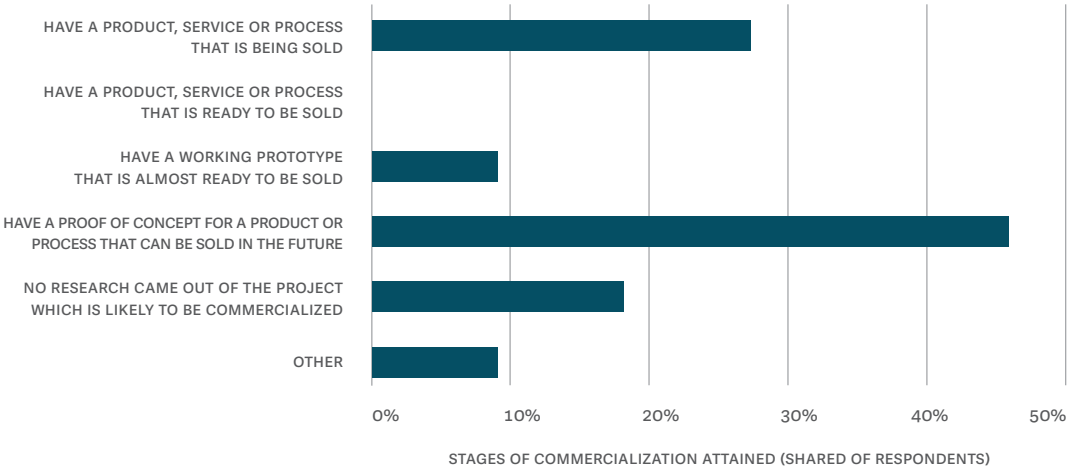
Figure 4.27 Almost a third of respondents had a publication in a top journal



Source: Beneficiary surveys. N=10.

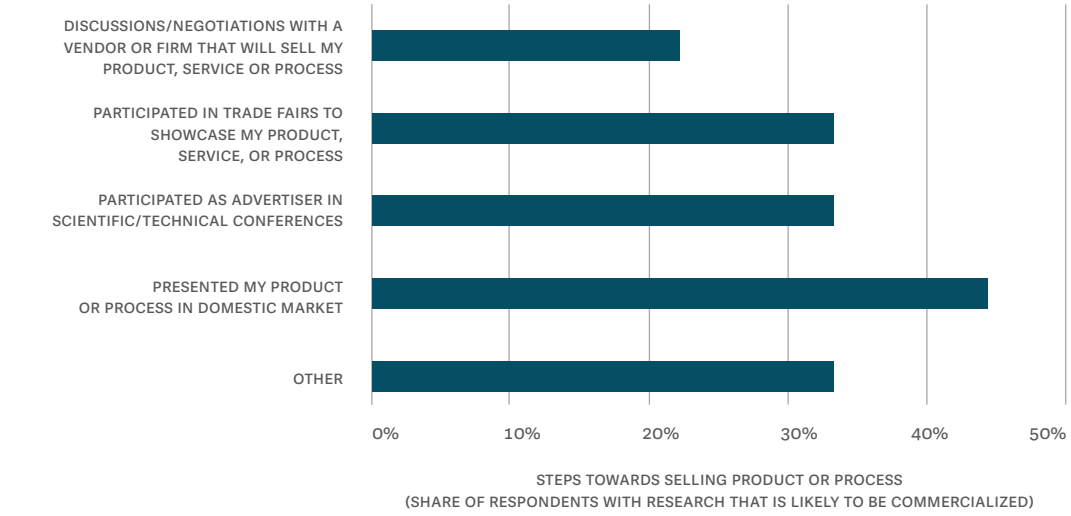
Respondents had important achievements regarding new or upgraded products related to the project. In particular, 45 percent of respondents developed 7 new products, processes, or services, 36 percent developed a total of 9 upgraded products, processes or services, and 73 percent developed a total of 13 new technology developments (Table 4.3). When asked about the stages of commercialization attained, results were promising with 45 percent of respondents having a proof of concept for a product or process that can be sold in the future and 27 percent having a product, service, or process that was being sold at the moment of the survey (Figure 4.28). Of those with research that is likely to be commercialized, 44 percent presented their product or process in the domestic market, while one third participated in trade fairs or as advertisers in scientific or technical conferences (Figure 4.29).

Figure 4.28 Close to half of the respondents have developed a proof of concept, and some already have a product or service on the market



Source: Beneficiary surveys. Multiple selection question. N=11. Other includes have a product that isn't tested.

Figure 4.29 Respondents with research that is likely to be commercialized presented their product or process in the domestic market, in trade fairs, conferences, etc.



Source: Beneficiary surveys. Multiple selection question. N=9. Other includes domestic industrial partner takes care of product promotion; looking for funds and ways to do the experimental phase for product testing.

Results in terms of transfer agreements, patents, and spin-off enterprises were more modest. Results related to patents granted were achieved by only one respondent, although 36 percent of respondents applied for six patents. Results on transfer agreements were achieved by only one respondent, and there were no results achieved in terms of copyrights or industrial designs (Table 4.3). Two survey respondents established two new enterprises, businesses, or spin-offs.

Other results

Survey respondents also achieved other results in terms of theses, market-oriented research, and prototypes. The most noticeable was the number of doctoral or master's titles or theses, which amounted to 19 and resulted from 91 percent of respondents (Table 4.4). Also, 45 percent of respondents were involved in market-oriented research, while 27 percent created 6 prototypes.

Table 4.4 Most respondents achieved results in terms of doctoral or master's theses or titles

OTHER PROJECT RESULTS ACHIEVED DURING OR AFTER THE PROJECT	SHARE OF RESPONDENTS THAT ACHIEVED RESULT	NUMBER OF RESPONDENTS THAT ACHIEVED RESULT	TOTAL NUMBER OF RESULTS REPORTED
Doctoral or master's titles or theses	91%	10	19
Market-oriented research	45%	5	14
Prototype	27%	3	6

Source: Beneficiary surveys. N=11.

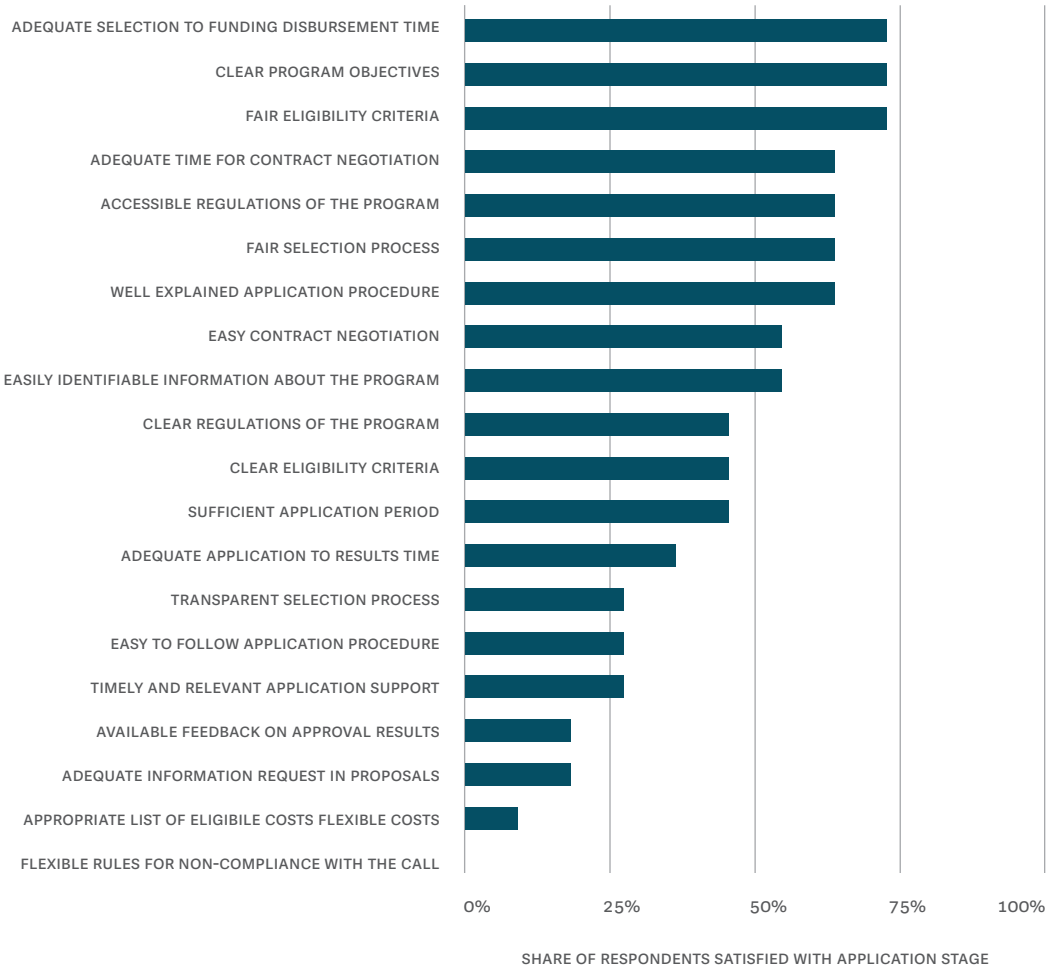
4.4 Perceived quality

Quality of program contributions

Survey respondents were most satisfied with the processing time between selection and funding disbursement, clarity of program objectives, and fairness of eligibility criteria. Although over 50 percent of survey respondents were satisfied with several areas of the application stage of the program, in contrast to SIIF, there are no areas for which over 75 percent of the respondents were satisfied. The three areas with the highest share of respondents satisfied, 73 percent, were the time between the selection and funding disbursement, the clarity of the program objectives, and the fairness of the eligibility criteria (Figure 4.30).

However, according to respondents, the transparency of selection, complexity of the application procedure, information requirements, application support, feedback, and flexibility, were less satisfactory. While two-thirds of respondents were satisfied with the fairness of the selection process, only 27 percent thought that it was sufficiently transparent. The application procedure was not easy to follow for a large portion of beneficiaries, and many were dissatisfied with the timeliness and relevance of application support. Only 18 percent of respondents were satisfied with the feedback on approval results and the adequacy of information requirements in the proposals. Other areas for improvement include the list of eligible costs, as only 9 percent found it appropriate, and the flexibility of the rules for non-compliance with the call, with which none of the respondents were satisfied.

Figure 4.30 Transparency of selection, complexity of the application procedure, information requirements, application support, feedback, and flexibility, were less satisfactory

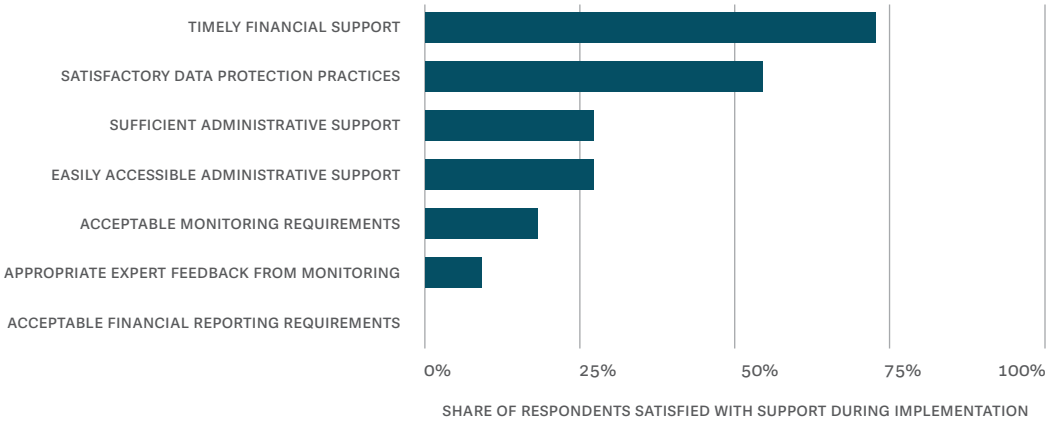


Source: Beneficiary surveys. N=11. Note: The level of satisfaction was measured on a scale of 1-5, where 1 is strongly disagree and 5 strongly agree. The figure shows the percentage of respondents who agreed or strongly agreed with the statements.

During implementation, respondents were most satisfied with the timeliness of the financial support but were dissatisfied with financial reporting requirements and expert feedback during monitoring. Most respondents found the financial support timely (73 percent) and were satisfied with the data protection practices (55 percent) (Figure 4.31). However, no one found the financial reporting requirements acceptable, and only one respondent was satisfied with expert feedback from monitoring. Only 27 percent of respondents were satisfied with the administrative support provided by the program.

The amount of funding and time were sufficient for most respondents to achieve their project objectives. Over 80 percent of survey respondents received the funding for their project according to the terms of the contract signed. The financial support received from the program was sufficient to successfully complete the project objectives of 73 percent of respondents. Similarly, 73 percent had enough time to complete their projects within the time allowed by the program. Among the most important reasons why some found the time allowed by the program for implementation insufficient was that they could not reduce other activities within their institutions.

Figure 4.31 Respondents were satisfied with the timeliness of the financial support but were dissatisfied with financial reporting requirements and expert feedback during monitoring

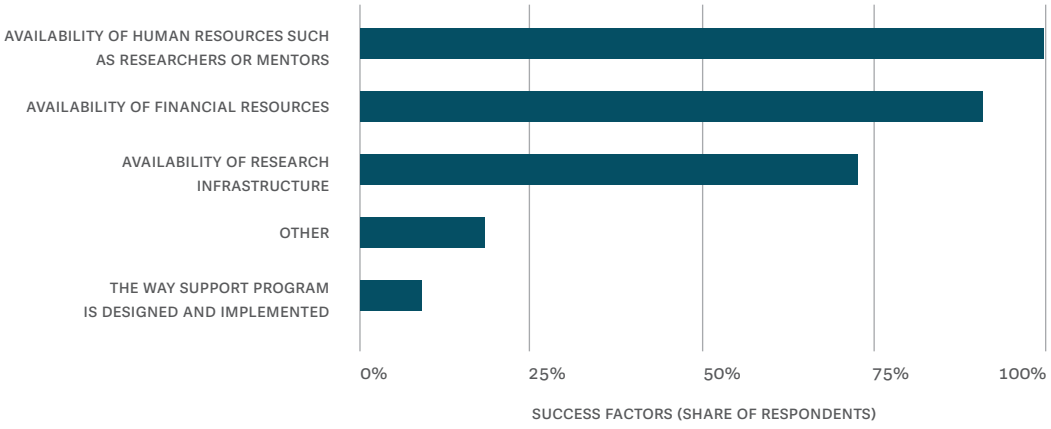


Source: Beneficiary surveys. N=11. Note: The level of satisfaction was measured on a scale of 1-5, where 1 is strongly disagree and 5 strongly agree. The figure shows the percentage of respondents who agreed or strongly agreed with the statements.

All respondents highlighted the availability of human resources as one the most important factors that contributed to the achievement of results. Also, the availability of financial resources and research infrastructure were success factors for a large share of respondents. In contrast, only nine percent of respondents considered the way the program is designed and implemented to be a success factor (Figure 4.32).

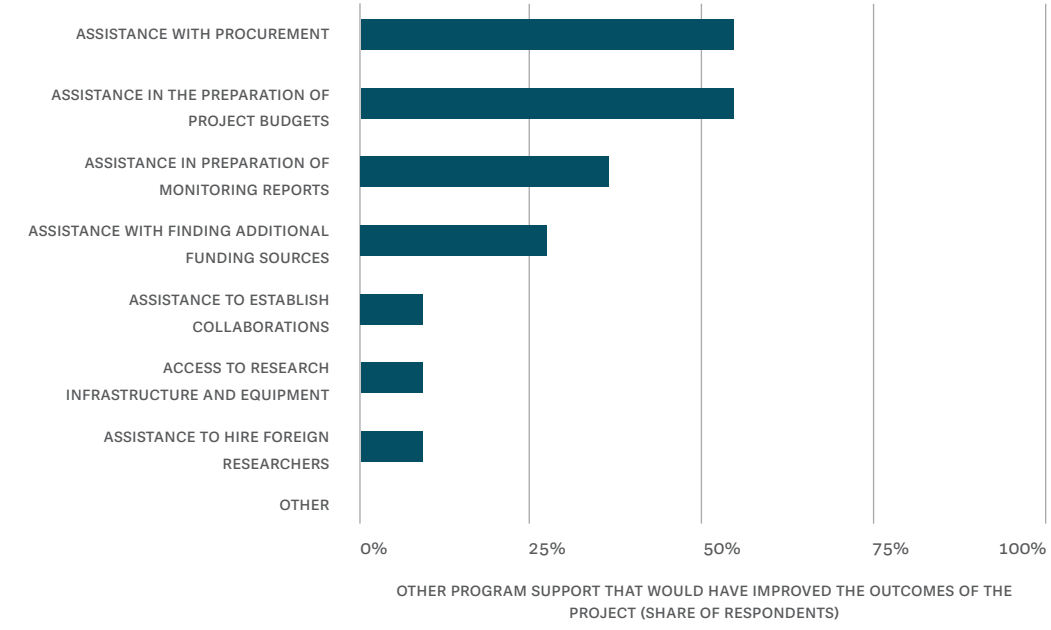
Some program support or services would have improved the project outcomes. Better administrative support could have improved the outcomes of 80 percent of respondents' projects. Assistance in the preparation of project budgets and with procurement could have helped 55 percent of respondents improve their projects' outcomes (Figure 4.33).

Figure 4.32 Human and financial resources were among the most important factors for project success



Source: Beneficiary surveys. Multiple selection question. N=11.

Figure 4.33 Administrative support would have improved the outcomes of the project according to survey respondents

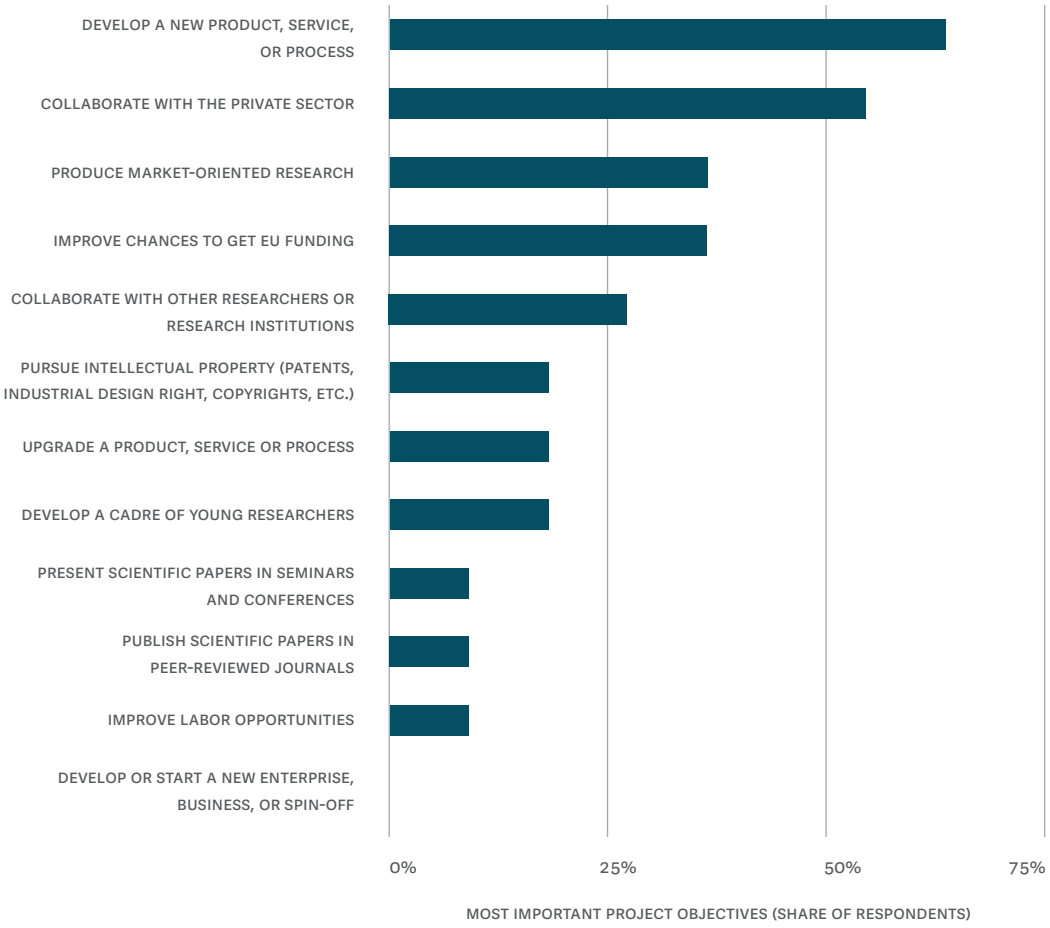


Source: Beneficiary surveys. Multiple selection question. N=11.

Overall project quality

Project objectives according to survey respondents were somewhat aligned with program objectives. Over half of respondents had projects whose main objectives were to i) develop a new product, service or process (64 percent of respondents), and ii) collaborate with the private sector (55 percent), which were aligned with the program's objectives (Figure 4.34). Additionally, the survey captured another project objective highlighted by 27 percent of the respondents which was aligned with the program goals, namely, to collaborate with other researchers or research institutions. However, respondents also had other main objectives, such as improving chances to get EU funding or upgrading products, processes, and services, that were not fully aligned with the program's objectives.

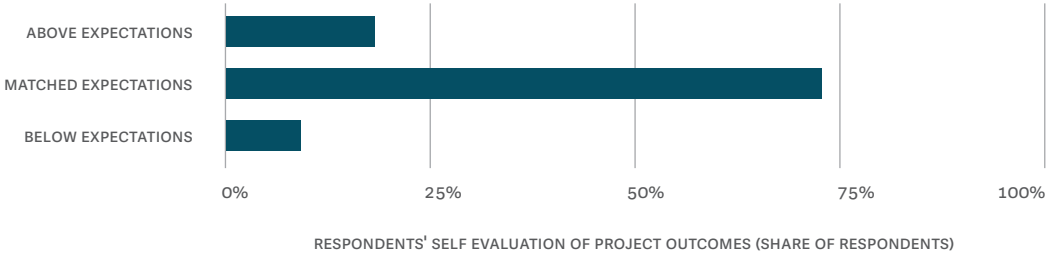
Figure 4.34 Respondents' project objectives were partially aligned with the intended outcomes of the program



Source: Beneficiary surveys. Multiple selection question. N=11.

Overall, project leaders evaluated the outcomes of their projects in a positive light. Respondents assessed the overall project quality by comparing their projects' overall outcome to their own expectations. The outcome matched the expectations of 73 percent of respondents, it was above the expectations of 18 percent, and it was below the expectations of 9 percent (Figure 4.35).

Figure 4.35 More respondents rated the outcome of their project as better than expected, rather than lower



Source: Beneficiary surveys. N=11.

5 Research Scholarships for Professional Development of Young Researchers

Research Scholarships for Professional Development of Young Researchers

The program Research Scholarships for Professional Development of Young Researchers sought to develop research excellence and R&D competences of young researchers and postdoctoral researchers. The program was implemented as part of OP Human Resource Development (OPHRD) 2007-2013, under the MSE and the Agency for Vocational Education and Training (ASOO). The program provided financial support to doctoral students and postdocs to conduct an R&D project in basic research, applied research, or experimental development, either individually or in a research group of up to five people. Another eligible activity of this program was training (education) for collaboration with the private sector, project management, IPR management, proof of concept, etc. The program financed salaries of young researchers and postdocs, short-term mobility, participation in conferences, external services, as well as equipment and minor renovation works related to the project. In OPCC 2014-2020, a similar program was implemented by HRZZ to provide funding for doctoral students, putting greater emphasis on mentorship and career development plan of the doctoral student. This analysis refers to the 2014 call, which supported 52 projects.

The survey response rate for this program was 45 percent. This rate is calculated as those that completed over 50 percent of the survey. Beneficiaries that responded to the survey received 49 percent of the funding disbursed. On average, respondents received a higher value grant (HRK 976,000) compared to all RS beneficiaries (HRK 887,000). All beneficiaries received the survey in June 2020, and 29 out of 52 opened it, generating a cooperation rate of 56 percent.

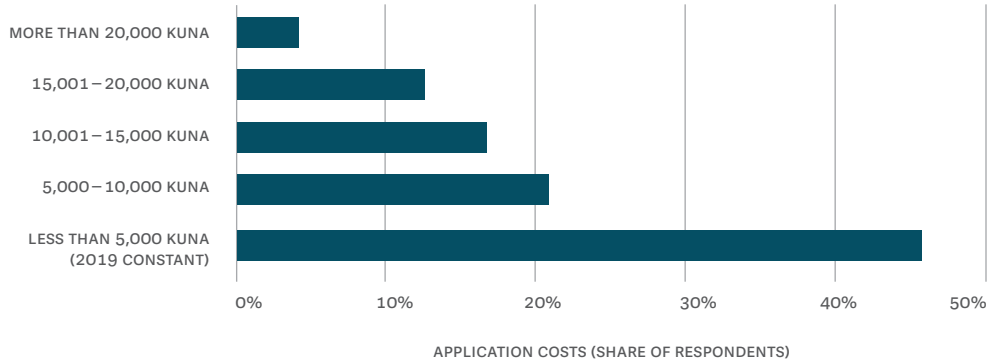
The program implementers did not provide data on the administrative and operating costs for this program, which limits the scope of the analysis. In the absence of administrative cost data, it is not possible to calculate the amount and composition of program costs, average administrative and operating cost per project, the ratio of costs covered by the program to costs covered by beneficiaries, and direct transfers per unit of administrative and operating costs. Therefore, the analysis is limited to presenting the data collected in the beneficiary surveys, including costs incurred by beneficiaries, program outputs, outcomes, beneficiary satisfaction, and alignment with program objectives.

5.1 Use of inputs

Costs covered by beneficiaries

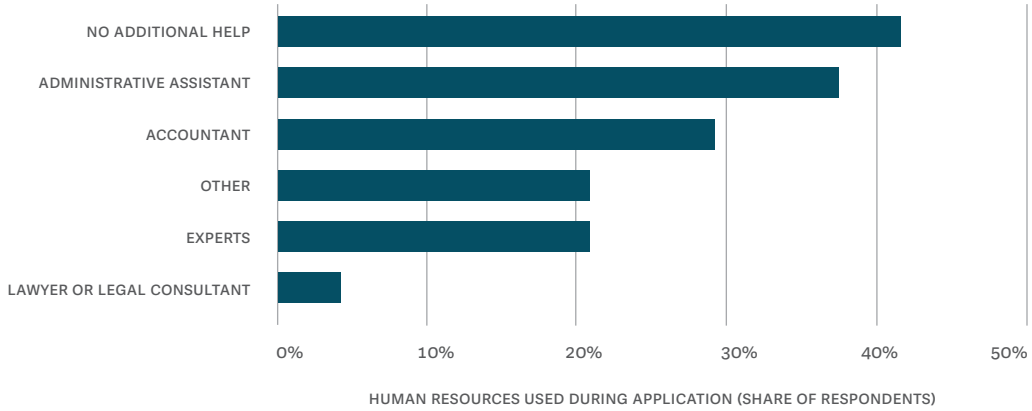
Application costs were rather low, and a substantial share of respondents required no additional help to complete the application process. The average application cost per project was HRK 8,771 with 46 percent of respondents reporting application costs of less than HRK 5,000. Only one respondent had application costs higher than HRK 20,000 (Figure 5.1). When asked about human resources needed, 42 percent of respondents completed the application without additional help, but 38 percent used the help of an administrative assistant to prepare the application and others used accountants or experts (Figure 5.2).

Figure 5.1 Application costs of respondents were fairly low



Source: Beneficiary surveys. N=24.

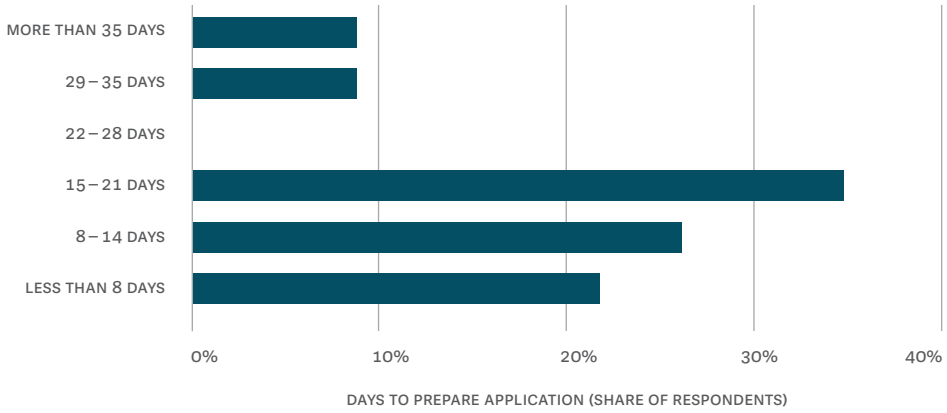
Figure 5.2 A substantial share of respondents required no additional help in the application process



Source: Beneficiary surveys. Multiple selection question. N=24. Other includes institution's Office for Projects, project associates, and Office for International Cooperation.

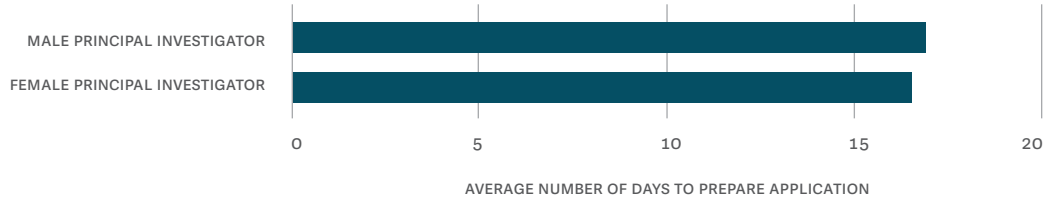
Most survey respondents were able to complete their applications in a reasonable amount of time. 83 percent of respondents spent up to three weeks (up to 21 days) preparing their application (Figure 5.3). On average, it took them 17 full working days to do so. Projects with male principal investigators took almost the same number of days, 17, on average, as those with female principal investigators to prepare the application to the program. The small difference is not statistically significant (Figure 5.4). The monetary and non-monetary costs of applying to the program were adequate for 83 percent of respondents.

Figure 5.3 Most respondents completed the application in less than three weeks



Source: Beneficiary surveys. N=23

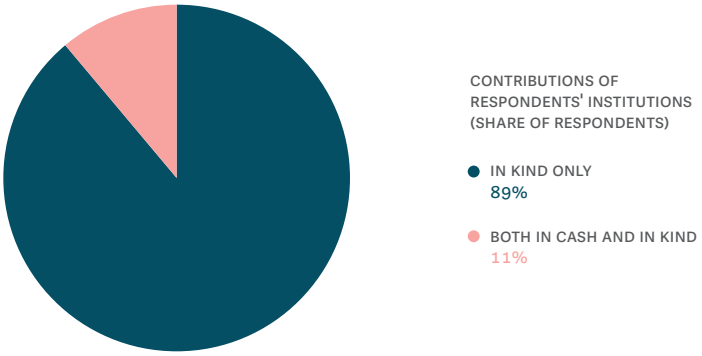
Figure 5.4 The difference in application preparation time between genders is not statistically significant



Source: Beneficiary surveys. N=23

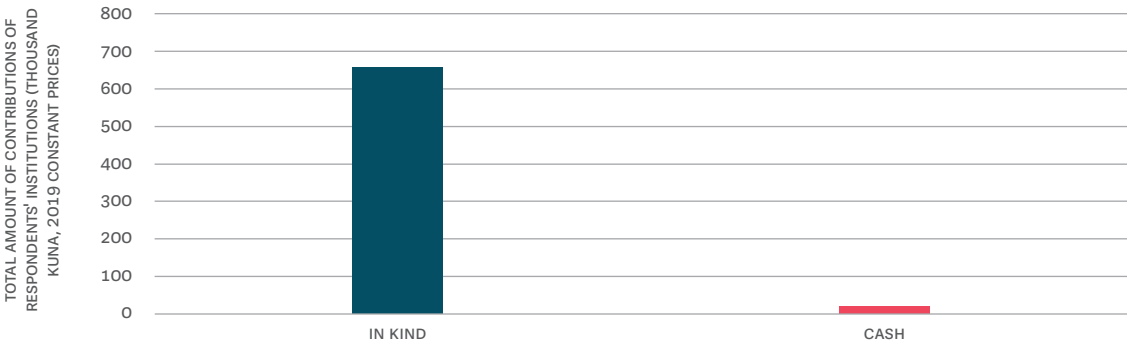
Most respondents received only in-kind contributions from their institutions. Eighty-nine percent of respondents received only in-kind contributions, and 11 percent both in-kind and cash contributions from their institutions (Figure 5.5). The cash contributions from all projects participating in the survey were valued at almost HRK 19,980 and the in-kind contributions in approximately HRK 656,342 (Figure 5.6). The average in-kind contribution per project was HRK 36,463 and the average cash contribution per project was HRK 9,990.

Figure 5.5 Most respondents received only in-kind contributions from their institutions



Source: Beneficiary surveys. N=18.

Figure 5.6 The value of cash contributions was comparatively low



Source: Beneficiary surveys. N=18.

For every HRK that beneficiaries put into the project, they received about HRK 16 from the program. On average, each beneficiary covered costs in the amount of HRK 55,224, including application expenses and contributions made by their institutions. On the other hand, the average direct financial transfer per project was approximately HRK 882,000.[17] Therefore, the ratio of costs covered by the program to costs covered by beneficiaries is 16.

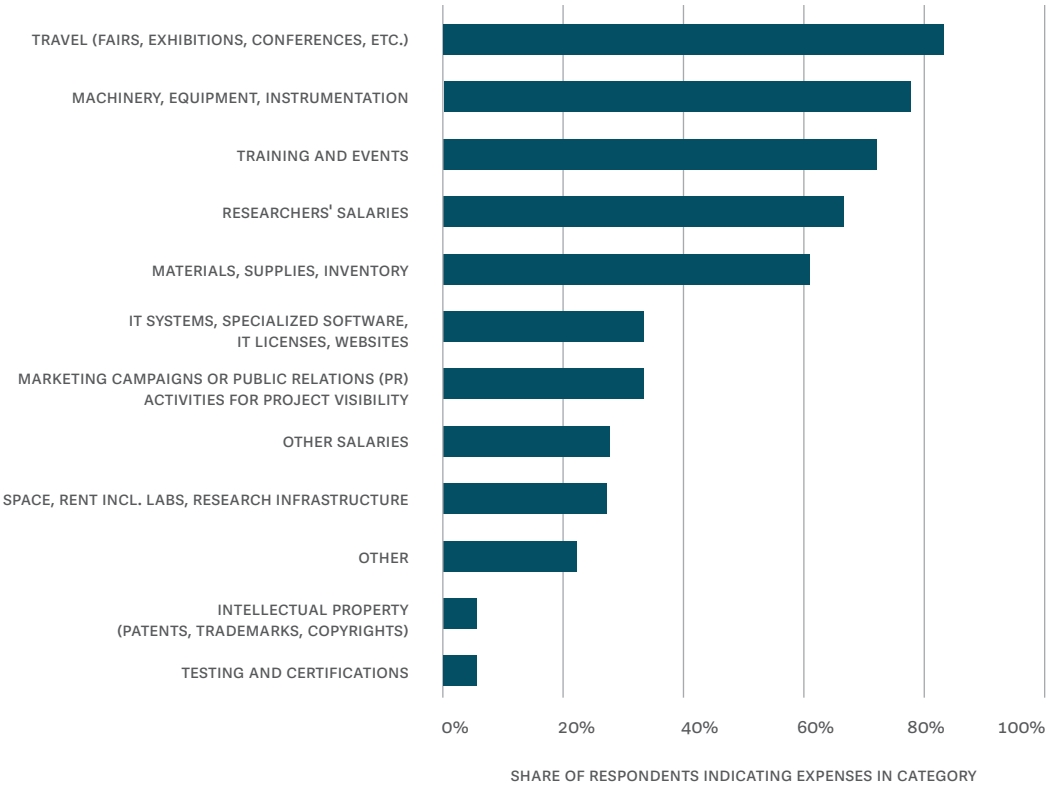
17 The program cost is underestimated because it only includes direct financial transfers. Indirect financial transfers, non-financial transfers, and administrative and operating costs were not reported. Consequently, the ratio of costs covered by the program to costs covered by the beneficiaries is also underestimated.

5.2 Efficiency in the generation of outputs

Investments in beneficiaries

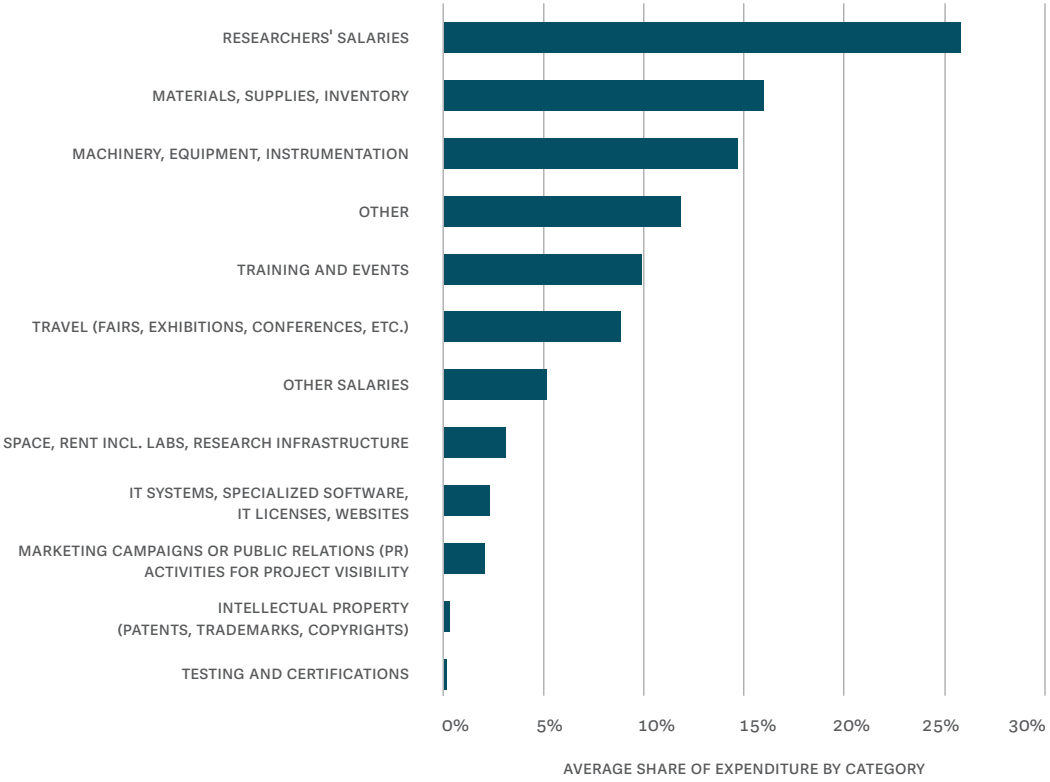
Consistent with the program objectives of training a new cadre of researchers, the investments in beneficiaries were mostly used for researchers' salaries. The program transferred approximately HRK 46 million to 52 beneficiaries in direct financial transfers (on average HRK 882,443 per project). Looking at the share of respondents with expenditures in each category, 78 percent invested in machinery, equipment, and instrumentation (Figure 5.7). Also, a large share of respondents, 83 percent, used some funding to travel, although the average allocation was rather low, only 9 percent of the funding received. Twenty-six percent of respondents' funding allocation was dedicated to salaries, followed by expenses in materials, supplies, and inventory (16 percent) (Figure 5.8). The share of funding allocated to machinery, equipment, and instrumentation was rather low when compared to SIIF and STRIP.

Figure 5.7 Most respondents invested funds into travel expenses, equipment, training, salaries, and supplies



Source: Beneficiary surveys. N=18. Other includes costs of publishing papers; Management and administration.

Figure 5.8 The largest portion of the budget went to researchers' salaries



Source: Beneficiary surveys. N=18. Other includes costs of publishing papers; management and administration.

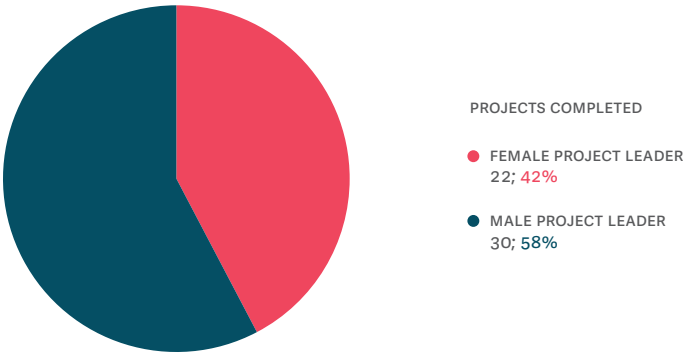
Outputs achieved

The program disbursed HRK 45.9 million to support 52 projects, mostly in natural and social sciences. All projects were completed in 2016. Out of the 52 projects, 42 percent had a female mentor, corresponding to 28 percent of the funds disbursed (Figure 5.9). Among respondents, 30 percent of projects were in natural sciences and 26 percent in social sciences. A rather small share of respondents implemented projects in agricultural sciences and humanities (Figure 5.10).

On average, 16 outputs were achieved per project, corresponding to 11 outputs per HRK 1,000 of program costs. Four outputs were tracked for this program: the number of researchers involved in the project; the number of senior researchers engaged as mentors; the number of seminars, workshops and conferences attended; and the number of training activities attended. In total, 384 outputs were achieved.

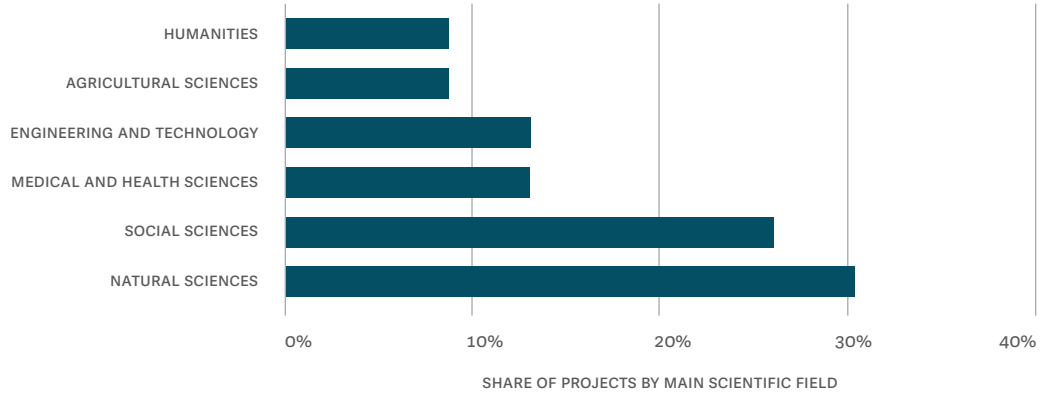
Since the objective of the program was to build capacities of young researchers to conduct R&D activities, the composition of the project teams is an important output to track. A total of 113 researchers and 52 mentors were involved in supported projects. On average, project teams were composed of 3 researchers, of which 45 percent were female. It would have been more informative to track the number of full-time equivalent researchers involved in the projects, but these data were not available.

Figure 5.9 The majority of mentors were male



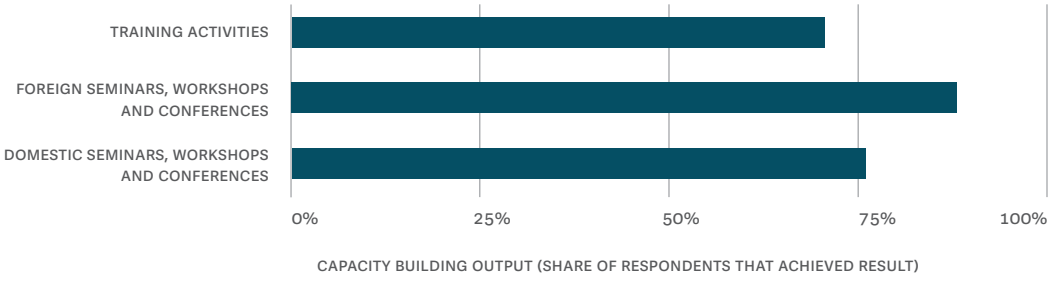
Source: MSE data. N=52.

Figure 5.10 Most respondents had projects in natural and social sciences



Source: Beneficiary surveys. N=23.

Figure 5.11 Most respondents achieved a variety of capacity building outputs



Source: Beneficiary surveys. N=17.

Respondents also achieved capacity building outputs, such as training activities and seminars, workshops or conferences. Specifically, 71 percent of survey respondents attended a total of 32 training activities, 88 percent attended a total of 113 foreign seminars, workshops of conferences, and 88 percent attended a total of 74 domestic ones (Figure 5.11).

5.3 Efficiency in the generation of outcomes

Respondents achieved a total of 200 outcomes (including intended outcomes and other results) which amounts to 12 outcomes achieved per project, on average. Intended outcomes include doctoral or master's titles or theses, scientific publications in peer-reviewed journals, patent applications, and registered intellectual property (patents granted, industrial designs and copyrights). Other outcomes that have been achieved include collaborative projects, new or upgraded products, processes, or services, prototypes, new designs, software and technology development.

Intended outcomes achieved

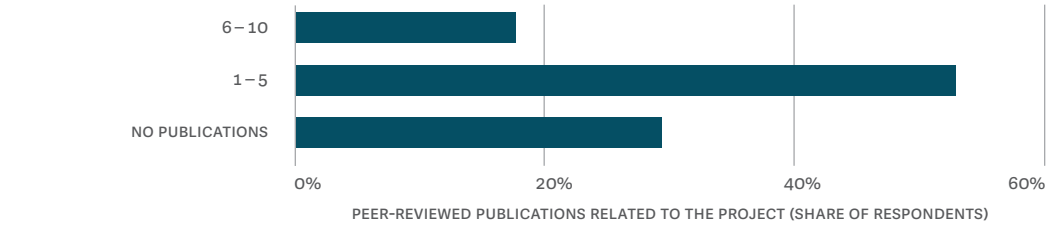
The most common outcomes include scientific publications and doctoral or master's theses, but none of the respondents managed to achieve results in terms of intellectual property. Table 5.1 shows achievements on intended outcomes. Most respondents (88 percent) published scientific papers and about 40 percent achieved titles or thesis. A total of 141 scientific papers were published, according to data from the survey. About half of the respondents published up to five scientific papers and 18 percent between 6 and 10 (Figure 5.12). However, 29 percent of respondents did not report any publication in peer-reviewed journals, which contrasts with the SIIF and STRIP programs where most respondents published scientific papers. Respondents did not achieve intellectual property outcomes such as patents, industrial designs, or copyrights, even though funding for training in the area of IPR protection was possible under the program.

Table 5.1 The most common outcomes were related to publications and doctoral or master's theses

INTENDED OUTCOME	SHARE OF RESPONDENTS THAT ACHIEVED RESULT	NUMBER OF RESPONDENTS THAT ACHIEVED RESULT	TOTAL NUMBER OF RESULTS REPORTED
Doctoral or master's titles or theses	41%	7	20
Scientific publications in peer-reviewed journals	88%	15	141
Patent applications	0%	0	0
Patents granted	0%	0	0
Industrial designs	0%	0	0
Copyrights	0%	0	0

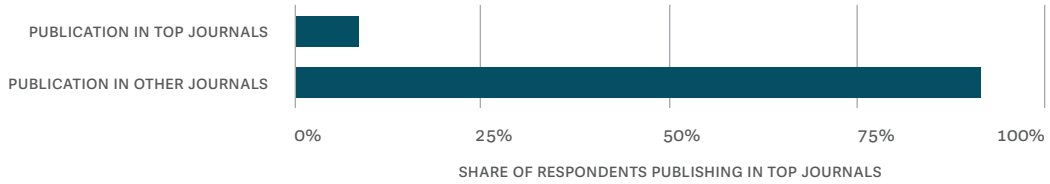
Source: Beneficiary surveys. N=17.

Figure 5.12 Around half of the respondents published up to five scientific papers



Source: Beneficiary surveys. N=17.

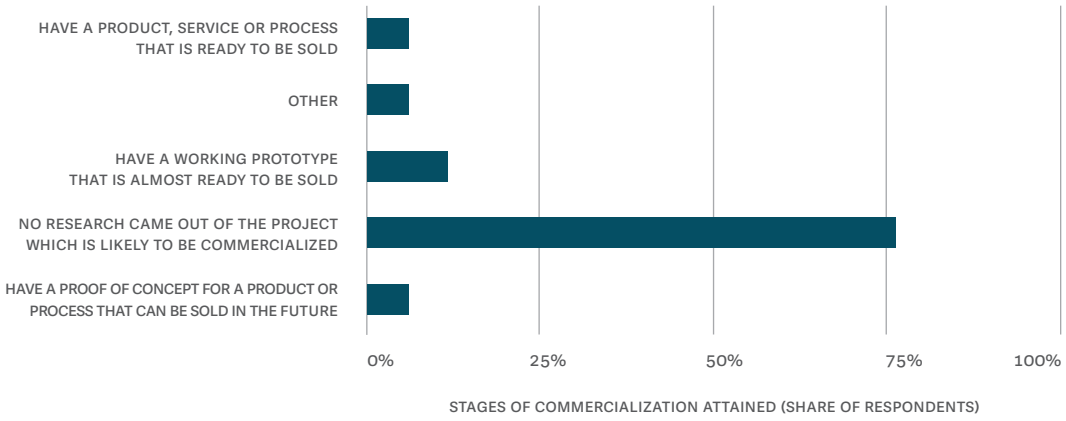
Figure 5.13 Few respondents managed to publish articles related to the project in top journals



Source: Beneficiary surveys. N=12.

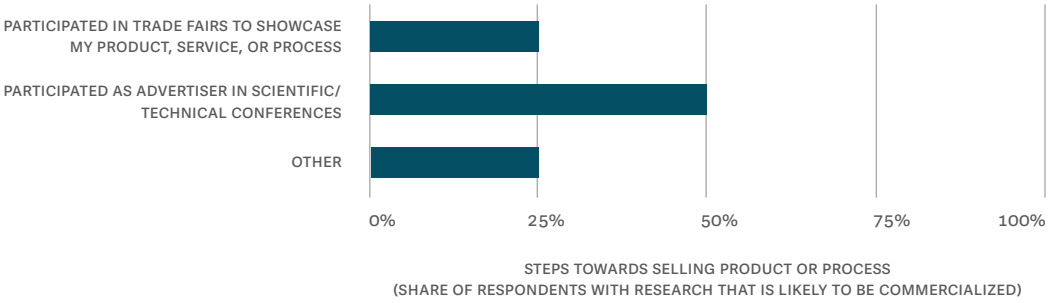
Consistent with the finding on the lack of achievement of intellectual property outcomes, beneficiaries had limited achievements in commercializing the research supported. For 76 percent of respondents, no research that was likely to be commercialized came out of the project. Only 12 percent had a working prototype almost ready to be sold (Figure 5.14). Overall, only 4 respondents had research likely to be commercialized, and half of them had participated in scientific or technical conferences as a step towards selling their product or process (Figure 5.15).

Figure 5.14 Most respondents stated that their research could not be commercialized



Source: Beneficiary surveys. Multiple selection question. N=17.

Figure 5.15 Respondents whose research was likely to be commercialized participated in scientific or technical conferences and trade fairs



Source: Beneficiary surveys. Multiple selection question N=4. Other not specified.

Other results

Program beneficiaries achieved other results related to their projects in terms of collaborations and market-oriented research. More respondents collaborated with researchers or research institutions than with enterprises. A large number of respondents (76 percent) pursued collaborative projects with foreign researchers. In addition to the publications mentioned in the previous section, 24 percent of respondents conducted market-oriented research (Table 5.2). Collaborative projects with enterprises were less frequent, even though the program provided funding for raising the capacity of researchers to collaborate with the private sector.

Despite no results related to intellectual property, beneficiaries achieved some results in terms of development of products, technology, and innovation. 35 percent of the beneficiaries developed new software and 24 percent new technologies. Additionally, eight prototypes were created, as well as four new products, processes or services (Table 5.2).

Table 5.2 Respondents achieved other outcomes related to collaborative projects, market-oriented research and software development

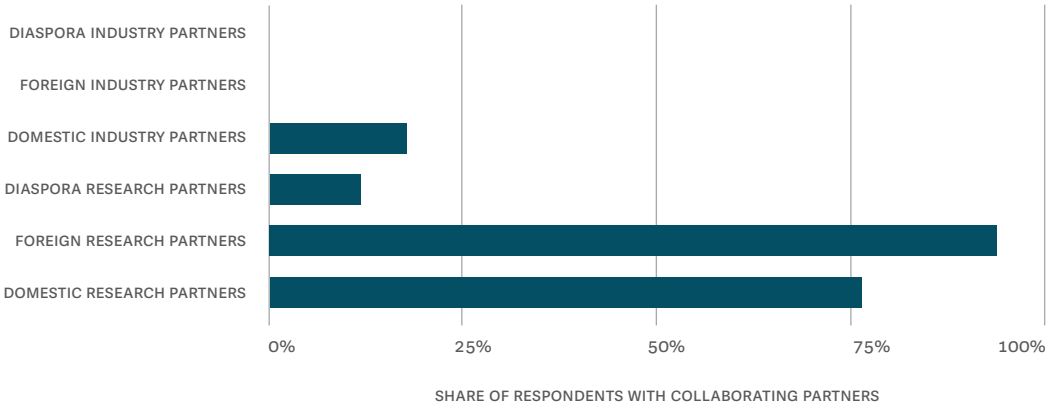
OTHER PROJECT RESULTS ACHIEVED DURING OR AFTER THE PROJECT	SHARE OF RESPONDENTS THAT ACHIEVED RESULT	NUMBER OF RESPONDENTS THAT ACHIEVED RESULT	TOTAL NUMBER OF RESULTS REPORTED
Collaborative projects with domestic researchers or research institutions	65%	11	38
Collaborative projects with foreign researchers or research institutions	76%	13	50
Collaborative projects with diaspora researchers or research institutions	18%	3	5
Collaborative projects with domestic enterprises	18%	3	4
Collaborative projects with foreign enterprises	6%	1	5
Market-oriented research	24%	4	4
Transfer agreements	0%	0	0
New enterprise, business or spin-off	0%	0	0
Prototype	18%	3	8
New products, processes, or services	18%	3	4
Upgraded products, processes, or services	18%	3	3
New design for a product, process, or service	6%	1	1
New software development	35%	6	6
New technology development	24%	4	8

Source: Beneficiary surveys. N=17.

Many respondents had research partners for their projects, especially foreign ones. Indeed, 76 percent of respondents had collaborations with 36 domestic research partners and 94 percent of respondents had collaborations with 33 foreign partners (Figure 5.16 and Figure 5.17). On the contrary, beneficiaries had limited collaborations with industry. Only 18 percent of respondents had domestic industry partners (four partners), and no respondents had foreign industry partners. Collaborations with foreign research partners not only were more frequent, but also received better quality ratings. Half of the respondents evaluated them as excellent and 31 percent above average (Figure 5.18).

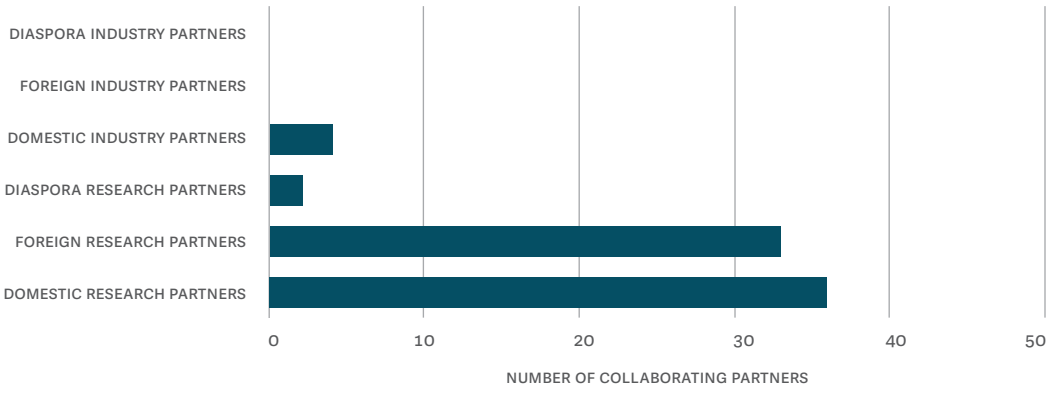
Regarding the nature of the collaborations, most respondents pursued joint R&D projects or co-authoring research publications with partners (75 percent). On the contrary, only 6 percent collaborated for the preparation of technical documentation and none for a patent registration or for selling a product (Figure 5.19).

Figure 5.16 Most respondents had foreign and domestic research partners



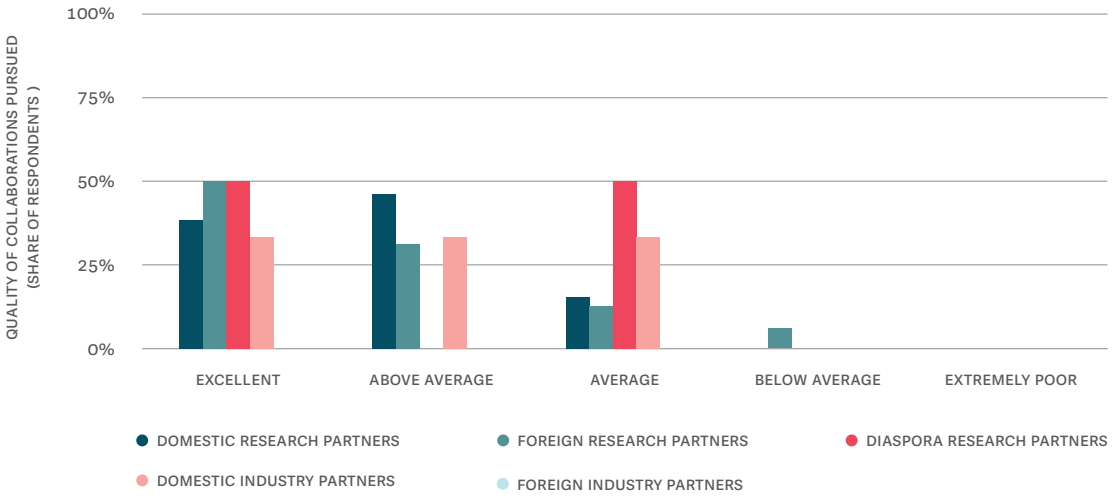
Source: Beneficiary surveys. Multiple selection question. N=17.

Figure 5.17 Respondents had very few industry partners



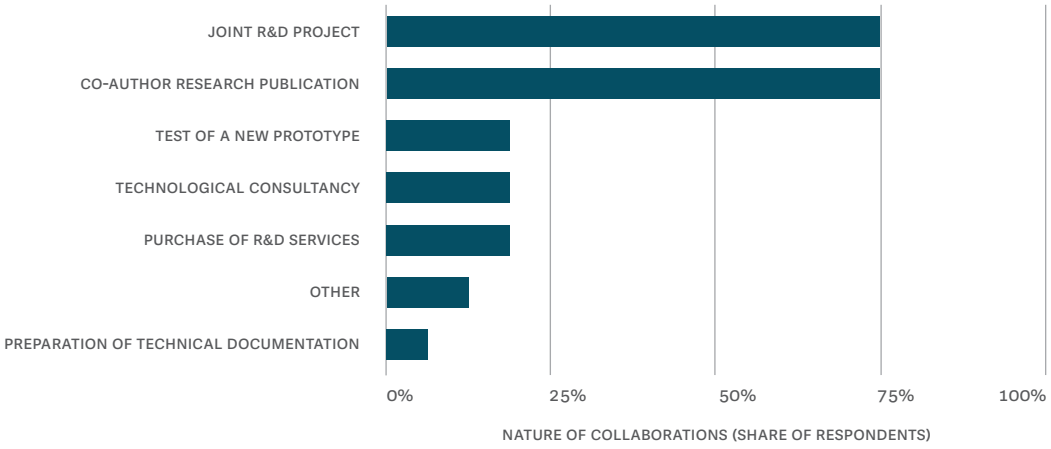
Source: Beneficiary surveys. Multiple selection question. N=17.

Figure 5.18 Collaborations with foreign research received better quality ratings



Source: Beneficiary surveys. N=16.

Figure 5.19 Collaborations were mostly pursued to conduct joint R&D projects and co-author research publications



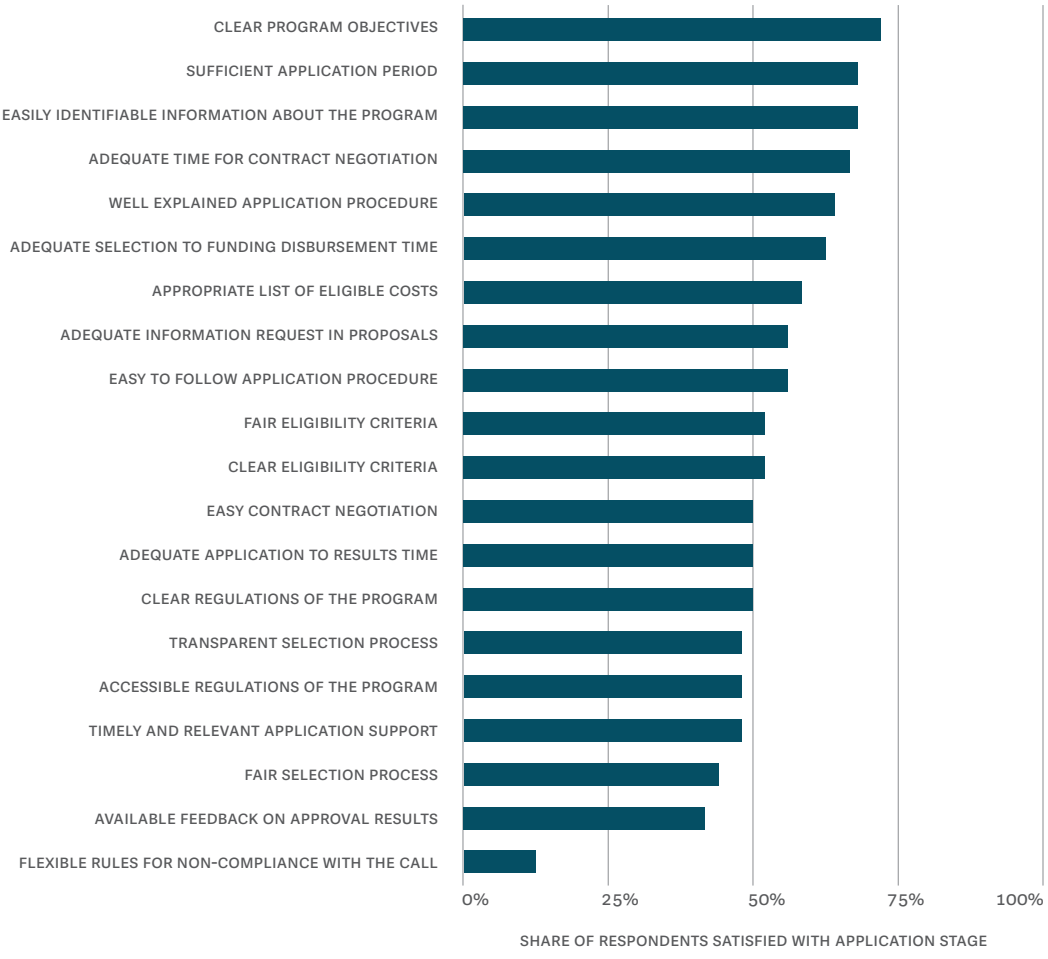
Source: Beneficiary surveys. Multiple selection question. N=16.

5.4 Perceived quality

Quality of program contributions

At the application stage, respondents were most satisfied the clarity of program objectives, the time allowed for preparing the application, and availability of information about the program, but were least satisfied with flexibility of rules, feedback, and fairness of the selection process. In contrast to SIIF, there were no areas for which over 75 percent of the respondents were satisfied. The areas with the best ratings were the clarity of program objectives, with 72 percent of respondents satisfied, the easiness to identify program information (68 percent), and the sufficiency of the application period (68 percent) (Figure 5.20). In line with what was found in previous programs, a clear area for improvement is the flexibility of the rules for non-compliance with the call, as only 13 percent of the respondents were satisfied with this.

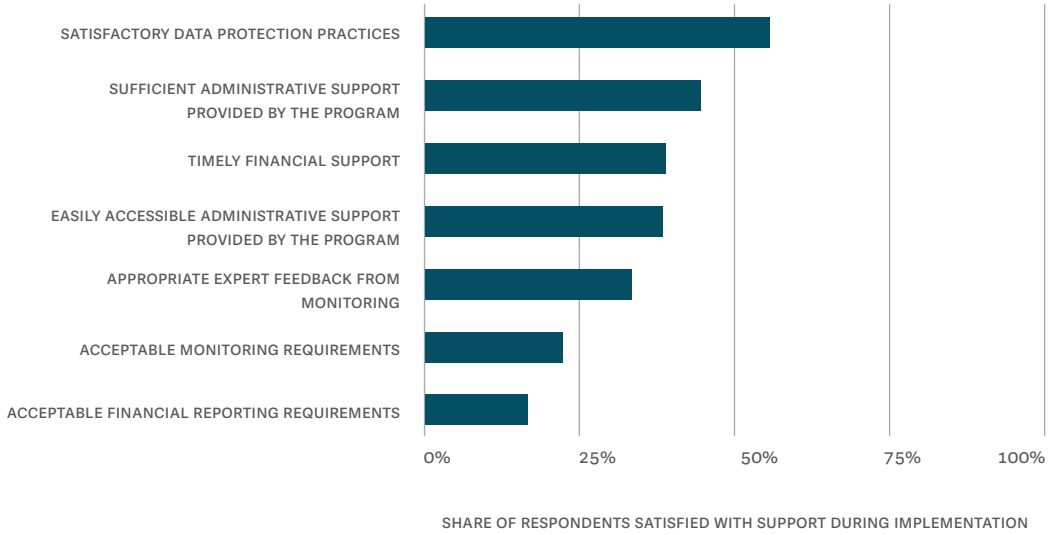
Figure 5.20 Respondents were least satisfied with flexibility, feedback and fairness of the selection process



Source: Beneficiary surveys. Note: The level of satisfaction was measured on a scale of 1-5, where 1 is strongly disagree and 5 strongly agree. The figure shows the percentage of respondents who agreed or strongly agreed with the statements.

Overall, respondents were not very satisfied with the program's support during implementation. About half of them were satisfied with the data protection practices, but less than 40 percent were satisfied with the timeliness of the financial support, the accessibility of administrative support, the appropriateness of expert feedback. Respondents were least satisfied with monitoring requirements and financial reporting (Figure 5.21).

Figure 5.21 Respondents were least satisfied with the program's financial reporting and monitoring requirements

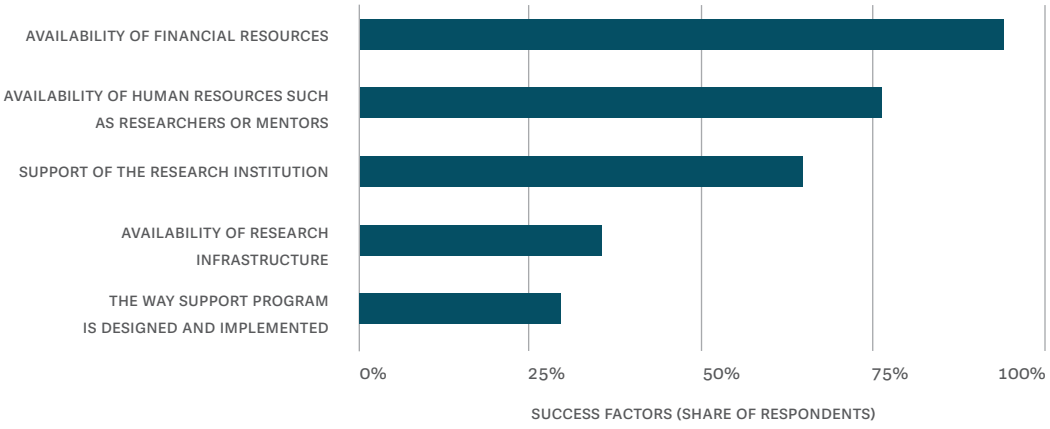


Source: Beneficiary surveys. N=18. Note: The level of satisfaction was measured on a scale of 1-5, where 1 is strongly disagree and 5 strongly agree. The figure shows the percentage of respondents who agreed or strongly agreed with the statements.

Most respondents felt that the financing and timeframe allowed to conduct the project were sufficient to successfully complete their project objectives. For almost 90 percent of respondents, the funding was delivered according to the terms of the contract. For all but one respondent, the amount of financial support provided by the program was sufficient to successfully complete their project objectives. For the beneficiary for whom the financial support was insufficient, an increase of up to 10 percent in the financial support would be enough to successfully complete the project's objectives. Similarly, for most respondents (83 percent), the amount of time allowed by the program for project implementation, including any extensions, was sufficient to successfully complete their projects. However, for the other 17 percent of respondents, the time was insufficient. The main reason was that they could not reduce their other activities within their institution.

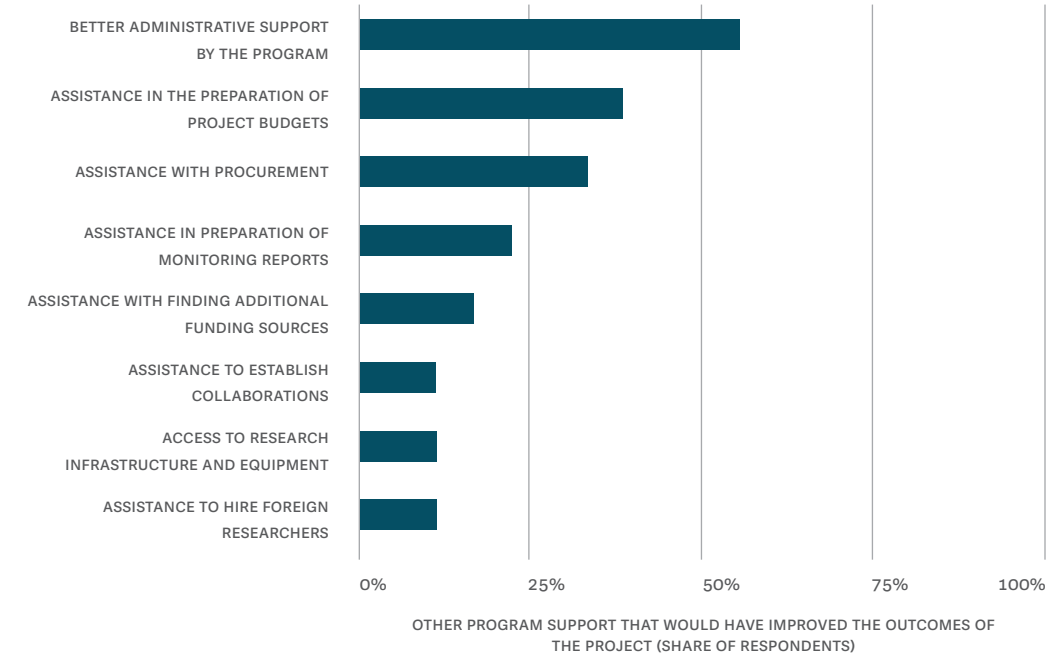
The main success factors highlighted by respondents were availability of financial and human resources. For over 90 percent of respondents, the availability of financial resources was among the most important factors that contributed to the achievement of results. In addition, for 76 percent, the availability of human resources was an important success factor. The way the program is designed and implemented was a success factor for fewer respondents (29 percent), similar to other programs (Figure 5.22).

Figure 5.22 Availability of financial and human resources were the most important success factors



Source: Beneficiary surveys. Multiple selection question. N=17.

Figure 5.23 Over half of the respondents wanted better administrative support by the program



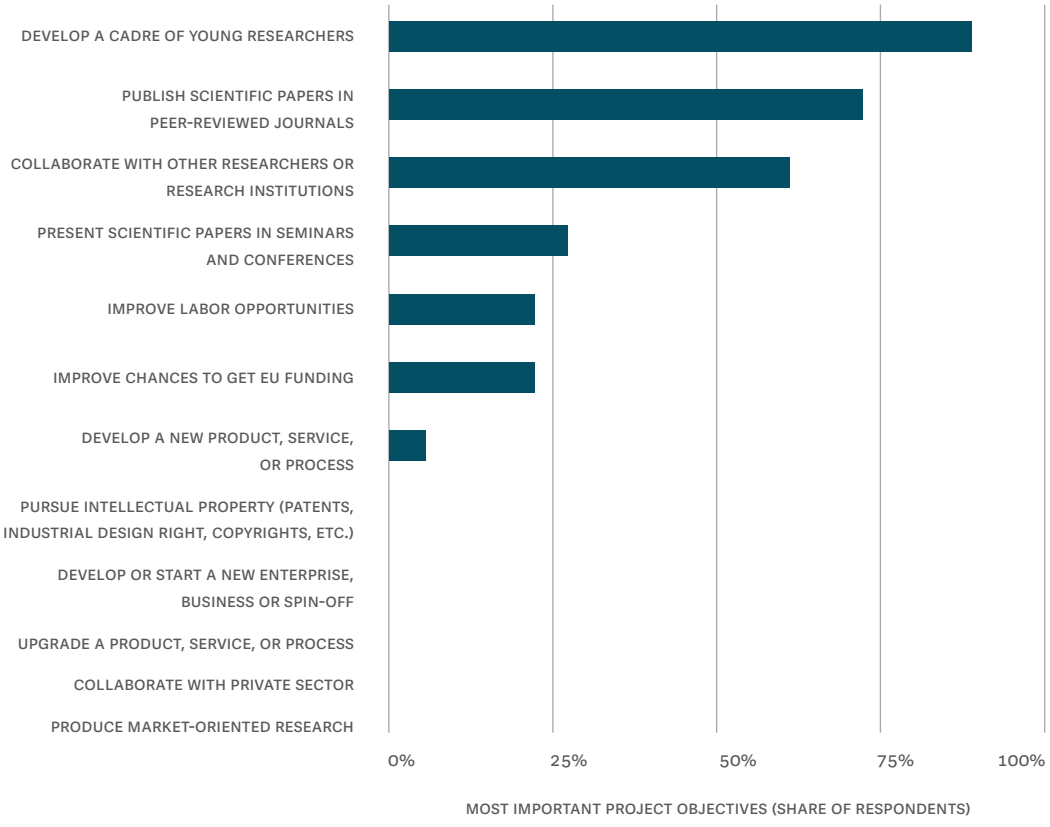
Source: Beneficiary surveys. Multiple selection question. N=18.

Beneficiaries would have appreciated having better administrative support by the program. Indeed, 56 percent of respondents mentioned a need for better administrative support by the program. This was followed by assistance in the preparation of budgets, which was needed by 38 percent of respondents, and assistance with procurement (33 percent) (Figure 5.23).

Overall project quality

Projects were largely aligned with program objectives. Almost 90 percent of the projects had developing a cadre of young researchers as one of their main objectives, which is fully aligned with the program objective to develop the capacity of doctoral students and postdoctoral researchers (Figure 5.24). Also, in line with the program's objectives, over 70 percent of respondents had publishing scientific papers in peer-reviewed journals as one of their main project goals. Presenting such scientific papers in seminars and conferences was also part of the program's objectives, but only 27 percent of respondents had that as one of their main goals. Despite providing funding for building the capacity of young researchers to collaborate with the private sector, none of the survey respondents had that goal, or goals related to pursuing intellectual property. This suggests that young researchers did not prioritize such outcomes. Survey respondents had other main objectives that were not part of the program's objectives. For example, 61 percent of the respondents' projects had as one of their main goals to collaborate with other researchers or research institutions, but this was not part of the program's main objectives, even though the program did provide funding for networking and mobility. This indicates that establishing collaboration within the scientific community is in high demand among young researchers, a fact that could serve to inform program design in the future.

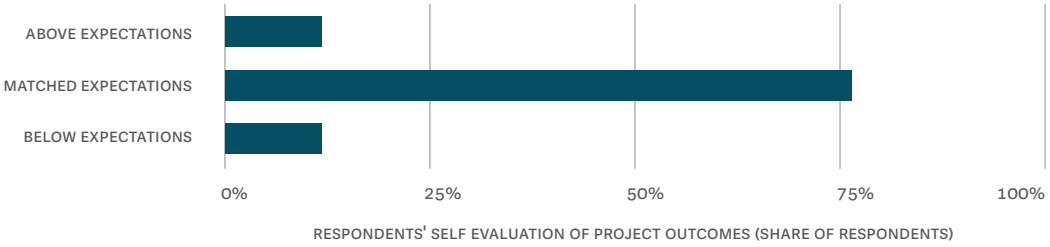
Figure 5.24 Project objectives were to a large extent aligned with program objectives



Source: Beneficiary surveys. Multiple selection question. N=18.

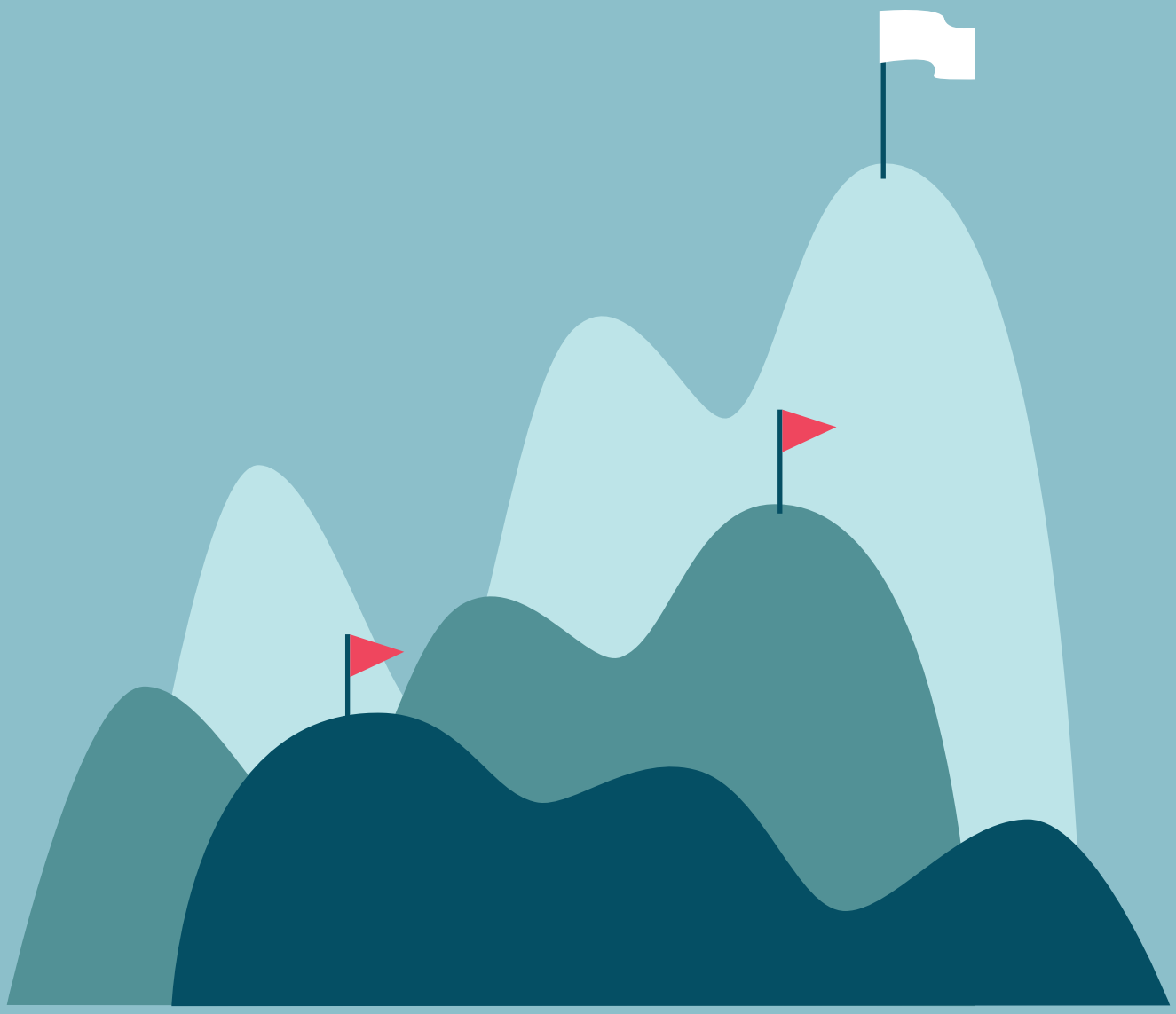
Lastly, projects matched most respondents' expectations in terms of outcomes. For 76 percent, their overall project outcome matched their expectations. For 12 percent, their projects' outcomes were above expectations, and for another 12 percent, they were below (Figure 5.25).

Figure 5.25 Project outcomes overall matched the respondents' expectations



Source: Beneficiary surveys. N=17.

6 Research Projects



Research Projects

The Research Projects program finances basic research to create new knowledge that will contribute to strengthening the country's economy and welfare. The program is designed and implemented by HRZZ and is funded from the national budget. The program seeks to encourage connections among researchers, developing research groups that can be competitive at the international level, as well as support scientists who can mentor a new generation of young researchers. From 2013 until today, six calls for proposals were launched under the program, and more than 700 projects have been funded so far. The sixth edition of the program was launched in 2020, with an allocation of around HRK 40 million. This analysis focuses on three calls conducted in 2013, 2014, and 2016, which supported a total of 335 projects.

The survey response rate for this program was 58 percent. This rate is calculated as those that completed over 50 percent of the survey. Beneficiaries that responded to the survey received 59 percent of the funding disbursed. On average, respondents received a higher value grant (HRK 727,000) compared to all RP beneficiaries (HRK 709,000). All beneficiaries (335) received the survey in June 2020, and 214 opened it, generating a cooperation rate of 64 percent.

6.1 Efficiency in the use of inputs

Costs covered by the program

Estimated program costs were HRK 249 million in the 2013–20 period, of which 95 percent were direct financial transfers to beneficiaries.[18] The other 5 percent were administrative and operating costs (Figure 6.1). The highest amount of transfers occurred in 2014 and 2015, a year after the first two calls of the program, while administrative and operating costs were the highest in 2018 and 2019 (Figure 6.2). Under this program there were neither indirect financial transfers (such as tax deductions or discounts), nor non-financial transfers to beneficiaries such as facilities or equipment lent.

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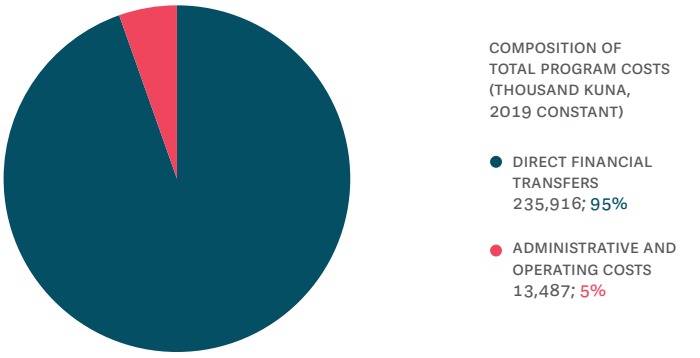
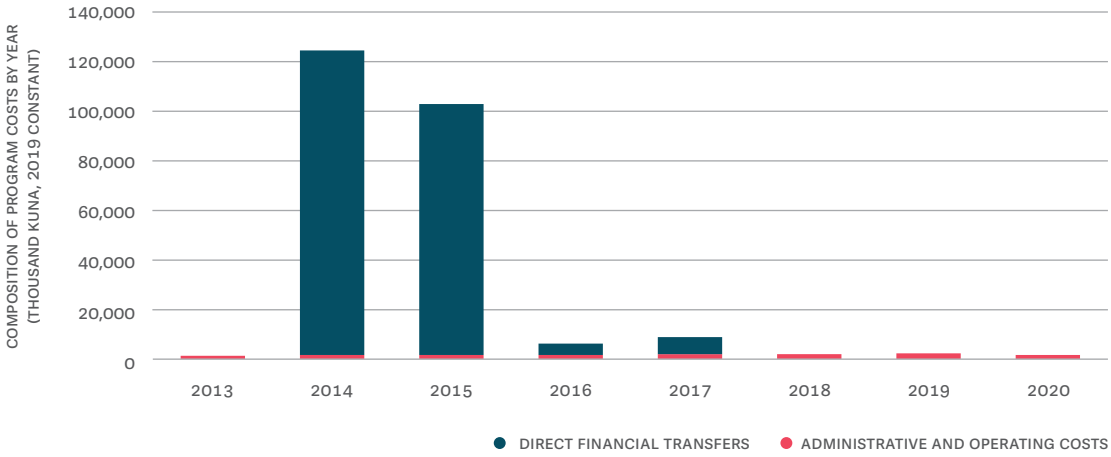
18 The administrative data on administrative and operating costs included personnel, fixed costs, and external services at the agency level, covering expenses for all their programs. Upon consultation with HRZZ, the following assumptions were made to calculate the costs particular to the Research Project program: For personnel costs, it was assumed that 90 percent of the entity's personnel workload was spent in tasks for the Research Projects and Installation Research Projects programs. It was also assumed that two thirds of the workload for these two programs pertains to the Research Projects program and one third to the Installation Research Projects program.

Figure 6.1 Administrative and operating costs are estimated at 5 percent of total program costs



Source: HRZZ data and staff calculations.

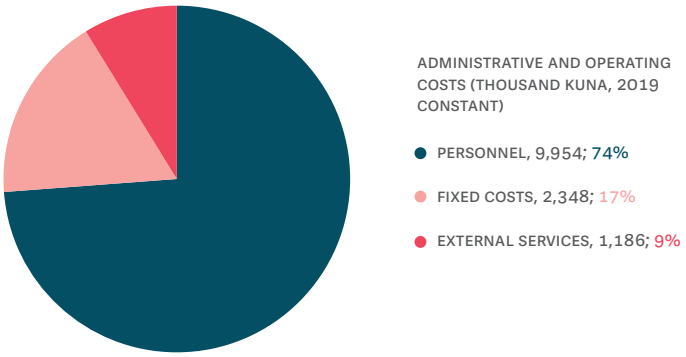
Figure 6.2 The highest amount of transfers occurred a year after the first two calls of the program



Source: HRZZ data and staff calculations.

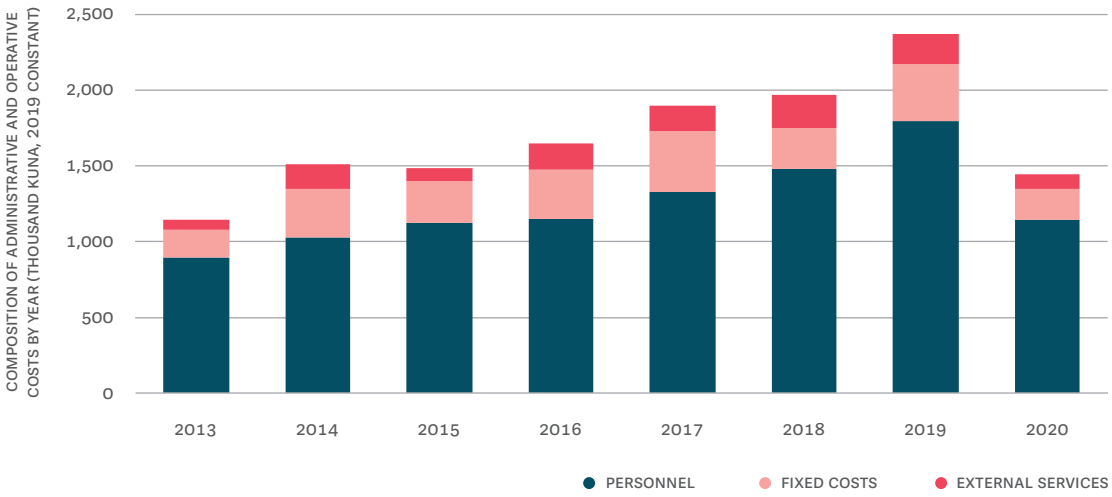
The highest share (74 percent) of administrative and operating costs was personnel salaries, which amounted to an estimated HRK 10 million in the 2013-2020 period. These are followed by fixed costs, which accounted for 17 percent. The rest of the costs, 9 percent, were external services contracted, which included expenses in consultants, experts, or firms supporting program staff in implementation, marketing, or travel expenses (Figure 6.3). Fixed costs were higher in 2017, while personnel costs were highest in 2019 (Figure 6.4).

Figure 6.3 Three quarters of program costs pertain to personnel costs



Source: HRZZ data and staff calculations.

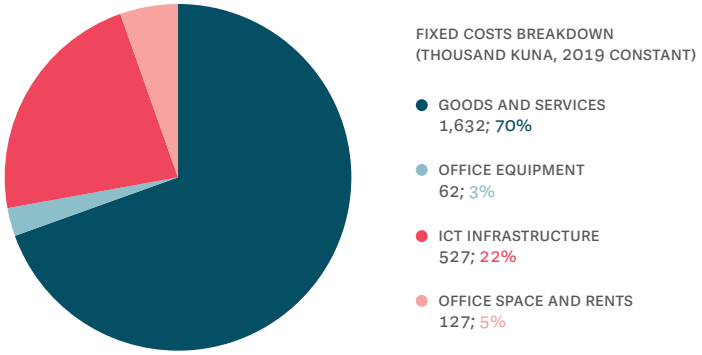
Figure 6.4 Administrative and operating costs rose gradually over time, driven by personnel costs



Source: HRZZ data and staff calculations.

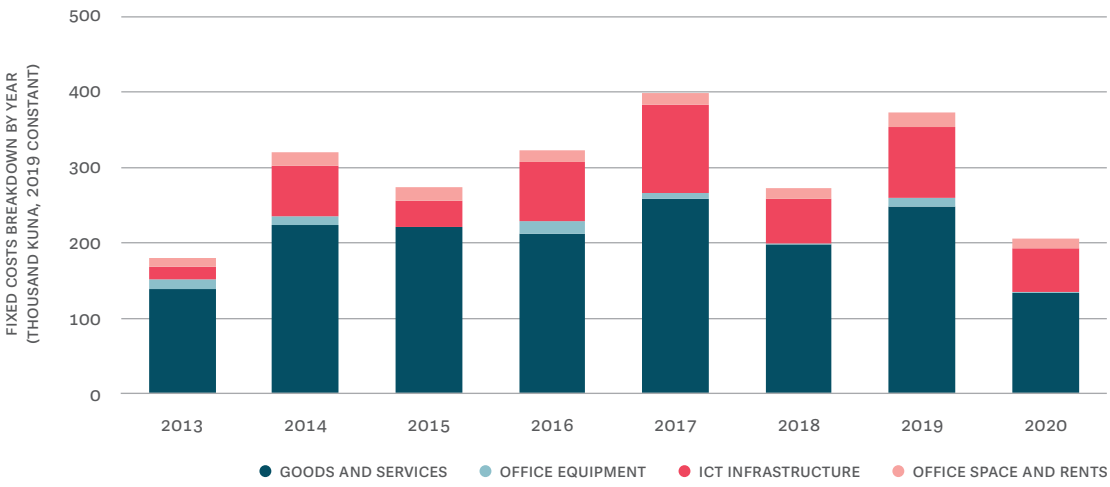
An estimated HRK 2.3 million in fixed costs were required to run the program in the 2013-2020 period. Fixed costs were mostly driven by goods and services, which accounted for 70 percent of total fixed costs, and included office supplies, materials, and services such as maintenance, external audit, intellectual services, and similar (Figure 6.5). ICT infrastructure represented 22 percent of the fixed costs and included equipment and licenses. Figure 6.6 presents the fixed costs by year. The administrative data provided included fixed costs for the whole entity as opposed to the fixed costs for this program only. Therefore, the fixed costs for this program were approximated through a weight that was defined as the share of personnel costs for this program of the personnel costs of the whole entity.

Figure 6.5 Goods and services dominate in the composition of fixed costs



Source: HRZZ data and staff calculations.

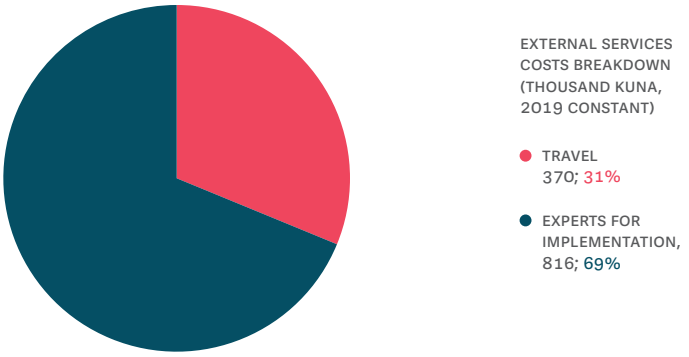
Figure 6.6 Fixed costs were highest in 2017



Source: HRZZ data and staff calculations.

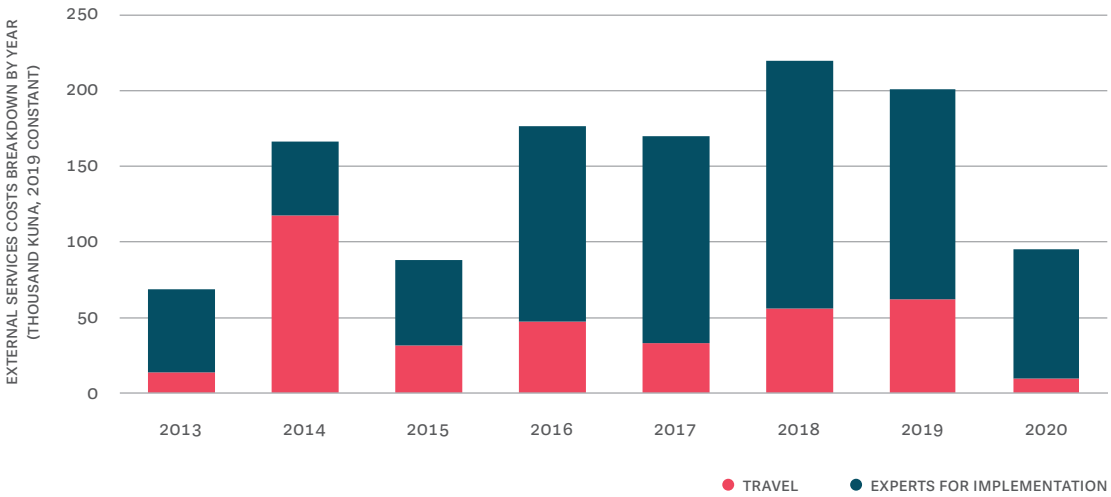
External services represented the lowest share of administrative and operating costs (9 percent). These included travel expenses for experts that evaluated the proposals as well as experts for implementation (for monitoring, evaluation, and other studies). Almost 70 percent of external services were spent in experts for implementation (Figure 6.7). The costs of travel were particularly high in 2014 (Figure 6.8). It is worth noting that, as it was the case for fixed costs, available administrative data did not include external services costs for this program exclusively, but only for the whole agency. Therefore, the program to entity personnel ratio was also used as a weight to calculate the external services expenses for this program.

Figure 6.7 External experts hired for implementation-related activities make up the bulk of external services costs



Source: HRZZ data and staff calculations.

Figure 6.8 There was some variation in external service costs over time



Source: HRZZ data and staff calculations.

On average, the program spent an estimated HRK 40,260 in administrative and operating costs per project. Of these, about HRK 30,000 per project were spent on personnel, HRK 7,000 per project on fixed costs, and HRK 4,000 per project on external services, on average (Table 6.1).

Table 6.1 Administrative and operating costs per project in the Research Projects program

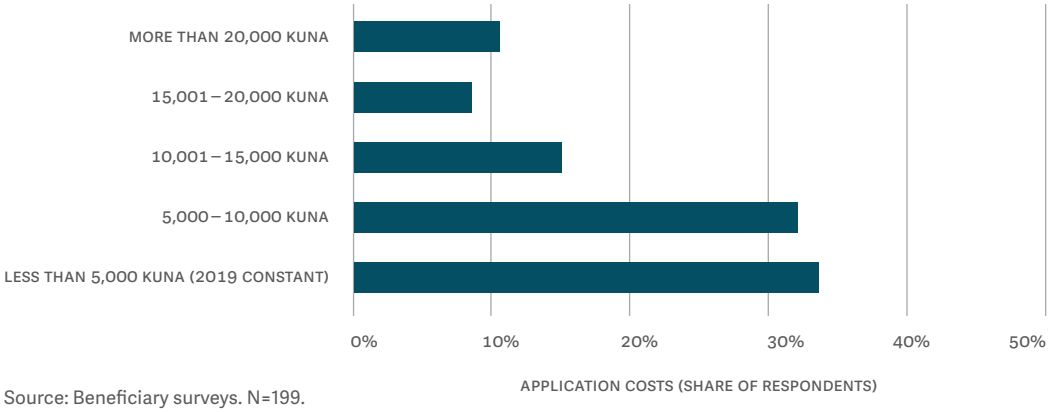
COST CATEGORY	TOTAL (CONSTANT 2019 - THOUSAND HRK)	AVERAGE PER PROJECT (CONSTANT 2019 - THOUSAND HRK)
Personnel	9,954	30
Fixed costs (offices, materials, equipment, services)	2,348	7
External services	1,186	4
Total administrative and operating costs	**13,487**	**40**

Source: HRZZ data and staff calculations.

Costs covered by beneficiaries

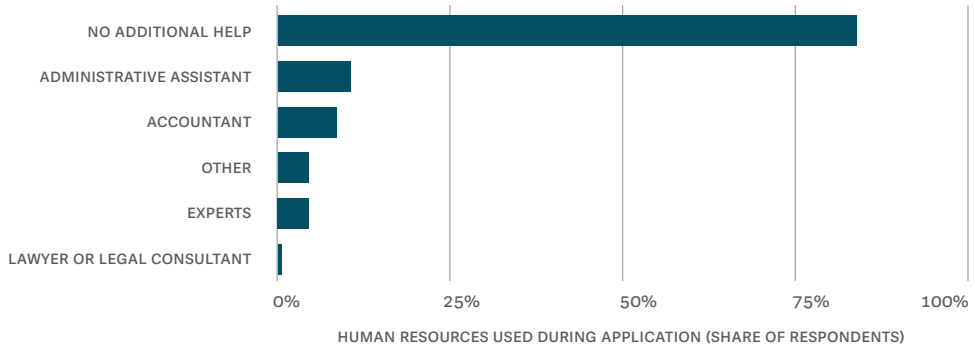
Application costs were rather low, and the majority of respondents required no additional help to complete the application process. The average application cost per project was HRK 10,304, with most respondents reporting application costs of HRK 10,000 or less. Only 11 percent of respondents had application costs of more than HRK 20,000 (Figure 6.9). This may be a result of the type of human resources needed during application. Although 84 percent of respondents completed the application without additional help, the rest needed expert or other support to assist their application. For example, 11 percent of respondents used an administrative assistant, and 9 percent used an accountant (Figure 6.10).

Figure 6.9 The majority of respondents spent less than HRK 10,000 on their application



Source: Beneficiary surveys. N=199.

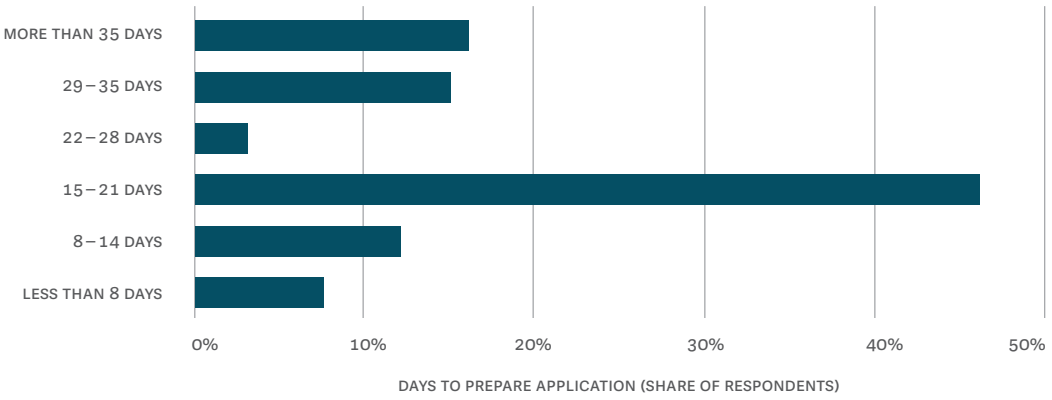
Figure 6.10 Most researchers required no external assistance to prepare the application



Source: Beneficiary surveys. N=199. Other includes project team with other human resources.

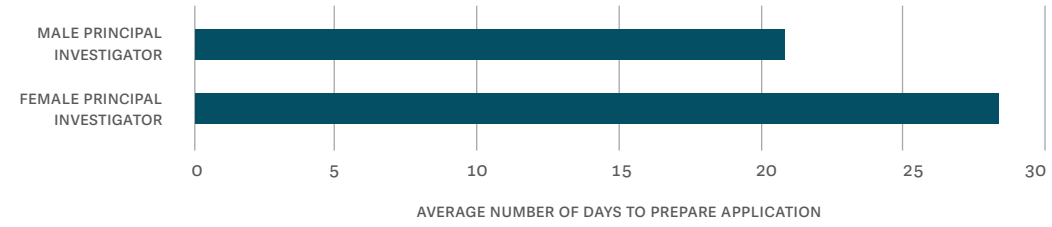
The amount of time needed to complete the application was reasonable. Respondents typically took 3 weeks to complete their application. More specifically, 46 percent of respondents took between 15 and 21 days, 12 percent between 1 and 2 weeks (or 8-14 days), and 8 percent less than one week (Figure 6.11). Only 16 percent took more than 35 days to prepare the application. On average, projects with female principal investigators needed 28 days to prepare their applications, while those with male investigators needed 21 days (Figure 6.12). This difference is statistically significant at the 1 percent level.

Figure 6.11 Most respondents needed three weeks or less to complete their application



Source: Beneficiary surveys. N=199.

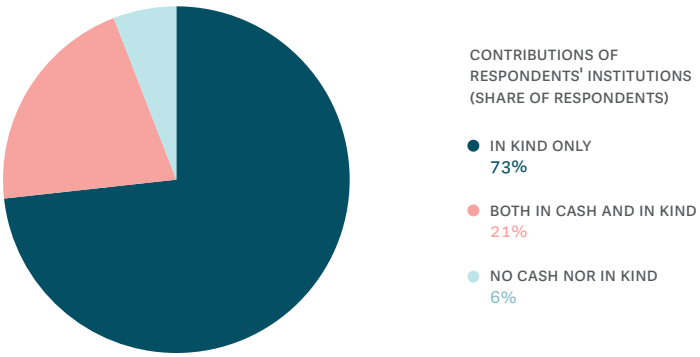
Figure 6.12 Projects with female principal investigators needed more time to prepare their applications



Source: Beneficiary surveys. N=199.

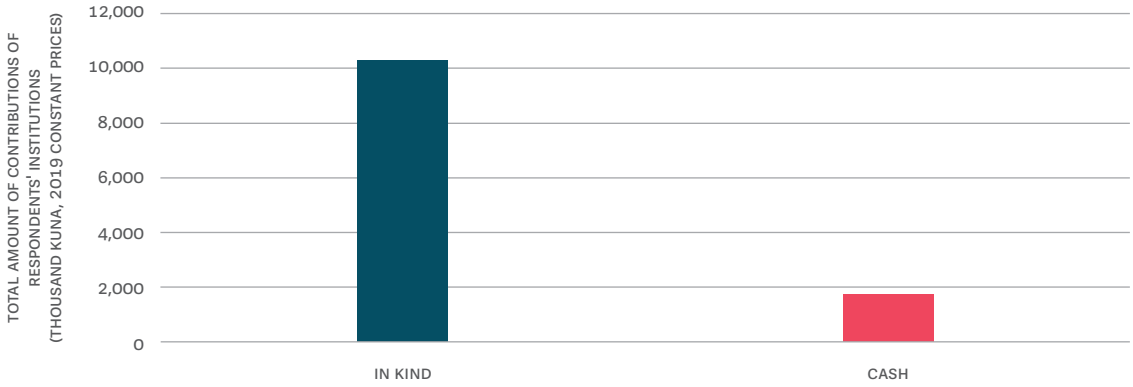
Most respondents received only in-kind contributions from their home institutions. Although 6 percent of respondents did not receive any contributions from their institutions, 73 percent received only in-kind contributions, and 21 percent received both in-kind and cash contributions (Figure 6.13). Total in-kind contributions were valued at approximately HRK 10 million, and cash contributions at HRK 2 million, at the time of the survey (Figure 6.14) . The average in-kind contribution per project was HRK 58,858, and the average cash contribution per project was HRK 45,577.

Figure 6.13 Most respondents received only in-kind contributions



Source: Beneficiary surveys. N=199.

Figure 6.14 The value of in-kind contributions exceeded the value of cash contributions



Source: Beneficiary surveys. N=199.

On average, the costs covered by the program were six times higher than the costs covered by beneficiaries. Considering the application costs and the contributions made by institutions, the average cost covered by beneficiaries amounts to HRK 114,739 per project. On the other hand, the average cost covered by the program is calculated at HRK 744,485 per project. Therefore, the ratio of costs covered by the program to costs covered by beneficiaries is 6.

6.2 Efficiency in the generation of outputs

Investments in beneficiaries

On average, beneficiaries received HRK 17 in direct financial transfers for each HRK the program spent in administrative and operating costs. The program transferred a total of HRK 236 million directly to beneficiaries (on average 704,226 per project). On the other hand, the program spent an estimated HRK 13 million in administrative and operating costs (Table 6.2). This program did not provide indirect financial transfers, such as taxes or discounts, to beneficiaries or other non-financial transfers.

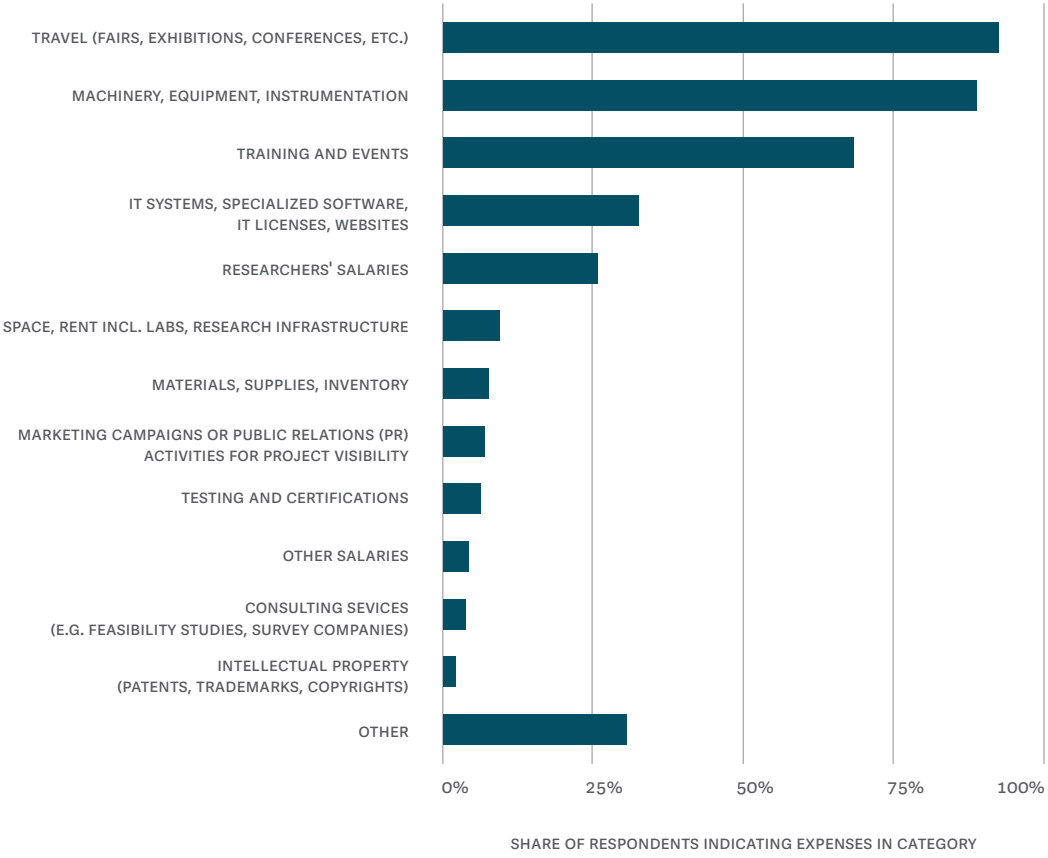
Table 6.2 Program expenditures per project in the Research Projects program

EXPENDITURE TYPE	TOTAL (CONSTANT 2019 - THOUSAND HRK)	AVERAGE PER PROJECT (CONSTANT 2019 - THOUSAND HRK)
Total transfers to beneficiaries (direct financial transfers)	235,916	704
Administrative and operating costs	13,487	40
Total program cost	**249,403**	**744**

Source: HRZZ data and staff calculations.

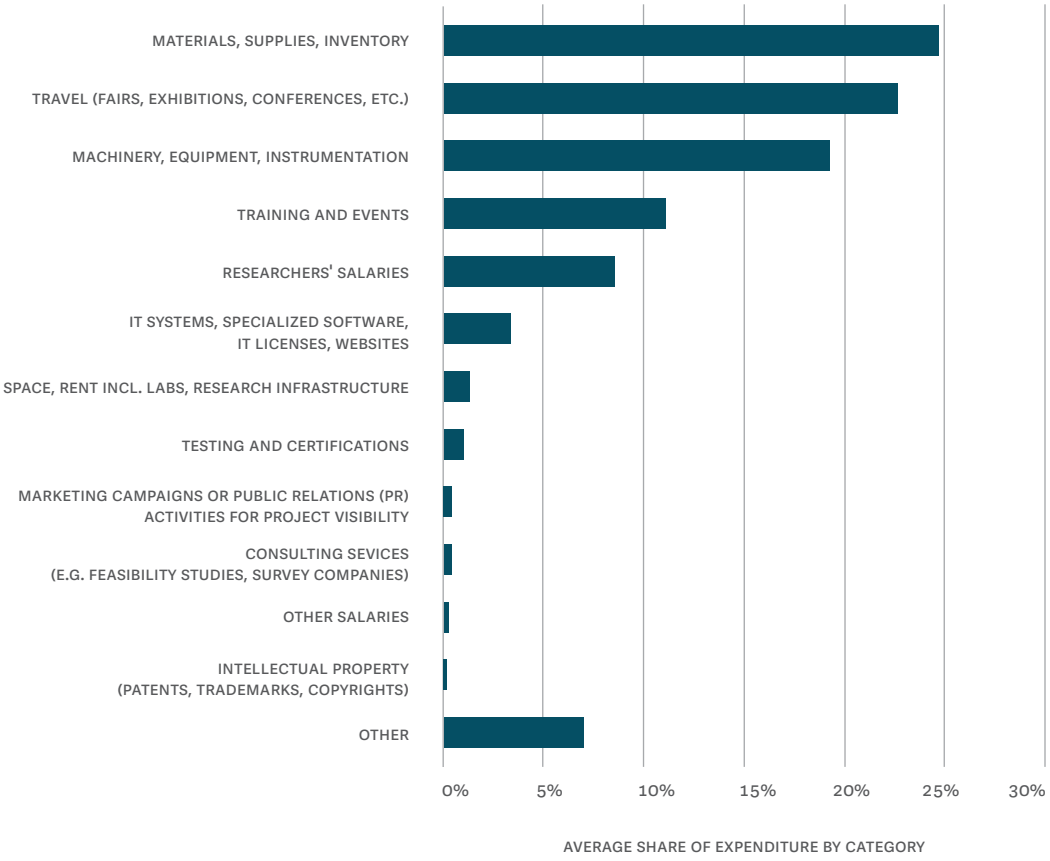
On average, beneficiaries allocated the largest share of their budgets to supplies, travel costs, and equipment. Around 90 percent of respondents had expenses related to travel, machinery, equipment, and instrumentation (Figure 6.15). These were followed by training and events, for which 68 percent of beneficiaries had expenses. In contrast, only 4 percent had expenses for consulting and 2 percent for intellectual property. Survey respondents estimated that a quarter of expenses went towards materials, supplies, and inventory. This was closely followed by travel expenses (23 percent), which include fairs, exhibitions, and conferences, among others (Figure 6.16). On the contrary, less than one percent of funding was allocated to intellectual property, salaries other than those of researchers, consulting services, and marketing campaigns.

Figure 6.15 Most respondents recorded expenses related to travel, machinery, equipment, and instrumentation



Source: Beneficiary surveys. Multiple selection question. N=190. Note: Other includes literature and data acquisition, scholarships, field work, publishing, compensation funds, external services, upgrade and maintenance of equipment.

Figure 6.16 The largest share of the budget was allocated to supplies, travel and machinery and equipment

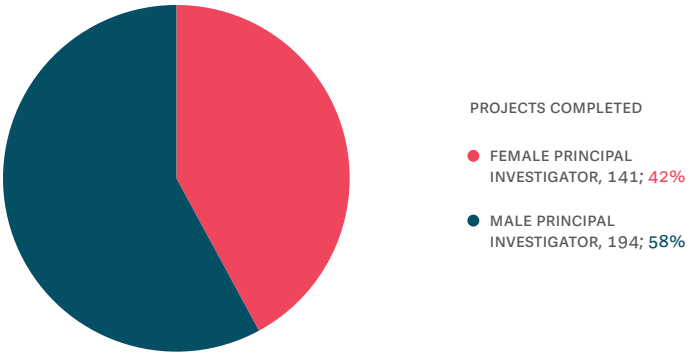


Source: Beneficiary surveys. Multiple selection question. N=190.

Outputs achieved

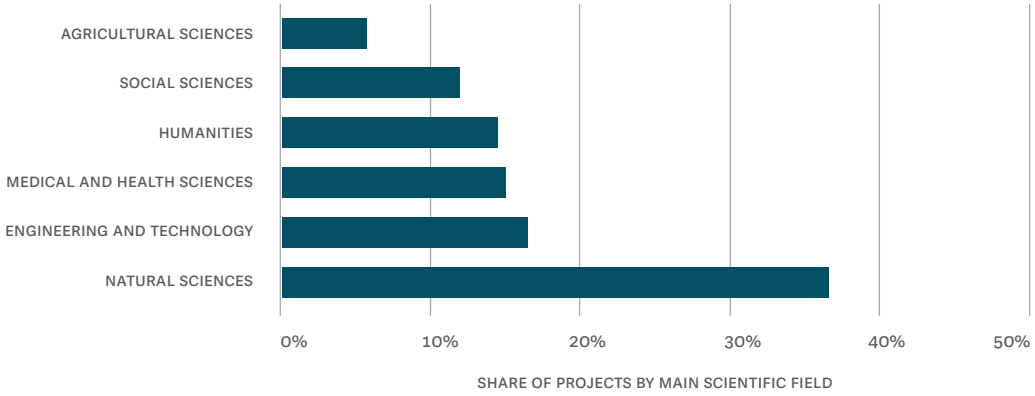
A total of 335 projects were completed with HRK 236 million of support in direct financial transfers, mostly in natural sciences, engineering, and medicine. The program also supported a total of 3,584 research team members, of which 51 percent were female. Most projects were completed in 2018 and 2019 and 42 percent had a female principal investigator (Figure 6.17), which corresponded to 41 percent of the funding disbursed. 37 percent of the projects in the survey had natural sciences as their main scientific field (Figure 6.18). Engineering and technology, medical and health sciences, and humanities were each represented by about 15 percent of the projects.

Figure 6.17 The majority of principal investigators were men



Source: HRZZ data. N=335.

Figure 6.18 Respondents' projects were most frequently in the field of natural sciences



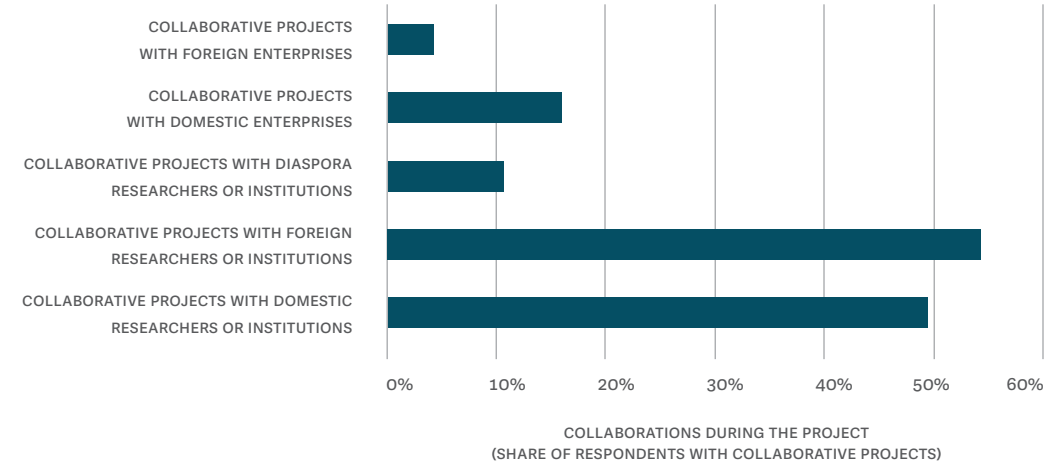
Source: Beneficiary surveys. N=194.

On average, respondents achieved 33 outputs per project, corresponding to 31 outputs per HRK 1,000 of program costs. Four outputs were tracked for this program: collaborative projects during implementation; the researchers involved in the project; seminars, workshops and conferences attended; and training activities attended. Among these, a total of 7,677 outputs were achieved.

About half of the respondents had collaborative projects with domestic or foreign researchers or research institutions during implementation (Figure 6.19). These amounted to 170 projects with domestic researchers, 213 with foreign researchers, and 29 with diaspora researchers. Collaborative projects with industry were less frequent: 62 in total. Sixteen percent of respondents had collaborative projects with domestic enterprises, amounting to 45 projects, while only 4 percent (or 17 projects) had collaborative projects with foreign enterprises.

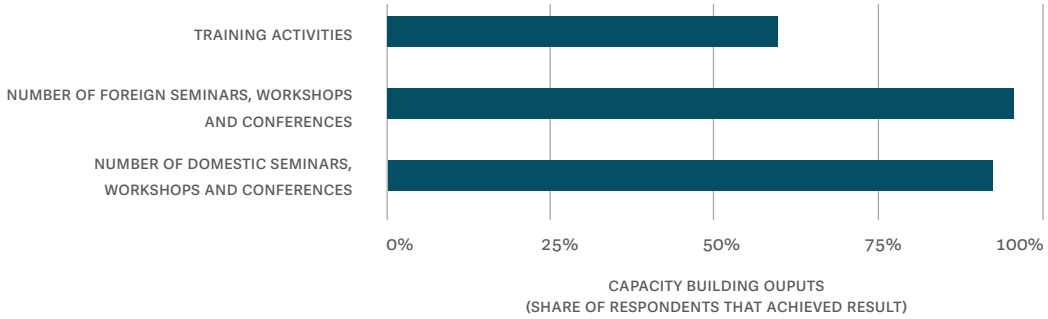
The majority of respondents were involved in seminars and conferences, both domestically and abroad. Over 90 percent of respondents attended a total of 1,140 domestic seminars, workshops, and conferences, and 96 percent attended 1,944 foreign ones. Also, 60 percent of respondents attended a total of 534 training activities during or after the implementation of their projects (Figure 6.20).

Figure 6.19 About half of the respondents had collaborative projects with domestic or foreign researchers or research institutions



Source: Beneficiary surveys. N=187.

Figure 6.20 Almost all respondents attended domestic and foreign seminars or conferences, and many attended training activities



Source: Beneficiary surveys. N=187.

6.3 Efficiency in the generation of outcomes

In total, 4,776 outcomes were achieved by survey respondents (including both intended and other results), averaging 26 outcomes achieved per project. Intended outcomes are related to collaborative projects after project completion, doctoral or master's theses or titles, scientific publications in peer-reviewed journals, and intellectual property (patent applications, patents granted, industrial designs, and copyrights). Other results include market-oriented research, technology transfer outcomes such as spin-offs, new products, processes, and services, and new software and technology development.

Intended outcomes achieved

Beneficiaries made achievements in all intended outcomes, mostly related to scientific publications. Most respondents had achievements in terms of publishing scientific papers (98 percent) and doctoral or master's titles or theses (76 percent) (Table 6.3).

Table 6.3 The most common outcomes were related to publications

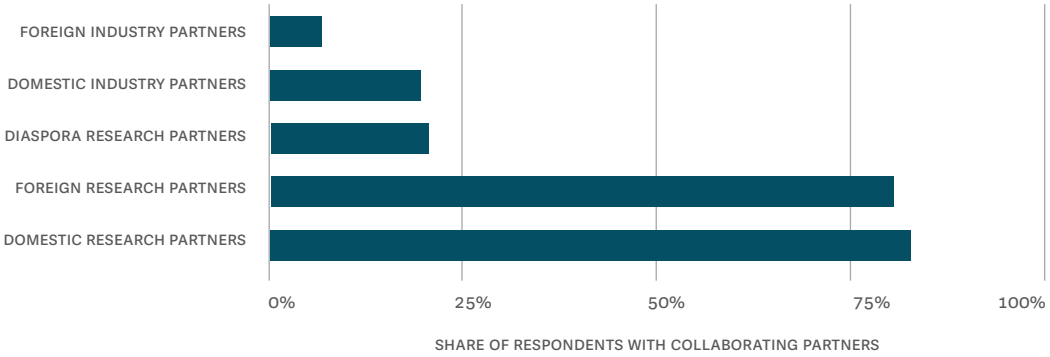
INTENDED OUTCOME	SHARE OF RESPONDENTS THAT ACHIEVED RESULT	NUMBER OF RESPONDENTS THAT ACHIEVED RESULT	TOTAL NUMBER OF RESULTS REPORTED
Collaborative projects with domestic researchers or research institutions after the project	46%	85	132
Collaborative projects with foreign researchers or research institutions after the project	43%	81	137
Collaborative projects with diaspora researchers or research institutions after the project	9%	17	21
Collaborative projects with domestic enterprises after the project	17%	32	53
Collaborative projects with foreign enterprises after the project	1%	2	4
Doctoral or master's titles or theses	76%	142	448
Scientific publications in peer-reviewed journals	98%	183	3,638
Patent applications	4%	8	17
Patents granted	2%	3	12
Industrial designs	0%	0	0
Copyrights	1%	1	6

Source: Beneficiary surveys. N=187.

Around 40 percent had collaborative projects with researchers or research institutions, and a small share with enterprises. Regarding intellectual property, few respondents submitted patent applications (4 percent), were granted patents (2 percent), or established copyrights (1 percent).

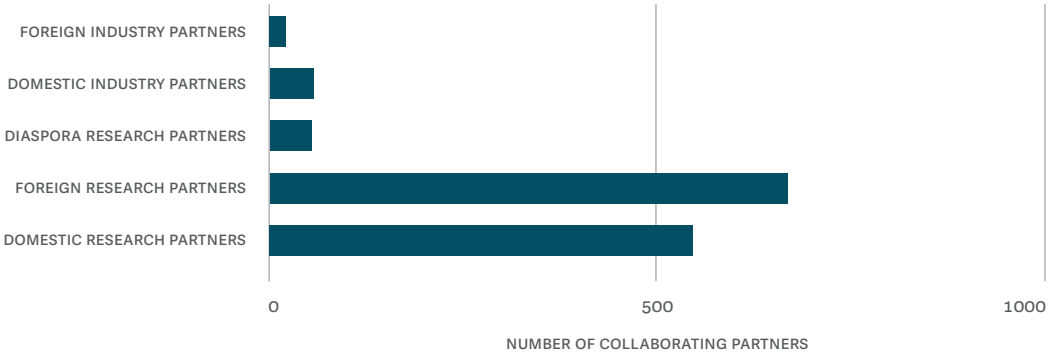
Most respondents collaborated with research partners and relatively few with industry partners. Around 83 percent of respondents engaged with a total of 546 domestic partners, and 81 percent engaged with 668 foreign research partners. In contrast, respondents engaged with a total of 56 domestic industry partners and 19 foreign industry partners. (Figure 6.21 and Figure 6.22).

Figure 6.21 Most respondents collaborated with research partners, but relatively few had industry partners



Source: Beneficiary surveys. N=181.

Figure 6.22 The number of foreign research partners exceeded the number of domestic research partners



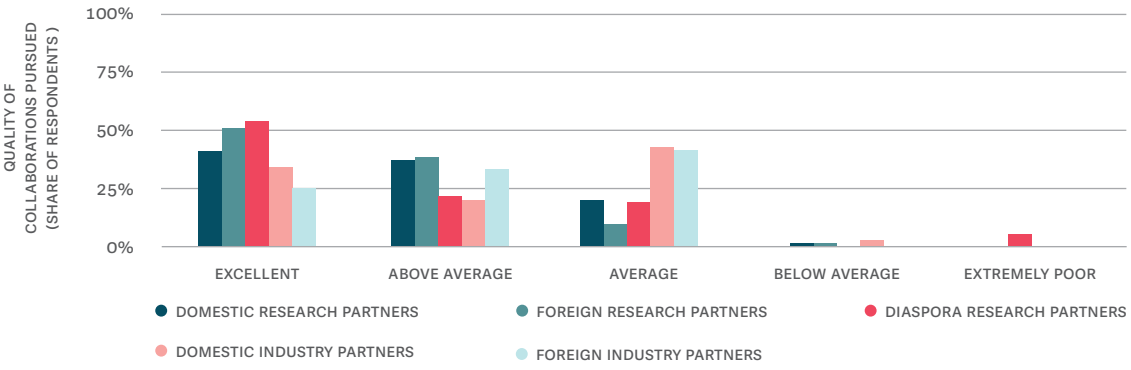
Source: Beneficiary surveys. N=181.

When evaluating the quality of the collaborations pursued, foreign and diaspora research partners received the best ratings. 51 percent of those who pursued collaborations with foreign research partners and 54 percent of those who pursued collaborations with diaspora rated them as excellent. In contrast, domestic industry partners were one

of the lowest rated, with 43 percent of respondents with those partnerships evaluating them as average and 3 percent as below average (Figure 6.23).

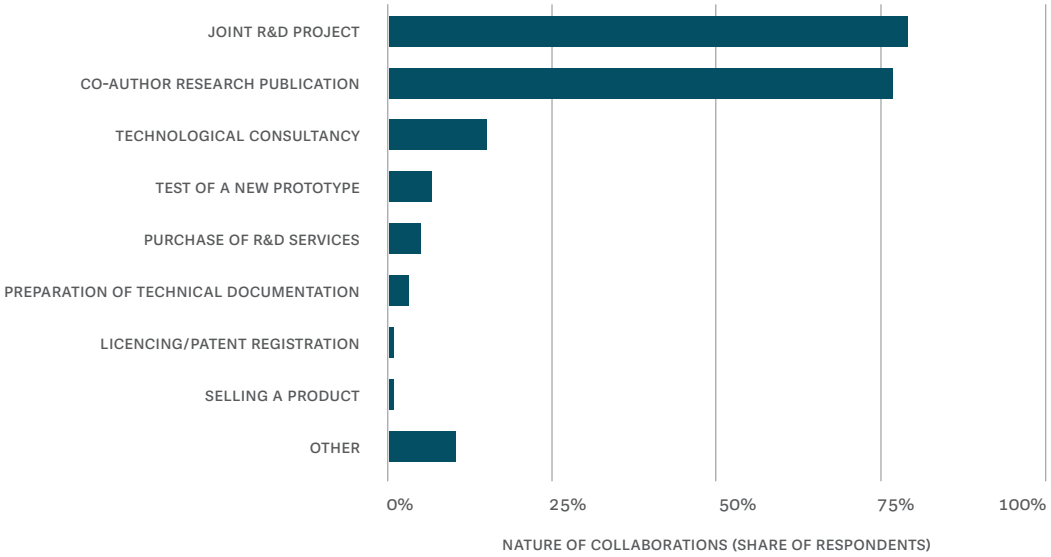
The nature of the collaborations pursued was varied, but similar to other programs, but for most respondents, their purpose was to conduct joint R&D projects and co-authorship. Almost 80 percent of respondents worked jointly in R&D projects and 77 percent co-authored research publications with their partners (Figure 6.24). Technological consultancies were the third most pursued type of collaboration, which 15 percent of respondents had. Licensing, patent registration, and selling a product were among the least pursued type of collaborations.

Figure 6.23 Foreign and diaspora research partners received the best ratings



Source: Beneficiary surveys. N=168.

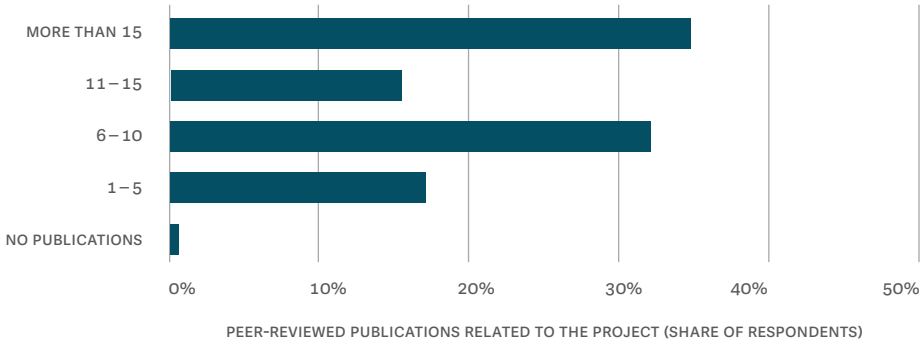
Figure 6.24 The most commonly cited purpose for collaboration was conducting joint R&D projects and co-authorship on publications



Source: Beneficiary surveys. N=168. Other includes gaining experience and expanding contacts, lectures and conferences, preparation of book, consultations.

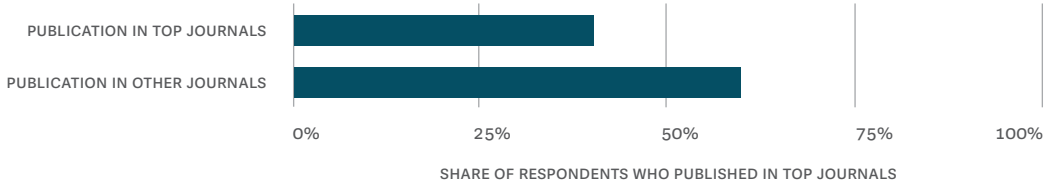
Program beneficiaries published a large volume of scientific papers during or after the implementation of their projects (Table 6.3). Almost all respondents (98 percent) published papers in peer-reviewed journals, and 40 percent of them were published in top journals. An important share of respondents published a rather large amount – 35 percent published more than 15 scientific papers and 32 percent between 6 and 10 (Figure 6.25). 40 percent of respondents published in top journals (Figure 6.26). When asked to list the most important publications, respondents provided 857 titles, out of which 14 percent were published in top journals. An additional analysis about the quality of publications of HRZZ-funded projects was conducted with data from CROSBI database and is presented in section 2.3.

Figure 6.25 The majority of respondents published more than five publications related to the project



Source: Beneficiary surveys. N=187.

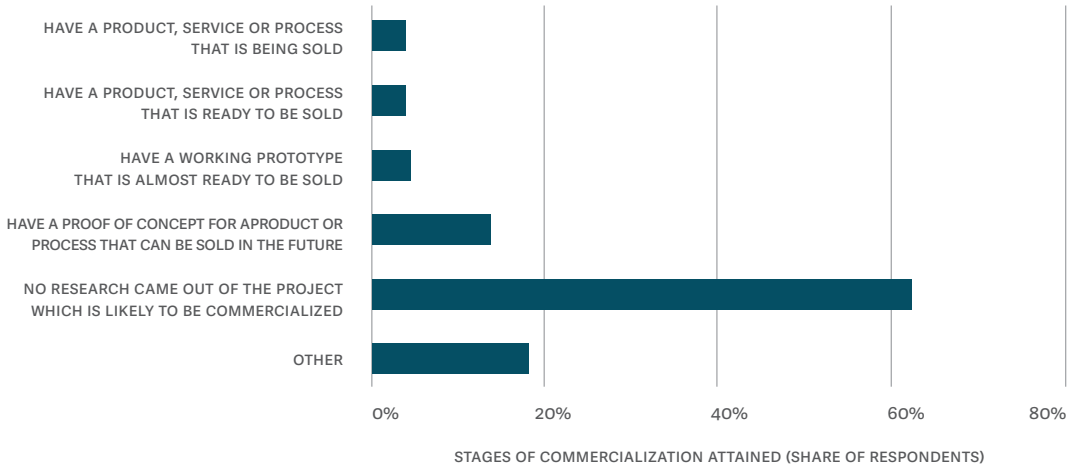
Figure 6.26 A high share of publications were published in top journals



Source: Beneficiary surveys. N=179.

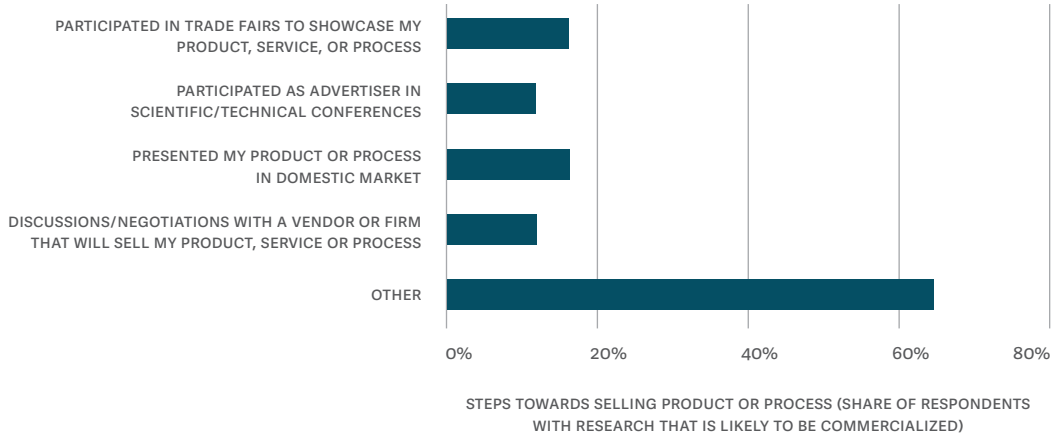
Most of the research is unlikely to be commercialized. Only about 14 percent of respondents have a proof of concept for a product or process that can be sold in the future, and a few have a working prototype or have a product, service or process that is ready to be sold or is already being sold (Figure 6.27). Those whose research is likely to be commercialized have taken steps such as participating in trade fairs (16 percent of respondents with research that is likely to be commercialized) or presenting their product or process in the domestic market to sell them (16 percent) (Figure 6.28).

Figure 6.27 For most respondents, the results of the research are unlikely to be commercialized



Source: Beneficiary surveys. N=181. Other includes project is not commercial (e.g. research).

Figure 6.28 Research that is likely to be commercialized is most frequently presented in conferences or in the media



Source: Beneficiary surveys. N=68. Other includes media presentation & press conferences, scientific conferences, product is not ready for commercialization, dissemination of results (conferences, seminars, etc.), further technological improvements, technology transfer agreement.

Other results

Other achievements reveal a high potential for the beneficiaries of the program to contribute to the economy, despite this not being the main focus of the program. The most prominent outcomes were 70 market-oriented research activities conducted by 15 percent of respondents and 66 new software applications developed by 17 percent (Table 6.4). This shows that, despite the fact the program focuses on basic and applied research, Croatian researchers display a promising level of interest in using their research to respond to the needs of the economy.

Table 6.4 Other results achieved by respondents include the development of new software, new technology, and market-oriented research

OTHER PROJECT RESULTS ACHIEVED DURING OR AFTER THE PROJECT	SHARE OF RESPONDENTS THAT ACHIEVED RESULT	NUMBER OF RESPONDENTS THAT ACHIEVED RESULT	TOTAL NUMBER OF RESULTS REPORTED
Market-oriented research	15%	28	70
Transfer agreements	2%	4	4
New enterprise, business or spin-off	1%	2	4
Prototype	6%	11	26
New products, processes, or services	14%	27	38
Upgraded products, processes, or services	7%	14	31
New design for a product, process, or service	4%	8	11
New software development	17%	31	66
New technology development	12%	23	36

Source: Beneficiary surveys. N=187.

6.4 Perceived quality

Quality of program contributions

The program was successful in making its objectives clear and its information easily identifiable during the application stage, but many respondents were not satisfied with the flexibility of rules, the information required in proposals, and the time to get a funding decision. Figure 6.29 shows that three-quarters or more of the survey respondents were satisfied with the clarity of program objectives, identifiability of program information, explanations of the application procedure, and availability of feedback on why the project was approved. Fewer respondents were satisfied with the time from application to results (36 percent), information required in project proposals 33 percent) and the flexibility of the rules for non-compliance with the call for proposal (18 percent).

Suggestions to improve the selection process revolve around reducing conflicts of interest in the selection panel and improving the quality of peer review. In open-ended questions, respondents were invited to propose changes to the selection criteria.[19] However, those that provided comments mostly reflected on the selection process rather than any particular criterion. Reducing conflicts of interest in the domestic selection panel, as well as increasing the quality of the peer review were the most commonly raised issues. With regards to the domestic selection panel, proposals ranged from increasing the transparency of the work of the domestic panel, to abolishing the first round of selection, to abolishing the domestic panel altogether. While the solutions to improve the work of the domestic panel varied widely, they all pointed to a common concern of respondents related to potential conflicts of interest in the domestic panel.[20] Respondents also called for improving the quality of the international peer review, including by seeking the assessment of a third reviewer, especially in case of a substantial discrepancy in the scores of two reviewers.

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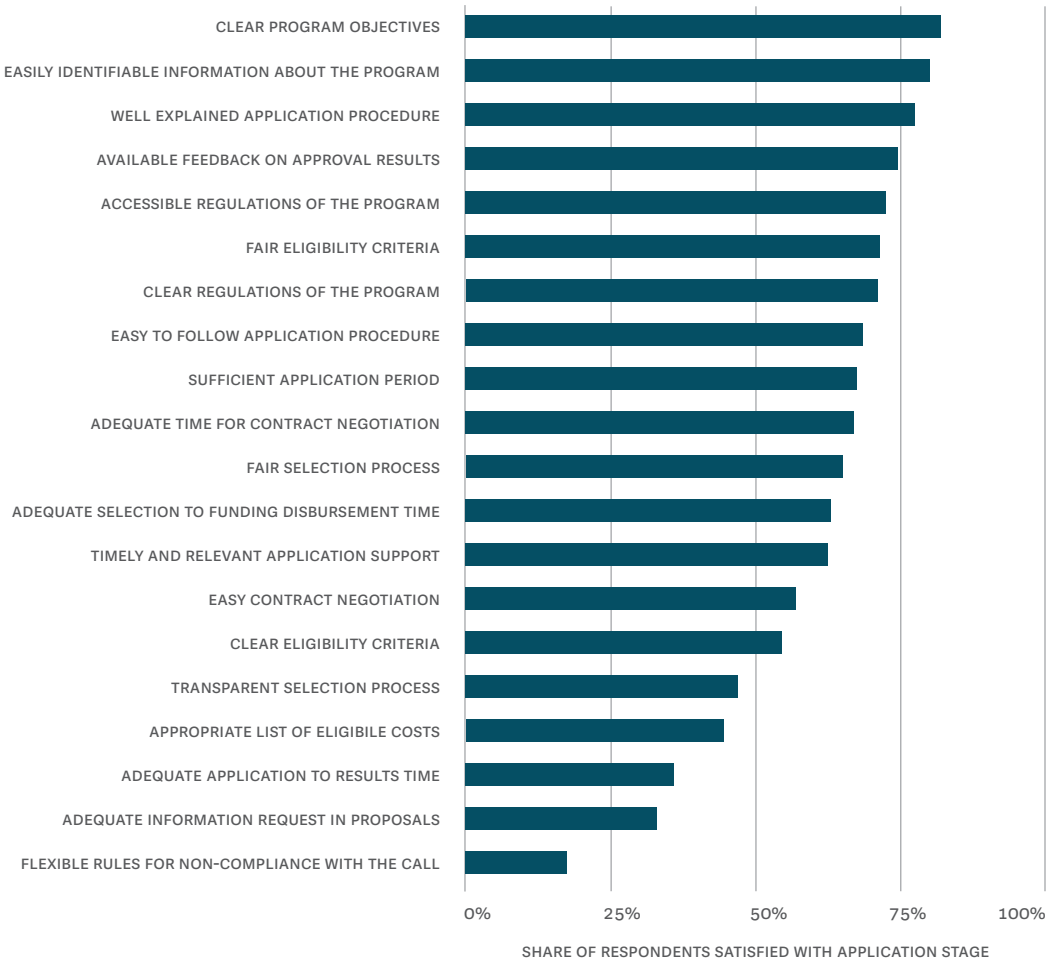
19 For the RP program, respondents submitted 50 open-ended responses for changing selection criteria, 21 for adding, and 16 for removing criteria. 19 responses were related to the quality of the international peer review and 21 were suggestions related to the domestic panel. In the question on eligibility criteria, an additional 3 respondents commented on the international peer review and 3 provided suggestions on the domestic panel.

20 The selection process in HRZZ has been described in detail in the report Functional and Governance Analysis (World Bank 2020b), where the possibility for a perception of conflict of interest in the work of the domestic panel was raised.

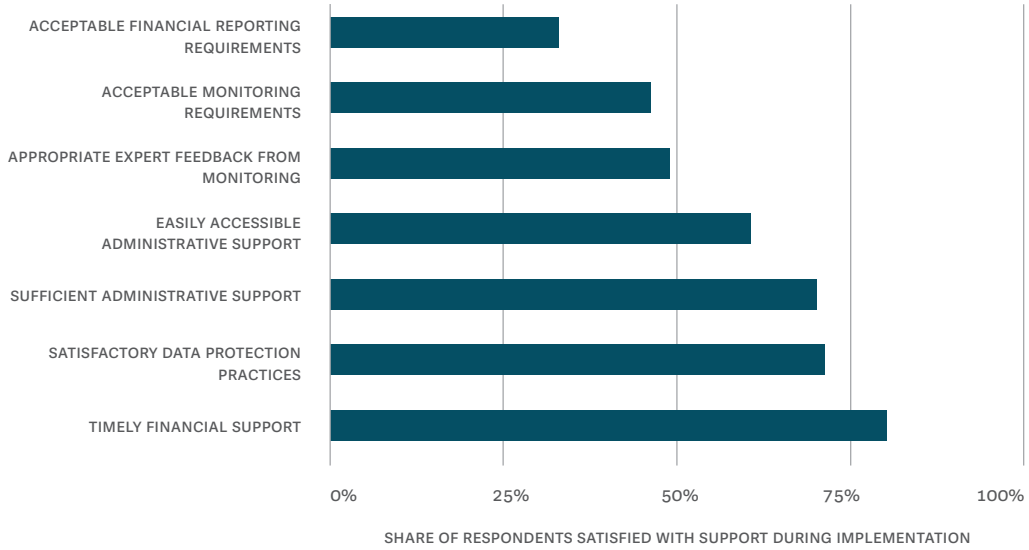
Figure 6.29 Respondents were not satisfied with the flexibility of rules, the information required in proposals, and the time to get a funding decision



Source: Beneficiary surveys. N=200. Note: The level of satisfaction was measured on a scale of 1-5, where 1 is strongly disagree and 5 strongly agree. The figure shows the percentage of respondents who agreed or strongly agreed with the statements.

Most respondents were satisfied with the timeliness of the financial support, the data protection practices, and the administrative support received during implementation, but dissatisfied with financial reporting requirements. Only 33 percent of respondents found the financial reporting requirements acceptable, while 46 percent found the monitoring requirements acceptable (Figure 6.30). Almost half of the respondents thought the expert feedback from monitoring was appropriate.

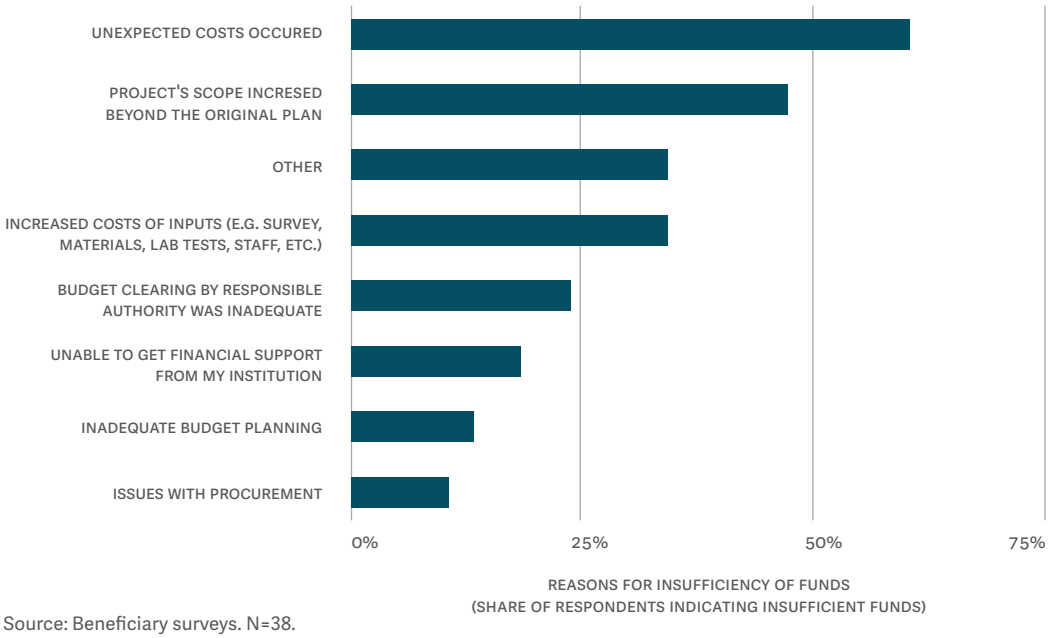
Figure 6.30 Financial reporting and monitoring requirements were least satisfactory



Source: Beneficiary surveys. N=188. Note: The level of satisfaction was measured in a scale of 1-5, where 1 is strongly disagree and 5 strongly agree. The figure shows the percentage of respondents who agreed or strongly agreed with the statements.

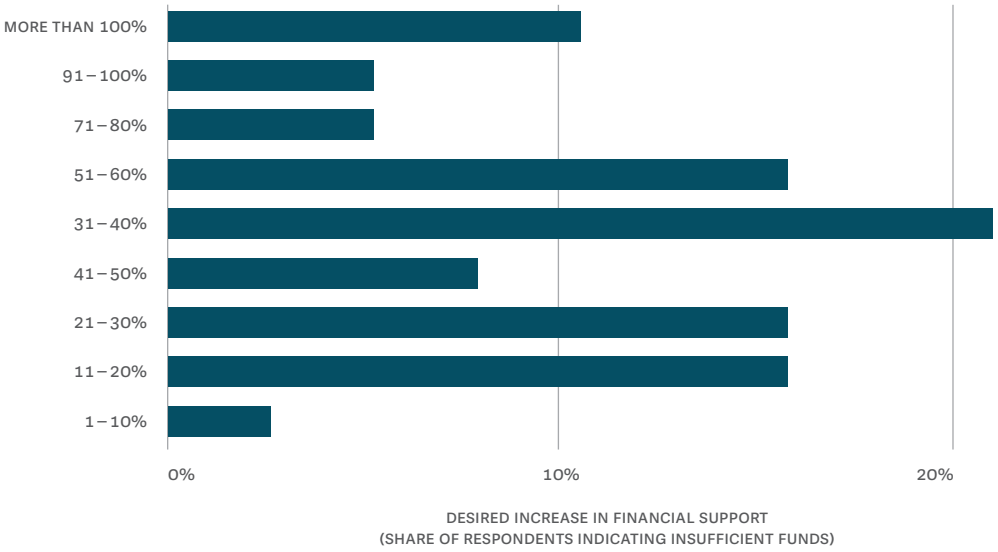
For most respondents, the time and funding provided for implementation were sufficient, but some had issues with unexpected costs, changes in the project scope, and heavy teaching loads. Ninety-six percent of respondents received the funding for their projects according to the terms of the contract signed with the program. Additionally, for 80 percent, the amount of financial support provided by the program was sufficient to successfully complete their project objectives. The main reasons why the amount of financial support was insufficient for some beneficiaries were unexpected costs and increases in project scope beyond the original plan (Figure 6.31). Those for whom the amount of financial support was insufficient had gaps of various sizes: for 21 percent, a 31 to 40 percent increase in funding would have been enough, while 11 percent needed more than 100 percent (Figure 6.32). Only 3 percent desired an increase of up to 10 percent. The time allowed for implementation was insufficient for 14 percent of respondents, mostly because they could not reduce their teaching workload.

Figure 6.31 Unexpected costs and increase in project scope were frequently cited as reasons why funds were insufficient



Source: Beneficiary surveys. N=38.

Figure 6.32 Respondents estimated varying levels of financing gaps, mostly requiring a funding increase of up to 60 percent

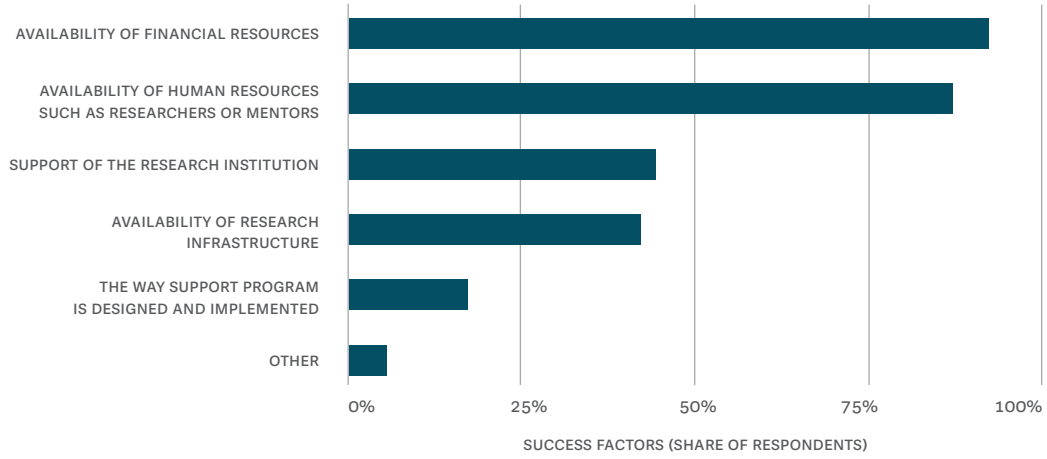


Source: Beneficiary surveys. N=38. Other includes: Too many project members; Budget limit on all categories; High costs of fieldwork; Total amount is too low for concrete science.

Similar to other programs targeting researchers, the availability of financial and human resources were the most important factors contributing to the achievement of results. The way the program is designed and implemented was among the most important success factors for only 17 percent of respondents (Figure 6.33).

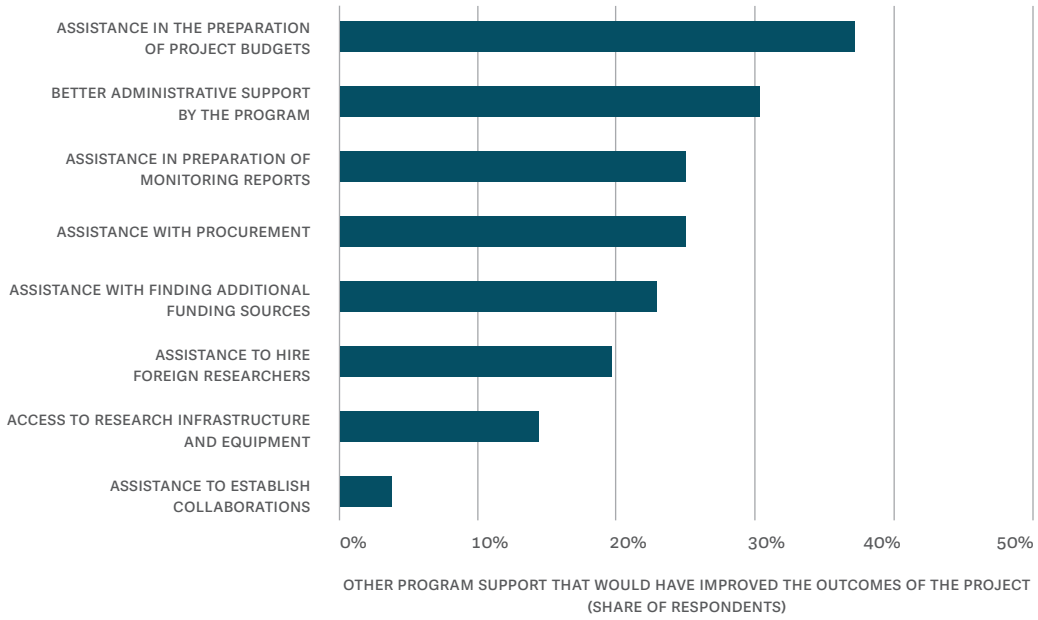
Beneficiaries need more assistance in the preparation of project budgets and better administrative support. Beneficiaries were asked about the type of support they needed during implementation that would have improved the outcomes of their project and were not present. The most prominent are assistance in the preparation of project budgets and better administrative support, which were selected by 37 and 30 percent of survey respondents, respectively (Figure 6.34). Assistance to establish collaborations was one of the least chosen (4 percent of respondents). Regarding the provision of support and services, 32 percent of the respondents would like the leading institution (HRZZ) to provide technical experts, and 29 percent would like eligible activities to include hiring experts for program support.

Figure 6.33 Availability of financial and human resources were the main success factors for most beneficiaries



Source: Beneficiary surveys. Multiple selection question. N=187.

Figure 6.34 Assistance in the preparation of project budgets and better administrative support were among the most frequent responses related to additional program support



Source: Beneficiary surveys. Multiple selection question. N=188.

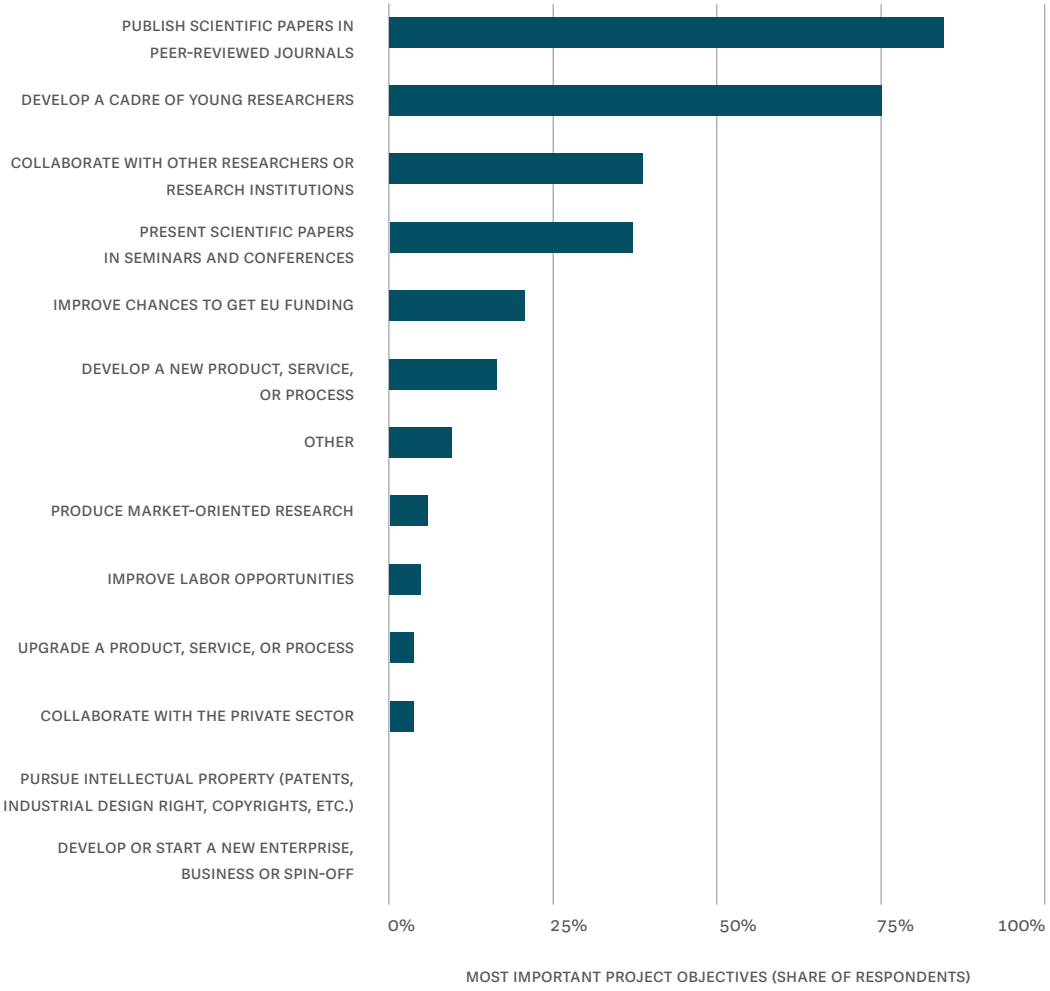
Overall project quality

Project objectives were largely aligned with program objectives. In line with the program's objectives, 85 percent of the survey respondents had as one of their main goals to publish scientific papers in peer-reviewed journals (Figure 6.35). Likewise, 75 percent of respondents selected to develop a cadre of young researchers among their main objectives. However, the program also had as objectives for beneficiaries to present scientific papers in seminars and conferences, as well as to collaborate with other researchers or research institutions. However, less than 40 percent of respondents had these among their top objectives.

A few survey respondents had other objectives that were broader than the program's primary objectives. For example, 21 percent of respondents had as one of their main objectives to improve their chances to get funding from a European Union source and 6 percent to produce market-oriented research.

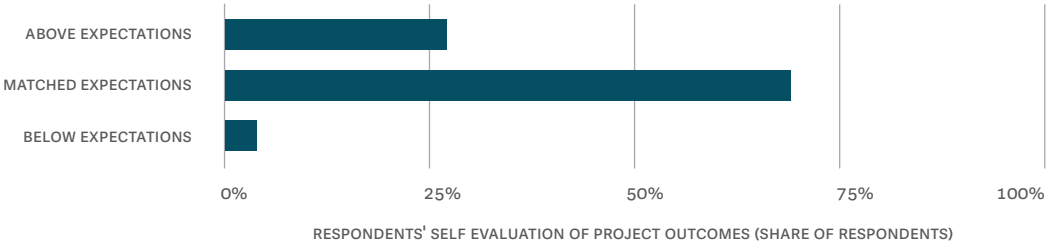
Most respondents stated that their project's outcome matched their own expectations, and for a large portion, the outcome exceeded their expectations. The overall project outcome matched the expectations of almost 70 percent of respondents. The outcome was above expectations for about a quarter, and it was below expectations for only 4 percent (seven respondents) (Figure 6.36).

Figure 6.35 Most important objectives for beneficiaries were to publish scientific papers and develop a cadre of young researchers



Source: Beneficiary surveys. N=189.

Figure 6.36 For close to a third of respondents, project outcomes exceeded their expectations



Source: Beneficiary surveys. N=181.

7 Installation Research Projects

Installation Research Projects

The Installation Research Projects program supports young scientists to establish new research groups, in order to accelerate the development of independent research careers. The program is designed and implemented by HRZZ and is funded from the national budget. From 2013 until today, five calls for proposals were launched under the program and more than 200 projects have been funded. The fifth edition of the program was launched in 2020, with an allocation of around HRK 20 million. This analysis focuses on two calls for which projects are completed, conducted in 2013 and 2014, which includes 102 projects.

The survey response rate for this program was 72 percent, the highest for the survey targeting researchers. This rate is calculated as those that completed over 50 percent of the survey. Beneficiaries that responded to the survey received 72 percent of the funding disbursed. On average, respondents received a higher value grant (HRK 621,000) compared to all IRP beneficiaries (HRK 604,000). 100 beneficiaries received the survey in June 2020, and 74 opened it, evidencing a high cooperation rate.

7.1 Efficiency in the use of inputs

Costs covered by the program

An estimated 90 percent of the program costs in the 2013-2020 period were direct financial transfers to beneficiaries. Administrative and operating costs represented 10 percent of the total program costs (Figure 7.1).[21] The total cost of the program amounted to almost HRK 68 million. Most of the costs in terms of direct financial transfers were incurred in 2014 and 2015, the years after the calls for proposals were launched (Figure 7.2). Under this program there were no indirect financial transfers (such as tax deductions or discounts) or non-financial transfers such as facilities or equipment lent.

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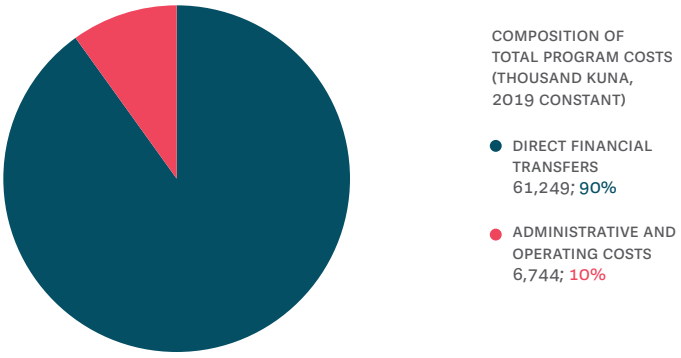
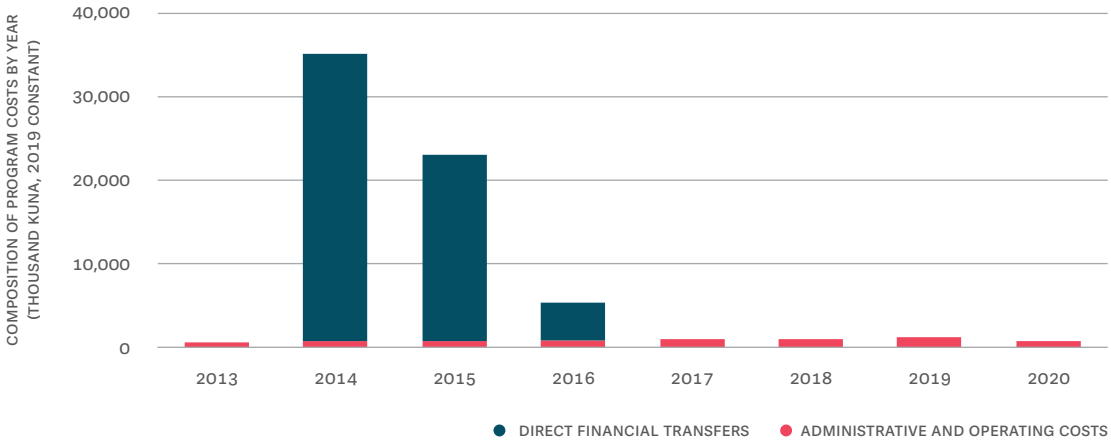
21 The administrative data on administrative and operating costs included personnel, fixed costs, and external services at the agency level, covering expenses for all their programs. Upon consultation with HRZZ, the following assumptions were made to calculate the costs particular to the Installation Research Projects program: For personnel costs, it was assumed that 90 percent of the entity's personnel workload was spent in tasks for the Research Projects and Installation Research Projects programs. It was also assumed that two thirds of the workload for these two programs pertains to the Research Projects program and one third to the Installation Research Projects program.

Figure 7.1 Administrative and operating costs make up around 10 percent of total program costs



Source: HRZZ data and staff calculations.

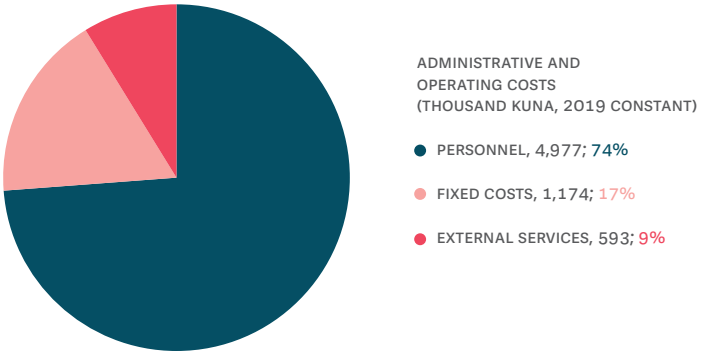
Figure 7.2 Program costs tend to be concentrated in the years after call publication



Source: HRZZ data and staff calculations.

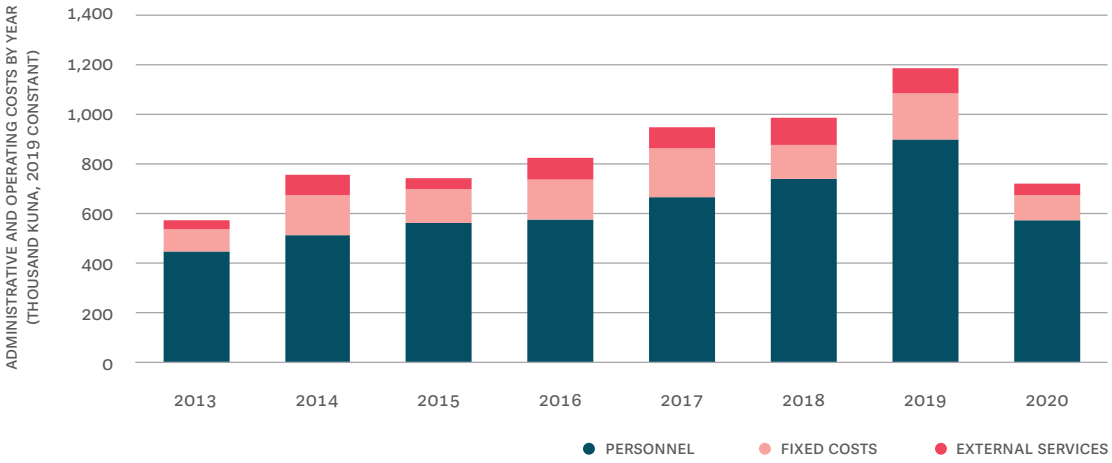
As in the case of other programs, administrative and operating costs were mainly driven by personnel salaries. Salaries accounted for 74 percent and amounted to an estimated HRK 5 million. In contrast, the lowest share of administrative and operating costs (9 percent) were external services contracted, which include costs incurred in experts for monitoring, evaluation, and other studies, as well as travel expenses for experts for evaluation of proposals (Figure 7.3). Personnel and external services have been increasing over the years (Figure 7.4).

Figure 7.3 Three quarters of program costs pertain to personnel costs



Source: HRZZ data and staff calculations.

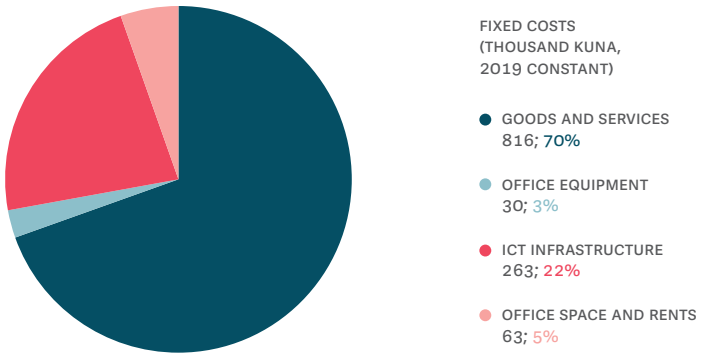
Figure 7.4 Administrative and operating costs grew due to an increase in personnel costs



Source: HRZZ data and staff calculations.

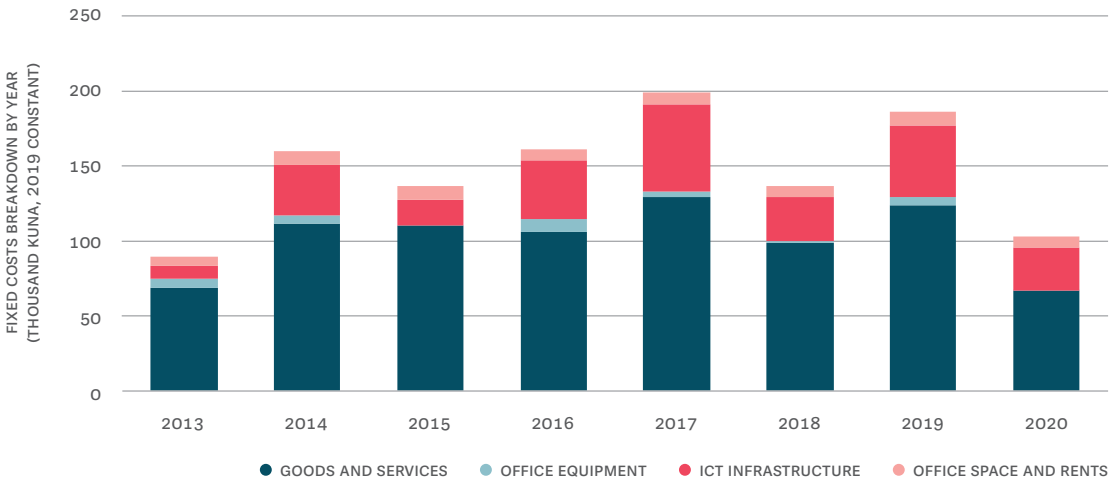
The program spent approximately HRK 1.2 million in fixed costs over a period of eight years, mostly towards goods and services. These included office supplies, materials, and services such as maintenance, external audit, intellectual services, and hosting of external partners, which accounted for 70 percent of the total fixed costs (Figure 7.5). ICT infrastructure costs are also sizable, making up 22 percent of total fixed costs. Across the years, there is some variability in the costs of goods and services and ICT infrastructure (Figure 7.6). It is worth noting that, as in the case of the Research Projects program, the administrative data available did not include fixed costs for this program in particular, but for the whole entity, thus, fixed costs were approximated using a weight that was defined as the share of personnel costs of this program to the personnel costs of the whole entity.

Figure 7.5 Fixed costs are dominated by expenses for goods and services



Source: HRZZ data and staff calculations.

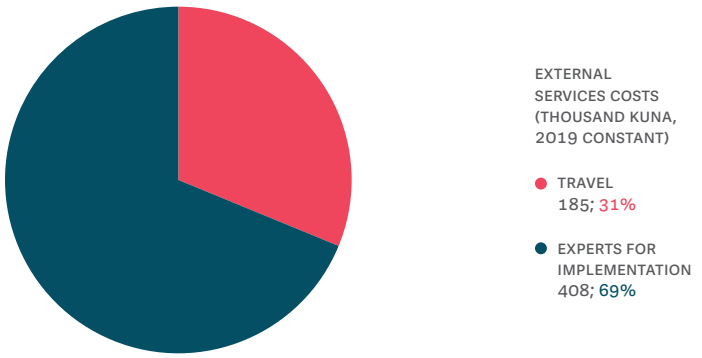
Figure 7.6 The variation in fixed costs was driven by variation in ICT costs and goods and services costs



Source: HRZZ data and staff calculations.

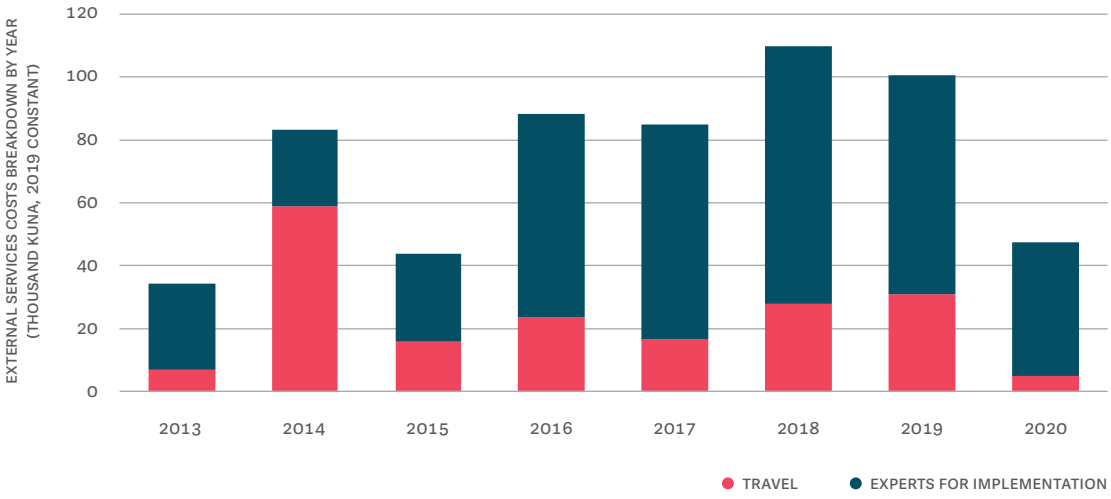
External service costs are driven mostly by costs for implementation experts and their travel expenses. External services amounted to over HRK 590,000 in the 2013-2020 period. Of these, 69 percent were incurred for experts in monitoring, evaluation, and other studies, and the rest corresponded to travel expenses of experts for the evaluation of proposals (Figure 7.7). There was variation in the costs of travel across the years, with the highest registered in 2014. The costs of experts for implementation increased considerably from 2016 onwards (Figure 7.8). As in the case of fixed costs, the available administrative data did not include the specific external services costs for this program, so the costs were approximated using the same weights as in the case of fixed costs.

Figure 7.7 External service costs cover expenses for implementation experts and travel costs for applicant evaluators



Source: HRZZ data and staff calculations.

Figure 7.8 External services costs varied widely from year to year



Source: HRZZ data and staff calculations.

The total costs of running the program amounted to approximately HRK 66,113 per project, on average. Of these, on average, about HRK 49,000 per project were spent on personnel, HRK 12,000 per project on fixed costs, and HRK 6,000 per project on external services (Table 7.1).

Table 7.1 Administrative and operating costs per project in the Installation Research Projects program

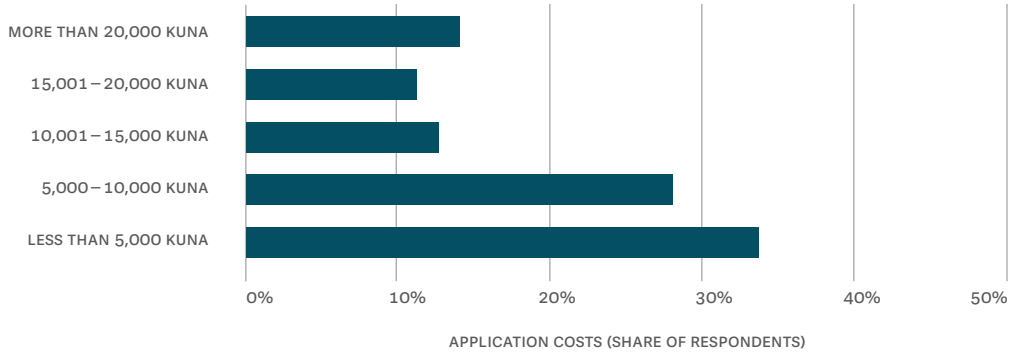
COST CATEGORY	TOTAL (CONSTANT 2019 - THOUSAND HRK)	AVERAGE PER PROJECT (CONSTANT 2019 - THOUSAND HRK)
Personnel	4,977	49
Fixed costs (offices, materials, equipment, services)	1,174	12
External services	593	6
Total administrative and operating costs	6,744	66

Source: HRZZ data and staff calculations.

Costs covered by beneficiaries

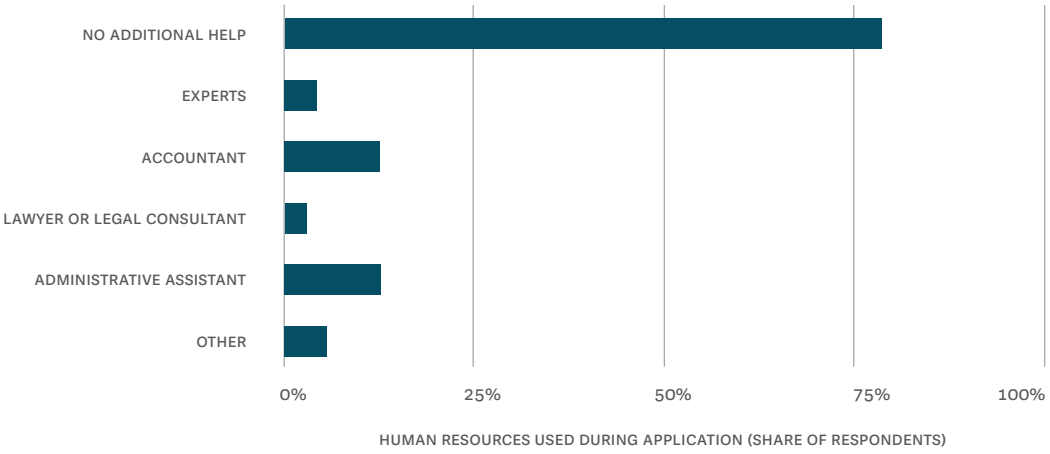
Average application costs were slightly higher than in the RP program, but still lower than in other programs that target researchers. Beneficiaries incurred average application costs of HRK 11,945 per project. Over half of the respondents spent up to HRK 10,000, but 14 percent spent more than HRK 20,000 for preparing their applications (Figure 7.9). Most respondents completed their applications without additional help (Figure 7.10).

Figure 7.9 Over half of the survey respondents spent up to HRK 10,000 to prepare their applications



Source: Beneficiary surveys. N=71.

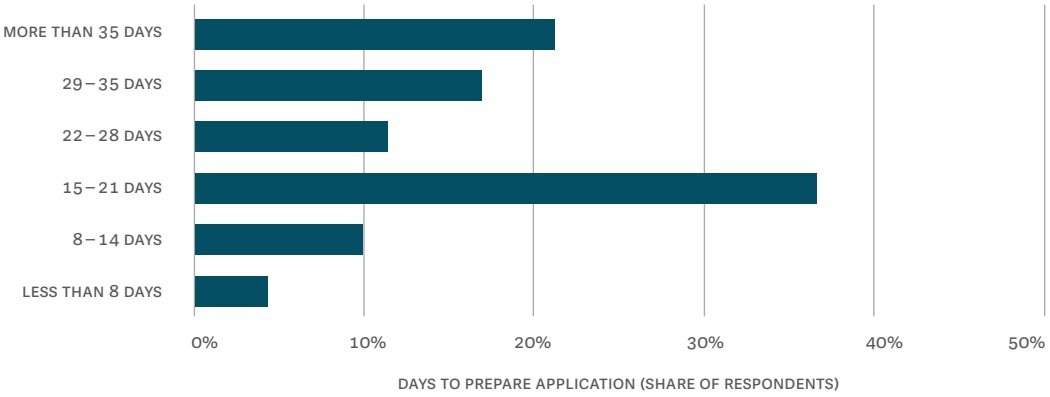
Figure 7.10 Most respondents needed no additional help in the application process



Source: Beneficiary surveys. N=71. Other includes project team with other experts.

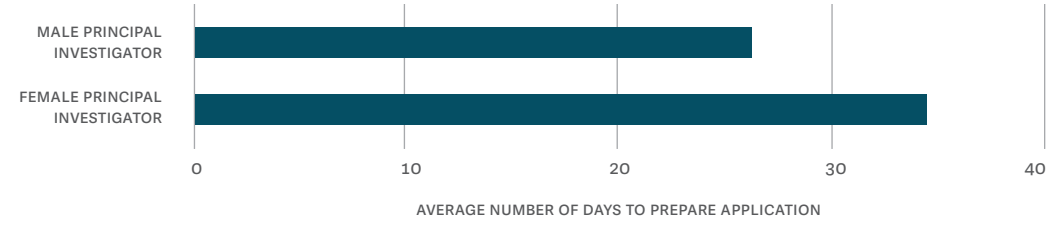
The most common application preparation time was two to three weeks, though a sizable portion of projects took longer than that. About 40 percent of respondents spent 2 to 3 weeks (or 15-21 days) to complete their application However, for almost half of respondents it took over three weeks (Figure 7.11). Projects with female principal investigators took more time (35 days on average) to prepare their applications than projects with male principal investigators (26 days) (Figure 7.12). However, this difference is not statistically significant.

Figure 7.11 About half of the respondents needed up to three weeks to complete the application



Source: Beneficiary surveys. N=71.

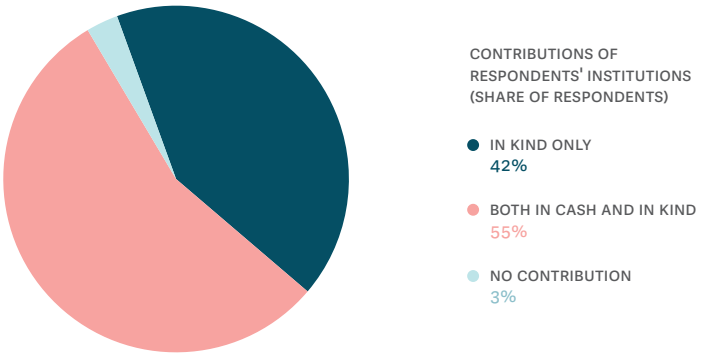
Figure 7.12 The difference in application preparation time between genders is not statistically significant



Source: Beneficiary surveys. N=71.

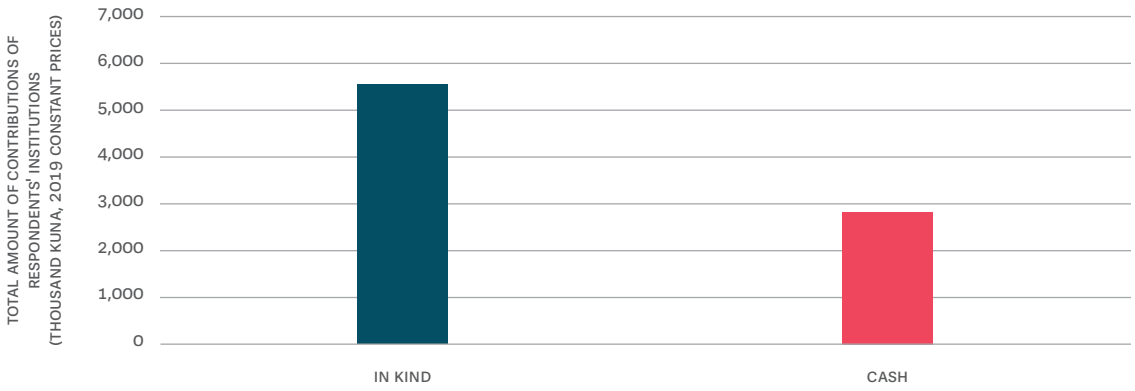
In most projects, home institutions contributed with a combination of cash and in-kind support, but in-kind support only was not uncommon either. Over half of respondents received both in-kind and cash contributions, and 42 percent received only in-kind support. Only a small share of 3 percent reported receiving no contributions of any kind (Figure 7.13). Respondents valued the total in-kind contributions received at about HRK 6 million and cash contributions at approximately HRK 3 million (Figure 7.14). The average in-kind contribution per project was HRK 84,092 and the average cash contribution per project was HRK 76,331.

Figure 7.13 Respondents received either a combination of cash and in-kind contributions, or in-kind contributions only



Source: Beneficiary surveys. N=67.

Figure 7.14 In-kind contributions were estimated at around double the amount of cash contributions



Source: Beneficiary surveys. N=67.

On average, the costs covered by the program were four times higher than the costs covered by beneficiaries – a slightly lower value for money that beneficiaries invested in the program compared to the RP program. Considering all costs incurred by beneficiaries (including the application costs and the contributions made by their home institutions), the average cost covered by beneficiaries was HRK 172,400 per project. The average cost covered by the program was HRK 666,600 per project. It follows that for every HRK that beneficiaries put into the project, the program invested 4 HRK.

7.2 Efficiency in the generation of outputs

Investments in beneficiaries

Beneficiaries received HRK 9 in direct financial transfers per HRK the program spent in administrative and operating costs. The program transferred approximately HRK 61 million directly to beneficiaries (direct financial transfers), which amounts to an average of HRK 600,483 per project (Table 7.2)**.** The program spent HRK 6.7 million in administrative and operating costs, making the ratio of transfers to administrative and operating costs equal to 9.

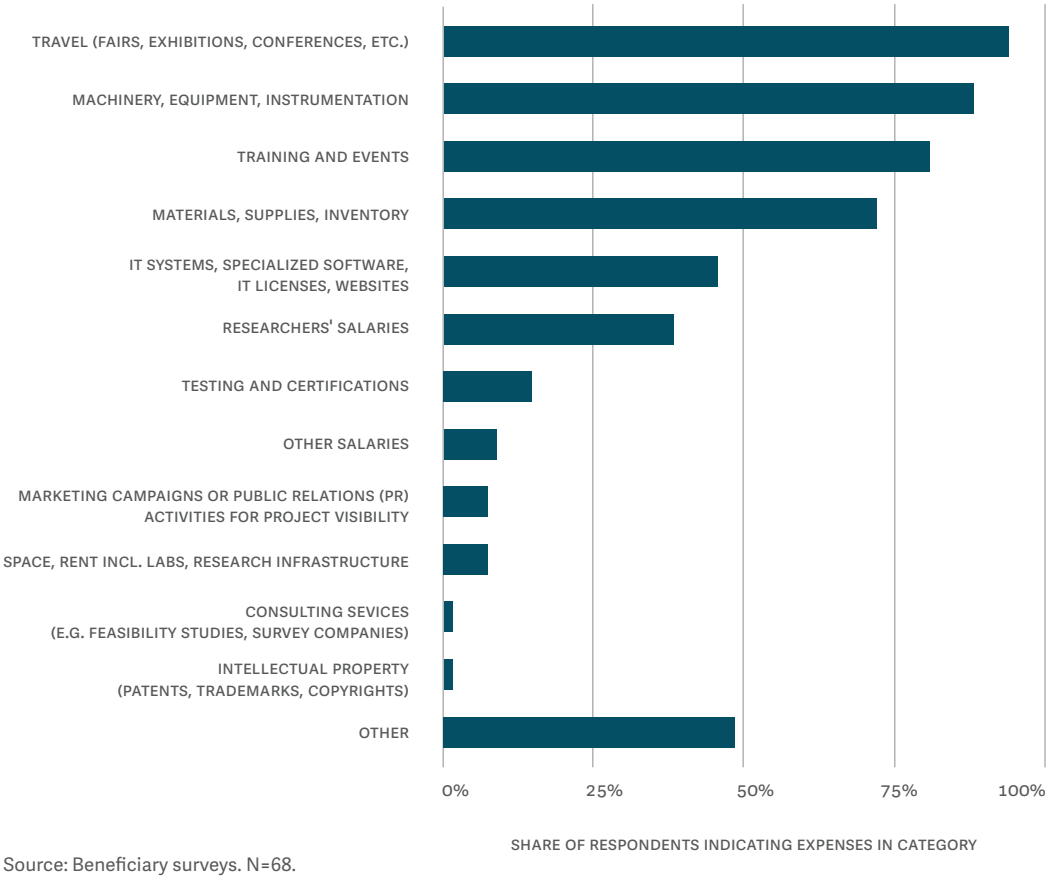
Table 7.2 Program expenditures per project in the Installation Research Projects program

EXPENDITURE TYPE	TOTAL (CONSTANT 2019-THOUSAND HRK)	AVERAGE PER PROJECT (CONSTANT 2019- THOUSAND HRK)
Total transfers to beneficiaries (direct financial transfers)	61,249	600
Administrative and operating costs	6,744	66
Total program cost	67,993	667

Source: HRZZ data and staff calculations.

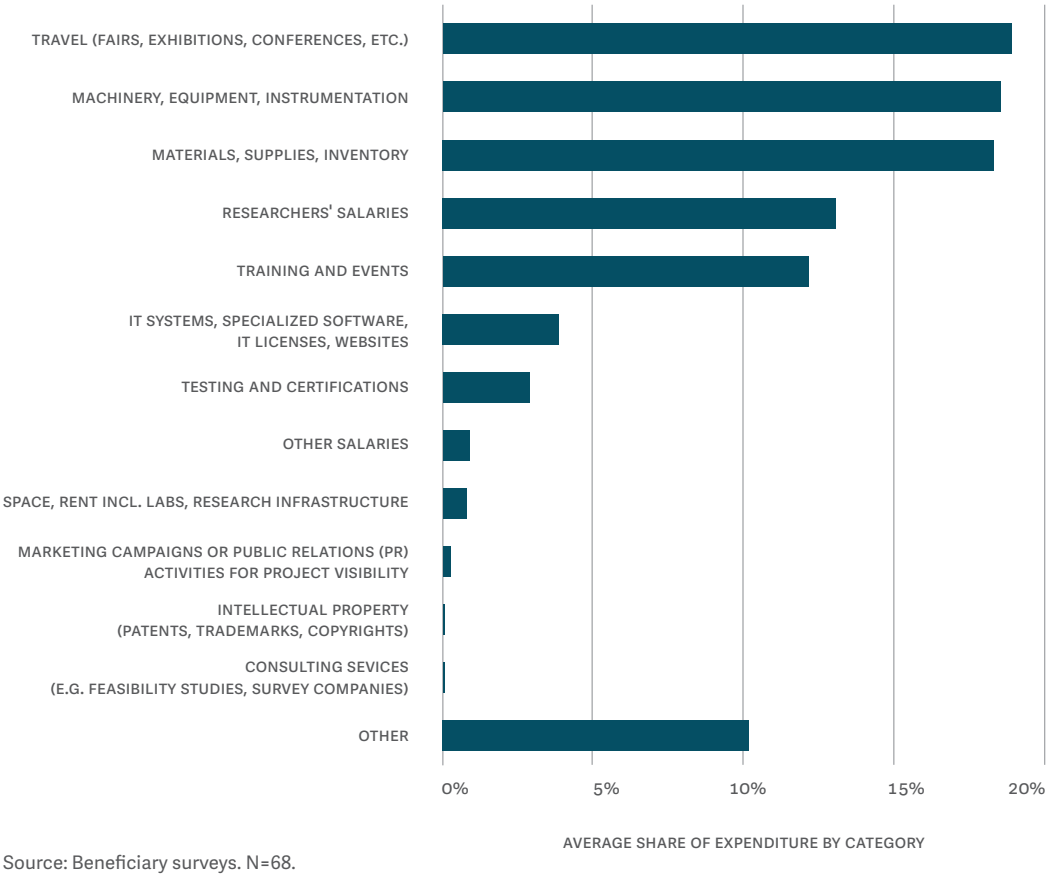
The highest share of funding was typically spent on travel, equipment, and supplies, which were also the most common expense categories. Over 90 percent of respondents used funding for travel, and over 80 percent used it for machinery, equipment, instrumentation, and training. However, only 1 percent of respondents used funding for consulting services and intellectual property (Figure 7.15). On average, respondents used 19 percent of the funding for travel, 19 percent on machinery, equipment, and instrumentation, and 18 percent on materials, supplies, and inventory. In contrast, they used the smallest share of project funding to intellectual property and consulting services (Figure 7.16).

Figure 7.15 Most respondents recorded using funding for travel, machinery and equipment, and training



Source: Beneficiary surveys. N=68.

Figure 7.16 The highest share of the budget was spent on travel, equipment, and supplies

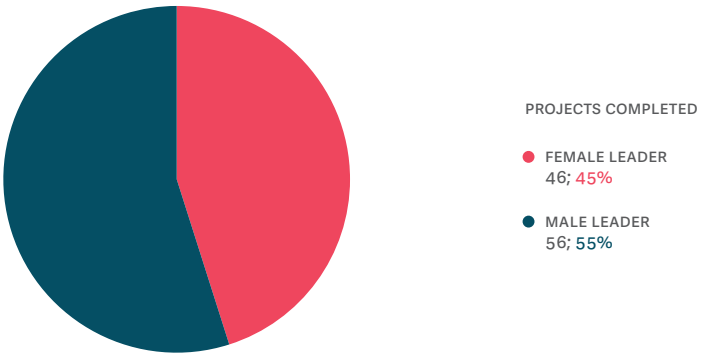


Source: Beneficiary surveys. N=68.

Outputs achieved

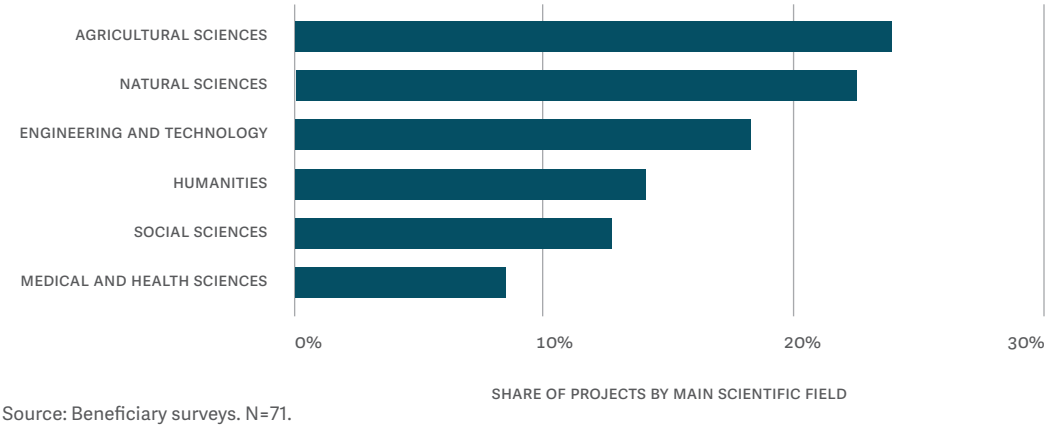
A total of 102 projects were completed in the 2017–2019 period, with HRK 61.2 million in grants transferred directly to beneficiaries, mostly in agricultural sciences, natural sciences, and engineering. The program supported a total of 828 research team members, of which 51 percent were female. Forty-five percent of projects had a female principal investigator (Figure 7.17), and projects with female principal investigators obtained 46 percent of the funding disbursed, the highest share of all programs targeted at researchers. Agricultural and natural sciences was the main scientific field of the project for almost a quarter of respondents. Only a small share of respondents, 8 percent, had projects related to the medical and health sciences (Figure 7.18).

Figure 7.17 The majority of principal investigators were men



Source: HRZZ data. N=102.

Figure 7.18 Respondents' projects were most frequently in the field of agricultural and natural sciences



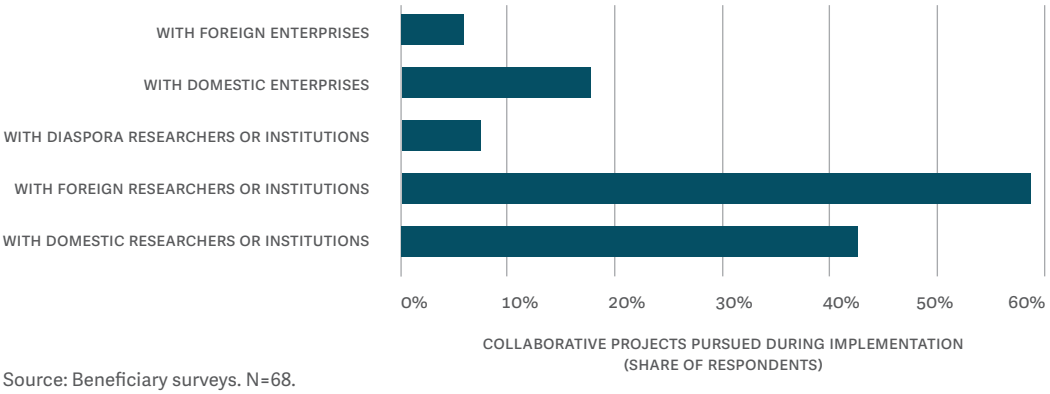
Source: Beneficiary surveys. N=71.

On average, 25 outputs were achieved per project, corresponding to 29 outputs per HRK 1,000 of program costs. Four outputs were tracked for this program: Number of researchers involved in the project; collaborative projects during the project; seminars, workshops and conferences attended; and training activities attended. In total, 1,970 outputs were achieved.

Similar to the RP program, the IRP program had more collaborative projects with researchers or research institutions than with enterprises during the implementation period. Almost 60 percent of respondents had collaborative projects with foreign researchers or research institutions and 43 percent with domestic ones (Figure 7.19). Of a total of 164 collaborative projects during implementation, 72 were with foreign researchers and 47 with domestic researchers. In contrast, only 18 percent of respondents pursued 31 collaborative projects with domestic enterprises (a total of 31 collaborative projects with domestic enterprises), and 6 percent pursued collaborative projects with foreign enterprises (a total of 8 collaborative projects with foreign enterprises).

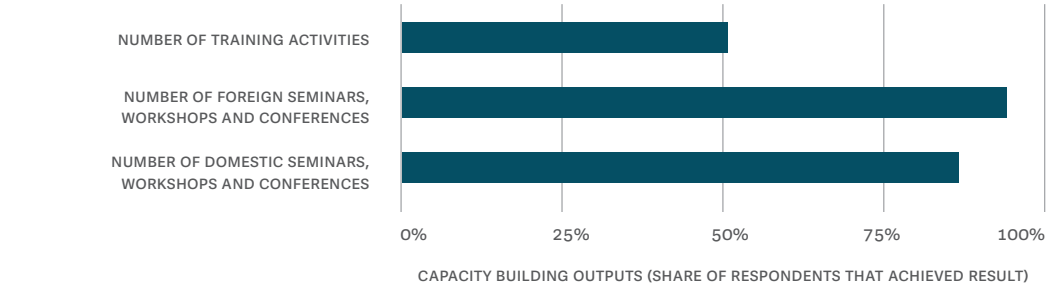
Beneficiaries had capacity building achievements, with seminars being more popular than training events. Ninety-four percent of respondents attended a total of 503 foreign seminars, workshops, or conferences and 87 percent attended a total of 343 domestic ones. However, a smaller share of respondents attended training events. A total of 132 training events were attended by 51 percent of respondents (Figure 7.20).

Figure 7.19 Respondents had more collaborative projects with foreign than with domestic researchers



Source: Beneficiary surveys. N=68.

Figure 7.20 Almost all respondents participated in foreign and domestic conferences or seminars



Source: Beneficiary surveys. N=68.

7.3 Efficiency in the generation of outcomes

Respondents achieved a total of 1,238 outcomes (including both intended and other results) and the average amount of outcomes per project is estimated at 18. Intended outcomes are related to collaborative projects after project completion, doctoral or master's theses or titles, scientific publications in peer-reviewed journals, and intellectual property (patent applications, patents granted, industrial designs, and copyrights). Other results include market-oriented research, technology transfer outcomes such as spin-offs, new products, processes, and services, and new software and technology development.

Intended outcomes achieved

Achievements were made in all intended outcomes. Most respondents had achievements in terms of collaborative projects after implementation with domestic and foreign researchers, scientific publications, and doctoral or master's titles or theses. However, few respondents had achievements regarding collaborative projects with enterprises or diaspora researchers, patents' applications, patents granted, and copyrights (Table 7.3).

Table 7.3 Almost all respondents produced outcomes in terms of scientific publications, and many had doctoral or master's theses, as well as collaborative projects

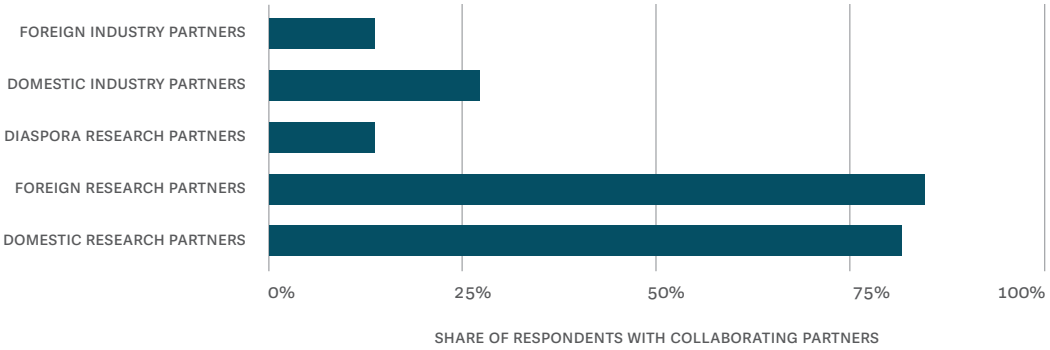
INTENDED OUTCOME	SHARE OF RESPONDENTS THAT ACHIEVED RESULT	NUMBER OF RESPONDENTS THAT ACHIEVED RESULT	TOTAL NUMBER OF RESULTS REPORTED
Collaborative projects with domestic researchers or research institutions after the project	65%	44	73
Collaborative projects with foreign researchers or research institutions after the project	59%	40	74
Collaborative projects with diaspora researchers or research institutions after the project	10%	7	9
Collaborative projects with domestic enterprises after the project	25%	17	24
Collaborative projects with foreign enterprises after the project	4%	3	3
Doctoral or master's titles or theses	68%	46	139
Scientific publications in peer-reviewed journals	99%	67	722
Patent applications	4%	3	4
Patents granted	3%	2	2
Industrial designs	0%	0	0
Copyrights	1%	1	2

Source: Beneficiary surveys. N=68.

Respondents continued engaging in collaborative projects with researchers or research institutions (and, to a lesser extent, with enterprises) after their projects were completed. For example, 65 percent of respondents engaged in a total of 73 collaborative projects with domestic researchers after project completion. Similarly, 59 percent of respondents engaged in 74 collaborative projects with foreign researchers after project completion. By contrast, only 25 percent of respondents engaged in 24 collaborative projects with domestic enterprises after project completion. More strikingly, only 4 percent of respondents engaged in 3 collaborative projects with foreign enterprises after project completion (Table 7.3).

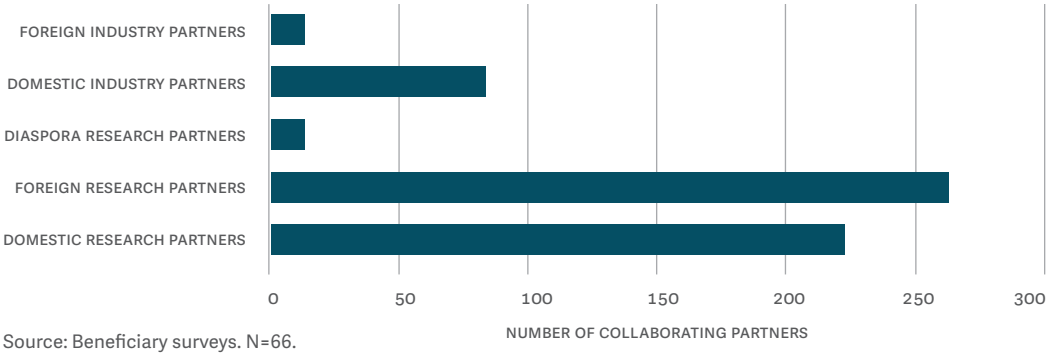
More than 80 percent of respondents had domestic and foreign research partners, while only 27 percent had domestic industry partners and 14 percent foreign industry partners (Figure 7.21)**.** Indeed, respondents had a large number of research partners—263 foreign and 223 domestic partners (Figure 7.22). The number of industry partners was much lower, amounting to 83 domestic and 13 foreign industry partners.

Figure 7.21 Most respondents had foreign and domestic research partners



Source: Beneficiary surveys. N=66. Multiple selection question.

Figure 7.22 The number of foreign partners exceeded the number of domestic partners



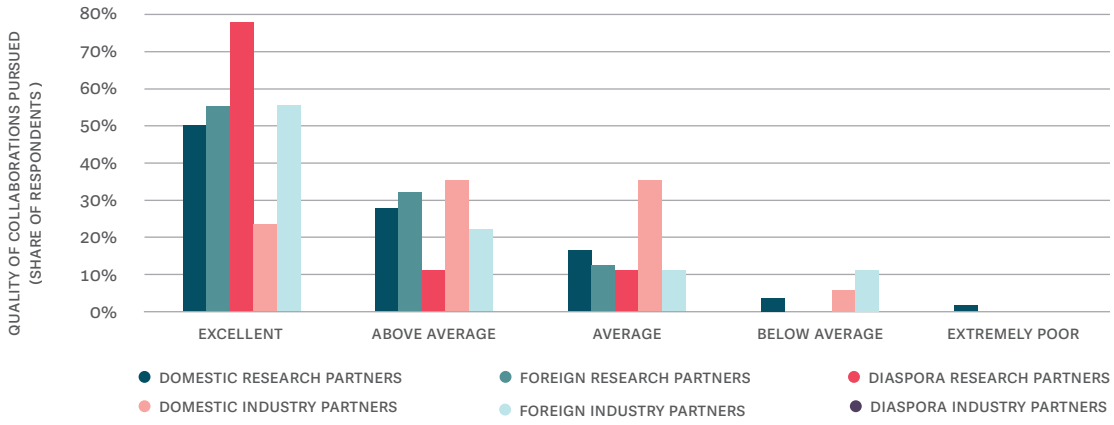
Source: Beneficiary surveys. N=66.

When it comes to quality of collaborations, foreign and diaspora research partners were the best rated. Respondents rated collaborations with foreign research partners (55 percent of respondents) and diaspora research partners (78 percent) as excellent. No

respondent evaluated these two types of collaborations as below average (Figure 7.23). However, although half of respondents rated collaborations with domestic research partners as excellent, 4 percent rated them below average and 2 percent extremely poor. Also, among those collaborations rated excellent, domestic industry partners had the lowest share of respondents (24 percent).

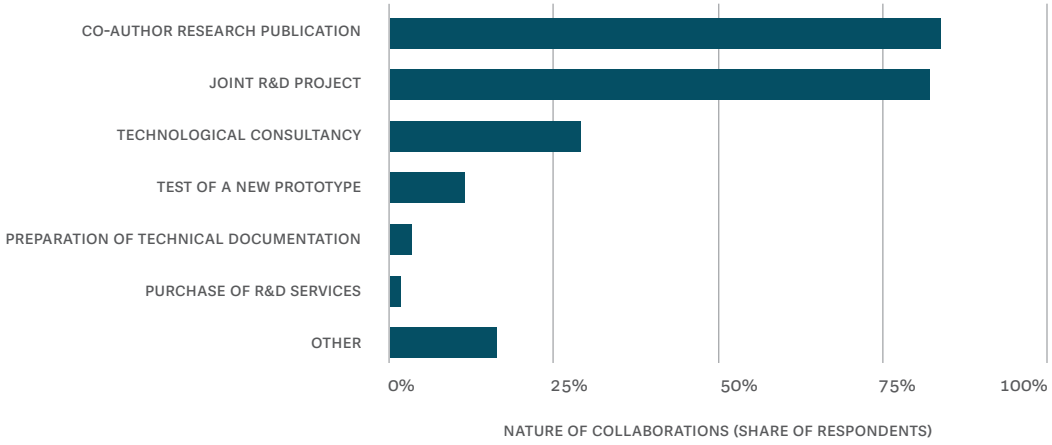
Similar to other programs targeting researchers, most collaborations pursued were for co-authoring research publications or implementing a joint R&D project with partners. Fewer respondents collaborated for technological consultancies (29 percent) or other reasons such as testing a new prototype (11 percent). Collaborations for purchasing R&D services were the least pursued (2 percent of respondents) (Figure 7.24).

Figure 7.23 The quality of collaboration with foreign and diaspora research partners were best-rated



Source: Beneficiary surveys. N=62.

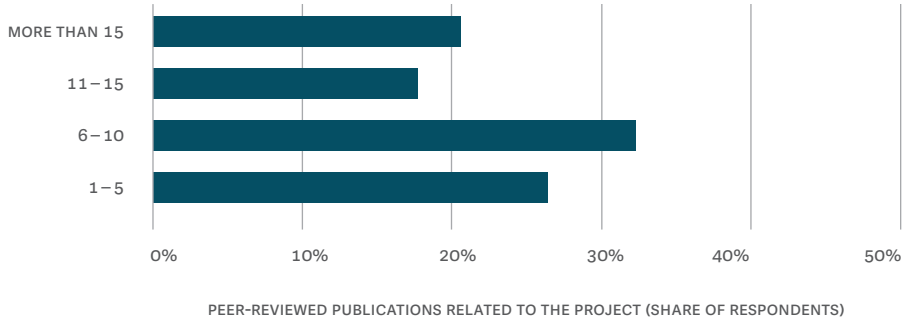
Figure 7.24 Most respondents pursue partnerships to publish scientific papers or conduct joint R&D projects



Source: Beneficiary surveys. N=62. Multiple selection question. Other includes training, provision of inputs, organization of conferences and meetings.

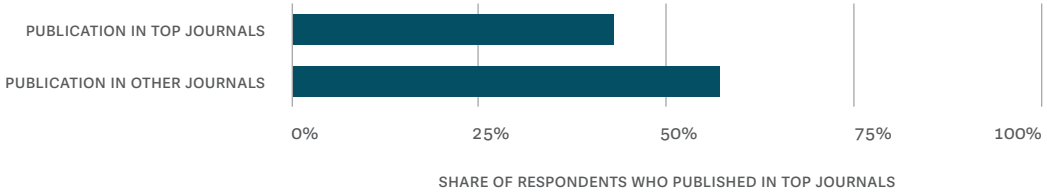
Respondents published a total of 722 scientific papers in peer-reviewed journals related to the supported projects. Almost all respondents (99 percent) published papers (Table 7.3). About a third of respondents published between 6 and 10 scientific papers, and 21 percent published more than 15 papers (Figure 7.25). Among those that listed publications achieved, 43 percent were able to publish in top journals and 57 percent in other journals (Figure 7.26). When asked to list the most important publications, respondents provided 284 titles, out of which 20 percent were published in top journals. An additional analysis about the quality of publications of HRZZ-funded projects was conducted with data from CROSBI database and is presented in section 2.3.

Figure 7.25 Over half of the respondents publish up to 10 papers



Source: Beneficiary surveys. N=68.

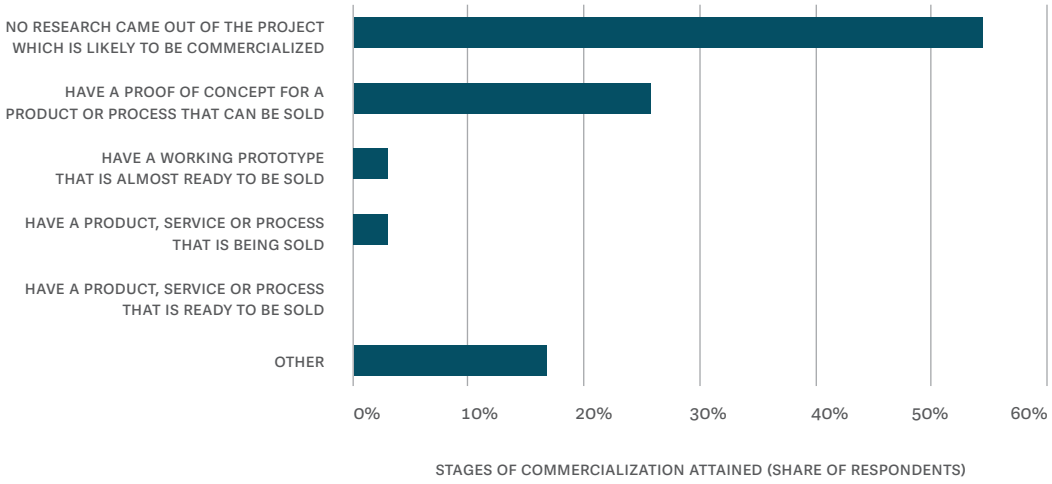
Figure 7.26 A high share of respondents had publications in top journals



Source: Beneficiary surveys. N=63.

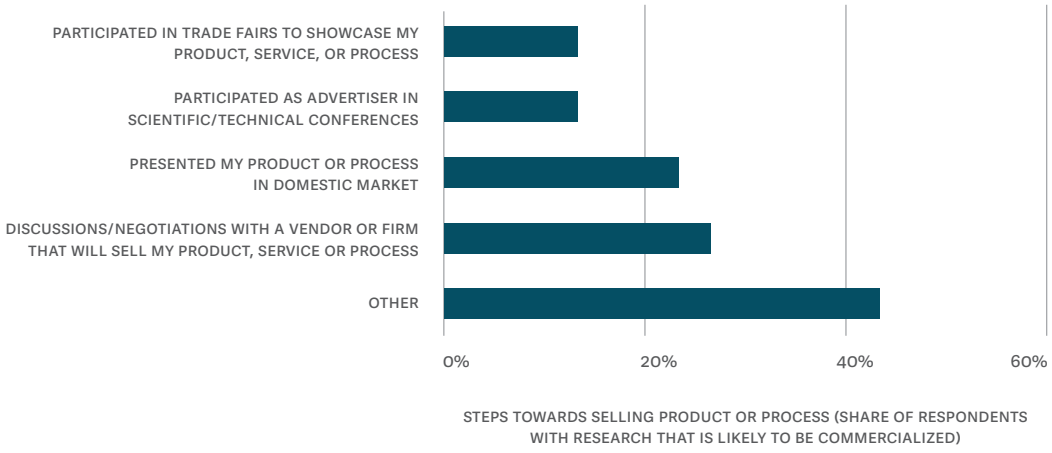
Despite the limited results achieved in terms of intellectual property, some beneficiaries advanced in terms of commercialization and steps towards selling their products or processes. Over half of respondents did not produce research with potential for commercialization through the program (Figure 7.27). But about a quarter of respondents achieved a proof of concept for a product or process that can be sold in the future. Also, among respondents with projects that were likely to be commercialized, 27 percent had engaged in negotiations with vendors, and 23 percent had presented their product in domestic markets (Figure 7.28). This demonstrates the existence of a solid base of researchers who are able to engage in technology transfer, and who should be supported in such efforts, both through funding, and through a more favorable career advancement framework.

Figure 7.27 For over half of the respondents the research is unlikely to be commercialized



Source: Beneficiary surveys. N=66. Other includes genotypes under investigation for registration as varieties in the future, open access data and software, popularization of science and archaeological heritage for tourism.

Figure 7.28 Discussions with vendors are ongoing for some research that is likely to be commercialized



Source: Beneficiary surveys. N=30. Other includes product is not ready to be sold, no steps taken, settlement of proprietary rights, the process was patented and the license was sold to a foreign company, workshops and scientific meetings, dissemination through journal publications, more research is needed to enter commercialization process, oral tradition.

Other results

Among other innovation results achieved by beneficiaries, the most frequent were market-oriented research and development of new products, processes, or services. Indeed, 22 percent of respondents completed a total of 39 market-oriented research related to the project. A total of 40 new products, processes, or services, were developed in the context of the supported project by 22 percent of respondents (Table 7.4). About 10 percent of respondents achieved outcomes in terms of product upgrading, prototypes, and development of new technologies.

Table 7.4 Some researchers have achieved other results in terms of new products, processes, or services, and market-oriented research

OTHER PROJECT RESULTS ACHIEVED DURING OR AFTER THE PROJECT	SHARE OF RESPONDENTS THAT ACHIEVED RESULT	NUMBER OF RESPONDENTS THAT ACHIEVED RESULT	TOTAL NUMBER OF RESULTS REPORTED
Market-oriented research	22%	15	39
Transfer agreements	1%	1	1
New enterprise, business or spin-off	9%	6	6
Prototype	12%	8	18
New products, processes, or services	22%	15	40
Upgraded products, processes, or services	9%	6	17
New design for a product, process, or service	6%	4	7
New software development	6%	4	25
New technology development	12%	8	13

Source: Beneficiary surveys. N=68.

7.4 Perceived quality

Quality of program contributions

A large proportion of beneficiaries were satisfied with various elements of the application, especially with how easy it was to identify program information and the clarity of program regulations, but many were dissatisfied with the flexibility and time needed to obtain results. More than two-thirds of respondents were satisfied with 14 aspects of the application stage. Areas for which over 75 percent or more respondents were satisfied are contract negotiation, program objectives, fairness and clarity of eligibility criteria (Figure 7.29). As in the case of all other programs, an area for improvement in this program is the flexibility of the rules for non-compliance with the calls, as only 27 percent of respondents were satisfied with this area, as well as the time needed to publish the results of the selection process.

Respondents' feedback on the selection process was centered around the quality of peer review and the functioning of domestic panels. When asked about whether they would change, add, or remove certain selection criteria, respondents raised issues related to the quality of peer review and the responsibilities and tasks of the domestic selection panel.[22] Some respondents were concerned about the heterogeneity in the assessment of projects, as different reviewers may have different expectations and levels of expertise. As in the case of the RP program, respondents proposed the introduction of a third peer reviewer, but also defining a greater range of grades and clarifying how these grades are taken into consideration when making the decision on financing. Comments on the work of the domestic selection panels were centered around their ability to prevent a project from advancing to international peer review. In some cases, respondents were concerned with the limitations of a small domestic research community, which makes it difficult to find panelists with sufficient expertise in niche areas.

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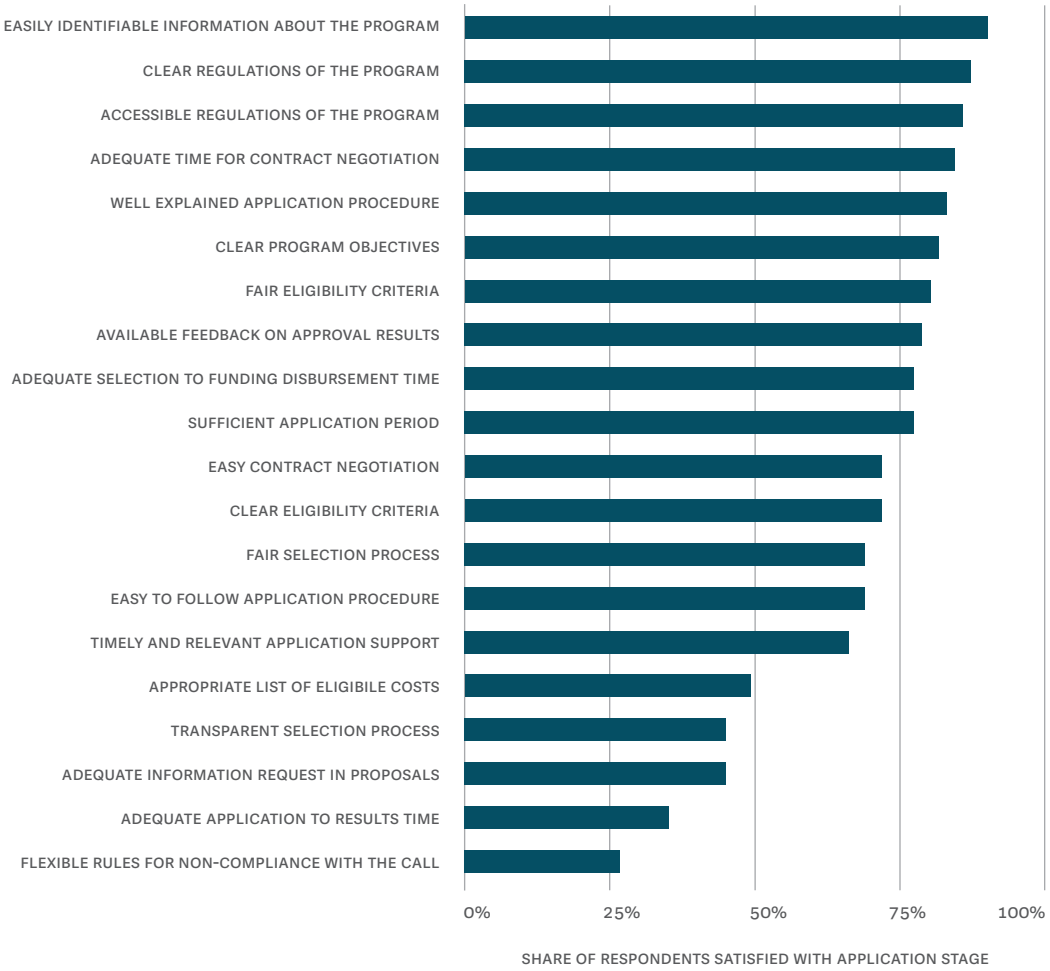
22 For the IRP program, respondents submitted 21 open-ended responses for changing selection criteria, 8 for adding, and 11 for removing criteria. 9 suggestions were related to the work of the domestic panel and 7 were related to international peer review.

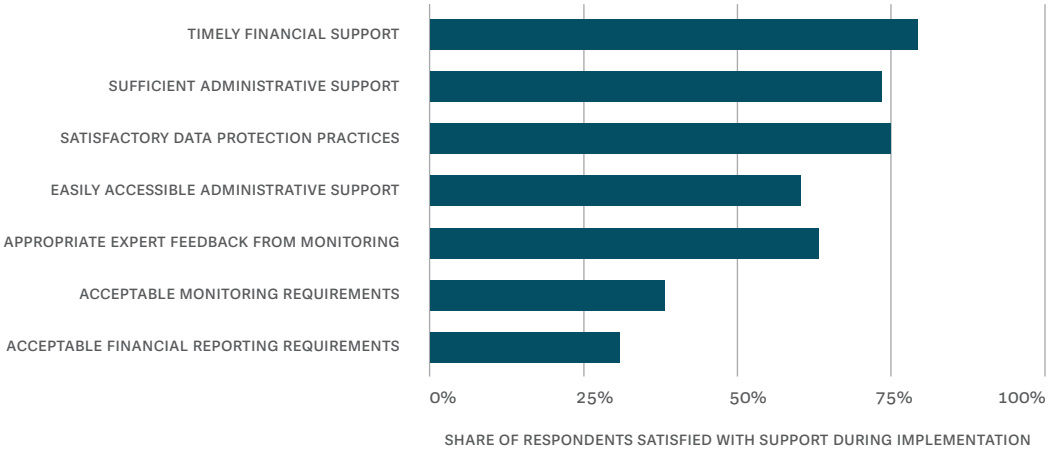
Figure 7.29 Many respondents were not satisfied with the program's flexibility and time needed to obtain results



Source: Beneficiary surveys. N=71. Note: The level of satisfaction was measured in a scale of 1-5, where 1 is strongly disagree and 5 strongly agree. The figure shows the percentage of respondents who agreed or strongly agreed with the statements.

A fair number of respondents were satisfied with the financial and administrative support during implementation but many were dissatisfied with financial reporting and monitoring requirements (Figure 7.30). Most respondents were satisfied with the timeliness of financial support (79 percent), the amount of administrative support (74 percent) and data protection practices (75 percent). However, only about a third of survey respondents thought the monitoring and the financial reporting requirements were acceptable.

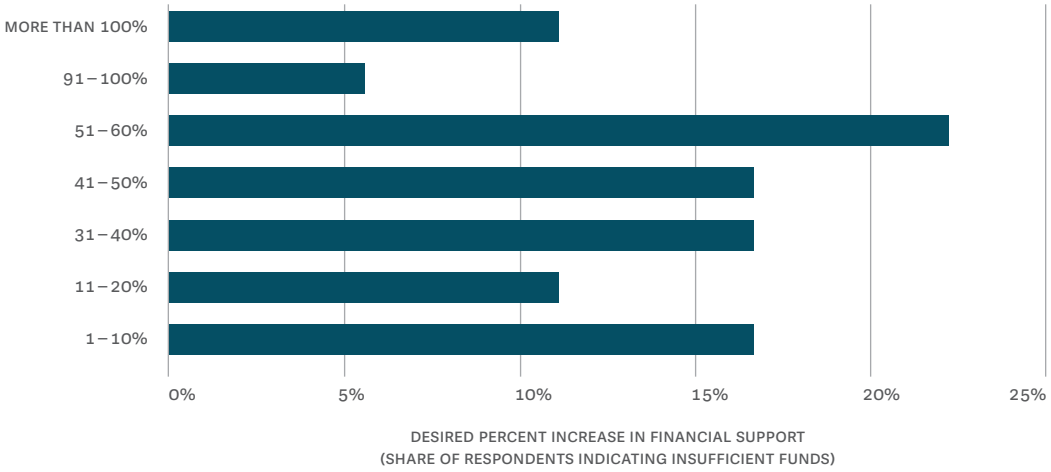
Figure 7.30 Monitoring and financial reporting requirements were least satisfactory to respondents



Source: Beneficiary surveys. N=68. Note: The level of satisfaction was measured in a scale of 1-5, where 1 is strongly disagree and 5 strongly agree. The figure shows the percentage of respondents who agreed or strongly agreed with the statements.

While most respondents were satisfied with the amount of financial support, the funding was not sufficient for some due to unexpected costs and increased costs of inputs. The program funding was delivered according to the terms of the contract for 93 percent of respondents. For 74 percent of respondents, the amount of financial support provided by the program was sufficient to successfully complete their project objectives. An increase of the funds between 31 and 60 percent would have been enough to complete the project objectives of 56 percent of those for whom the amount of financial support was insufficient (Figure 7.31). The main reasons for the project funds being insufficient were unexpected costs and increased costs of inputs such as surveys and materials. The amount of time allowed for project implementation, was sufficient to successfully complete the projects of almost 80 percent of respondents. For those that had insufficient time, the main issue was that researchers could not reduce other activities in their institutions.

Figure 7.31 Over half of the respondents that had a funding gap could cover it with a funding increase of 31-60 percent

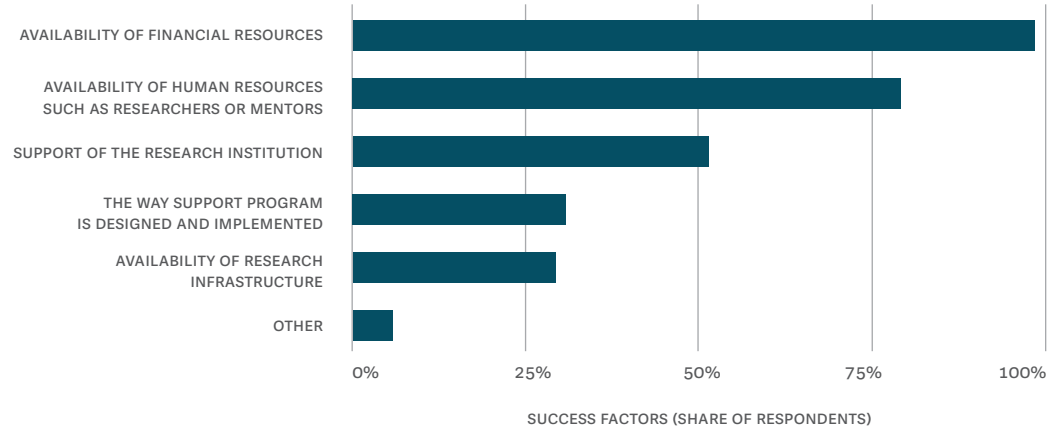


Source: Beneficiary surveys. N=18.

The main success factors highlighted by survey respondents as contributing to the project results are the availability of funding and human resources. Other factors such as the support from the research institution or the way the program is designed and implemented were highlighted by a much smaller share of respondents (50 and 17, respectively) (Figure 7.32).

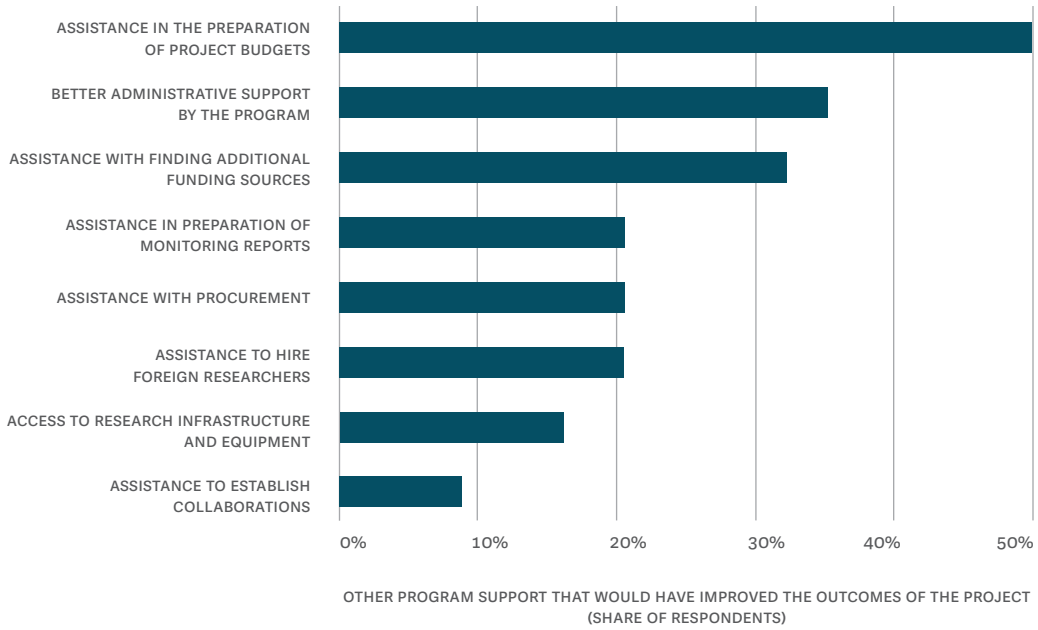
Similar to other programs, half of respondents would have liked assistance with preparing budgets (Figure 7.33). Other program support areas that would have improved the outcomes of the project were better administrative support (35 percent of respondents) and assistance with finding additional funding (32 percent). Only 9 percent needed assistance to establish collaborations.

Figure 7.32 Availability of financial and human resources were cited as the most important success factor of the project



Source: Beneficiary surveys. N=68. Multiple selection question. Other includes interactive bibliography, database.

Figure 7.33 Assistance in the preparation of budgets would have improved the project outcome

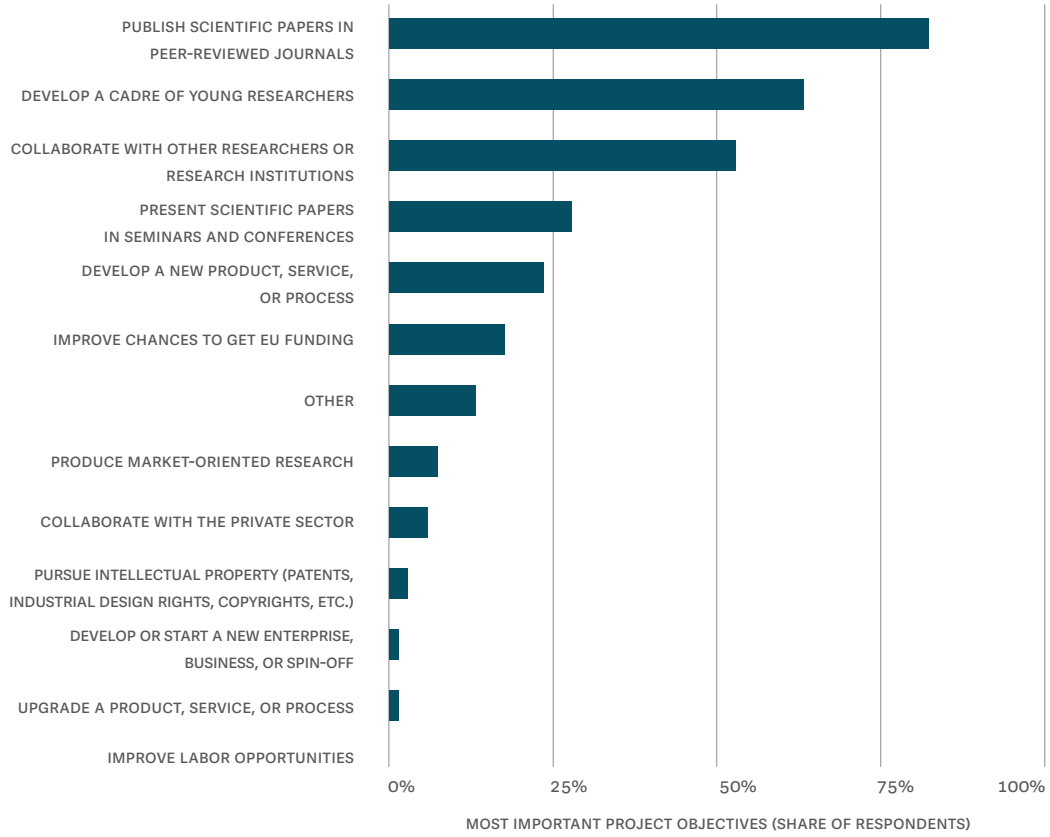


Source: Beneficiary surveys. N=68. Multiple selection question.

Overall project quality

Respondents had project objectives that were largely aligned with the program's objectives, such as publications, collaborations, and developing a cadre of young researchers. In line with the program's objectives, over 80 percent of respondents had publishing scientific papers in peer-reviewed journals as a main objective, 63 percent had developing a cadre of young researchers as a main objective, and 53 percent had collaborating with other researchers as a main objective (Figure 7.34). However, fewer than half of respondents had presenting scientific papers in seminars and conferences as a main project objective. Some respondents had main project objectives beyond the program's objectives. These included developing a new product, service or process (24 percent) or improving chances to get EU funding (18 percent).

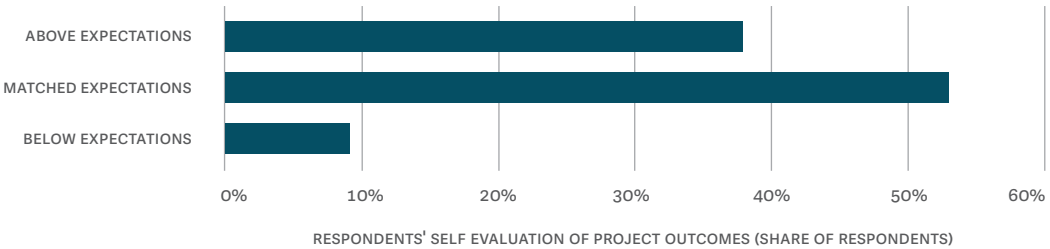
Figure 7.34 Respondent objectives included publishing scientific papers, developing a cadre of young researchers, and collaboration



Source: Beneficiary surveys. N=68. Multiple selection question.

Overall, most respondents gave their projects a neutral or a positive evaluation. A little over half of them evaluated the outcome of the project as matching their expectations. For almost 40 percent, their projects were above their expectations (Figure 7.35). In contrast, projects were below expectations for only 9 percent.

Figure 7.35 The outcome of the project exceeded expectations for many respondents



Source: Beneficiary surveys. N=66.

8 Improving Competitiveness and Efficiency of SMEs in Areas with Special Development Needs through ICT

Improving Competitiveness and Efficiency of SMEs in Areas with Special Development Needs through ICT

This program aims to encourage the use of ICT in SMEs to optimize business processes and improve business operations. The program, ICT-R for short, is part of the portfolio of the MESD and is financed from OPCC 2014-2020. The program provides matching grants for the procurement and application of ICT products**.** Two editions of the program have been launched so far. The first call was launched in September 2015, and was limited to applicants from less developed regions of Croatia. The call awarded grants in the amount of HRK 110 million to support 219 projects. Following that, another call was launched in November 2018, but this time it was open to all SMEs in Croatia. The second call allocated HRK 363 million to 926 projects with grants from HRK 80,000 to 1 million. The present analysis refers to the support given in the first call of the program.

The survey response rate for this program was 51 percent. This rate is calculated as those that completed over 50 percent of the survey. 218 out of 219 beneficiaries received the survey in June 2020. One beneficiary declared bankruptcy and could not be reached. Beneficiaries that responded to the survey received 47 percent of the funding disbursed. On average, respondents received a slightly lower value grant (HRK 427,000) compared to all ICT-R beneficiaries (HRK 454,000). 135 beneficiaries opened the survey, generating a cooperation rate of 62 percent.

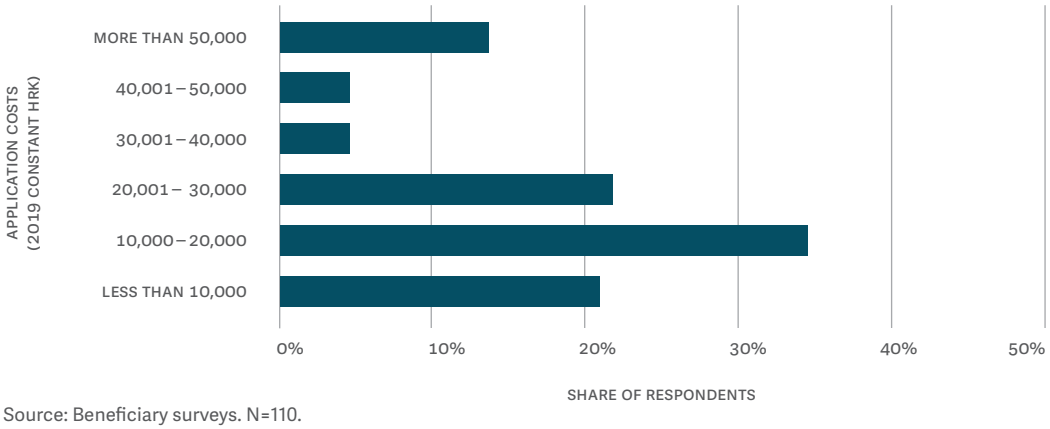
The program implementers did not provide data on the administrative and operating costs for this program, which limits the scope of the analysis. In the absence of administrative cost data, it is not possible to calculate the amount and composition of program costs, average administrative and operating cost per project, the ratio of costs covered by the program to costs covered by beneficiaries, and direct transfers per unit of administrative and operating costs. Therefore, the analysis is limited to presenting the data collected in the beneficiary surveys, including costs incurred by beneficiaries, program outputs, outcomes, beneficiary satisfaction, and alignment with program objectives.

8.1 Use of inputs

Costs covered by beneficiaries

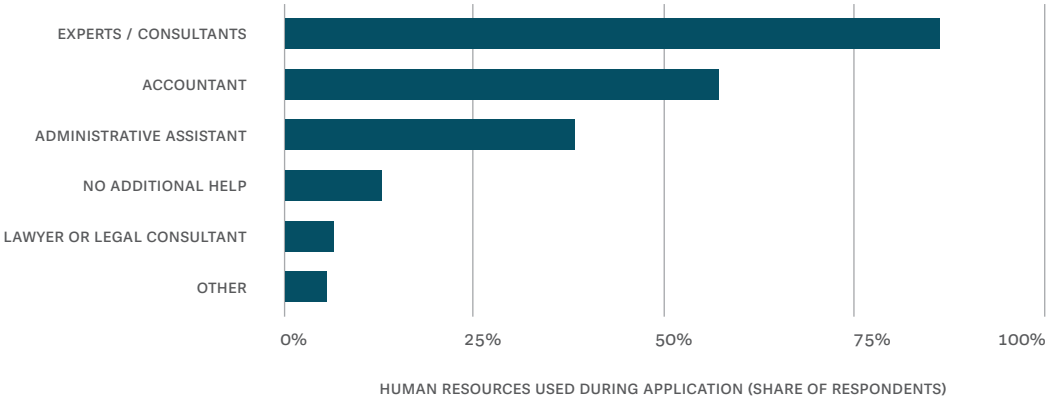
The program required a substantial investment in the application process, and most beneficiaries had to hire experts and consultants to complete it. The average application cost per project was HRK 30,046, with around half of the respondents reporting costs of over HRK 20,000. Most of the respondents spent up to HRK 20,000 preparing their application, with 21 percent spending less than HRK 10,000 and 35 percent spending between HRK 10,000 and HRK 20,000 (Figure 8.1). However, 14 percent of respondents spent more than HRK 50,000 preparing their application. Unlike programs presented in previous sections targeting researchers, most respondents report they used additional human resources to prepare their application (Figure 8.2), mostly experts or consultants (86 percent) and accountants (57 percent). Only 13 percent prepared their application without additional help.

Figure 8.1 Application costs were relatively high



Source: Beneficiary surveys. N=110.

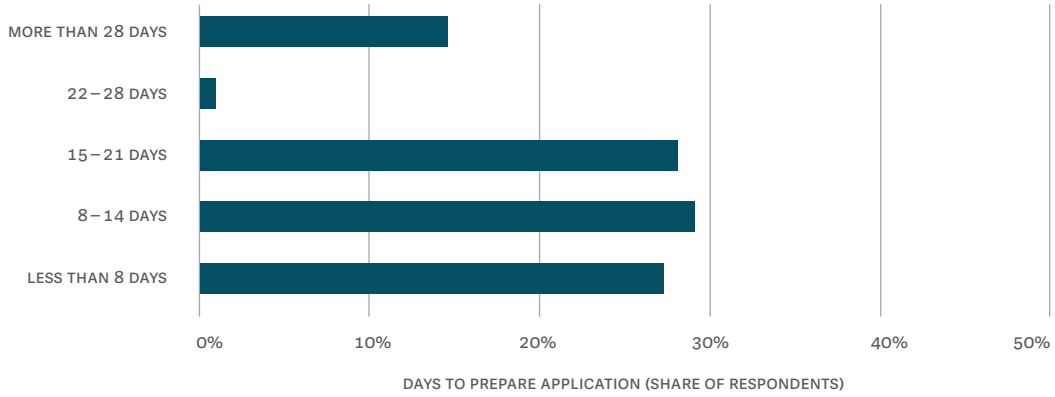
Figure 8.2 The majority of respondents required the assistance of consultants to complete their application



Source: Beneficiary surveys. N=110. Multiple selection question. Note: Other includes team and consultant.

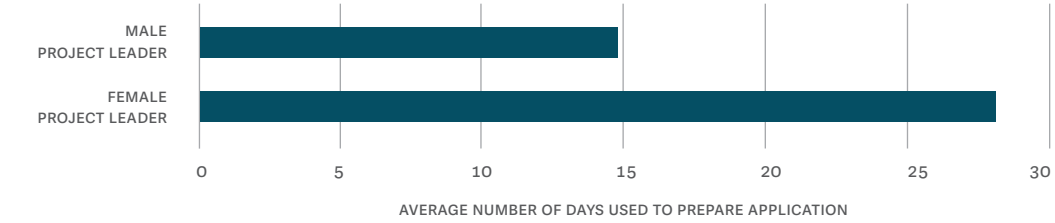
Most respondents were able to complete their application in a reasonable amount of time. Over 80 percent of respondents were able to complete their application in less than 3 weeks and on average it took them 20 days. More specifically, for 28 percent of respondents it took 2-3 weeks, for 29 percent 1-2 weeks and for 27 percent less than 1 week (Figure 8.3). There was a big difference between the average number of days to prepare the application by gender of the principal investigator of the projects: it took those with a female project leader 28 days, on average, to prepare their application, and only 15 days, on average, for those with male project leaders leaders (Figure 8.4). However, this difference is not statistically significant.

Figure 8.3 The application process did not require a major time investment



Source: Beneficiary surveys. N=110.

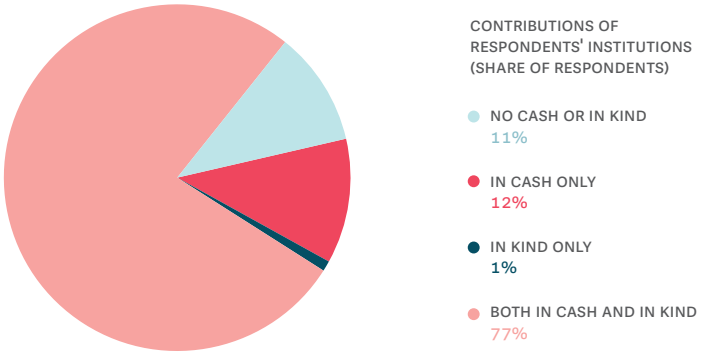
Figure 8.4 The difference in application preparation time by gender is not statistically significant



Source: Beneficiary surveys. N=110.

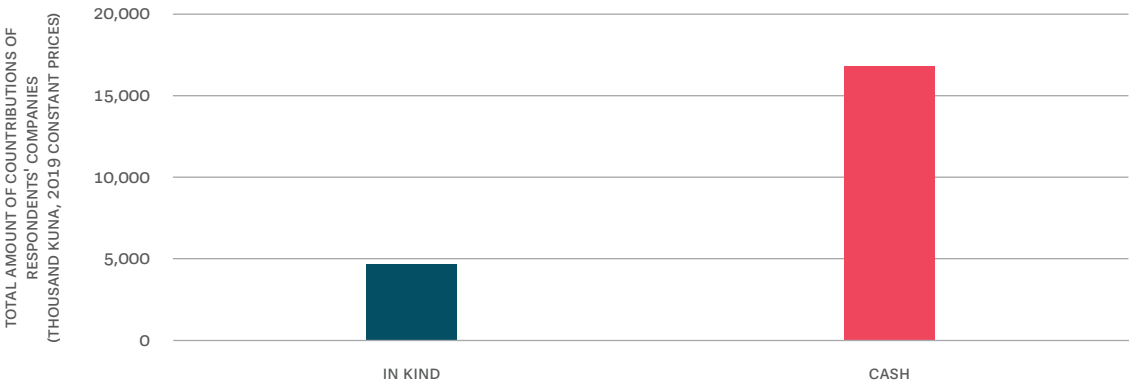
The value of cash contributions of beneficiaries by far exceeded the value of in-kind contributions. Most respondents, 77 percent, made both in-kind and cash project contributions from their companies. The remainder either made no contributions or made in-kind contributions only (Figure 8.5). Respondents valued in-kind contributions at HRK 4.7 million and cash contributions at HRK 16.8 million (Figure 8.6). Therefore, the average in-kind contribution amounted to almost HRK 59,000 per project, while the average cash contribution was HRK 185,000 per project.

Figure 8.5 Most respondents provided both cash and in-kind contributions



Source: Beneficiary surveys. N=103.

Figure 8.6 Respondents invested much more in cash than in kind

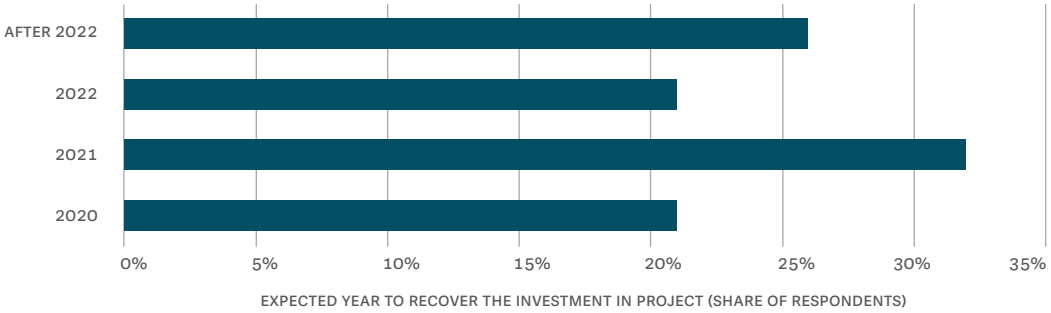


Source: Beneficiary surveys. N=103.

On average, survey respondents received two times more funding than they invested in the project. Respondents on average covered costs in the amount of HRK 273,461 per project, including application costs as well as companies' contributions. The average program cost, measured by direct financial transfers, was HRK 453,000 per project. That means that the ratio of costs covered by the program to costs covered by beneficiaries is 2. In other words, respondents received HRK 2 in direct financial transfers for every HRK that they put into the project.[23]

The expectations of survey respondents as to when would investments in the project be recovered were diverse. Half of the respondents expect to recover project investments in 2020-2021, while the other half expects to recoup the investment in 2022 and beyond (Figure 8.7).

Figure 8.7 Half of the respondents expect a return on investment in 2022 and beyond



Source: Beneficiary surveys. N=100.

8.2 Efficiency in the generation of outputs

Investments in beneficiaries

The analysis of efficiency in the generation of outputs is limited due to missing data. The program transferred a total of HRK 99 million directly to beneficiaries, which translates to an average grant of 452,783 HRK per project. Because the program did not provide information about other types of transfers to beneficiaries (indirect and non-financial transfers) and administrative and operating costs, the efficiency indicator on total transfers per unit of administrative and operating costs was not calculated. The program should consider gathering these data to analyze how much beneficiaries get for every HRK invested into designing and running the program.

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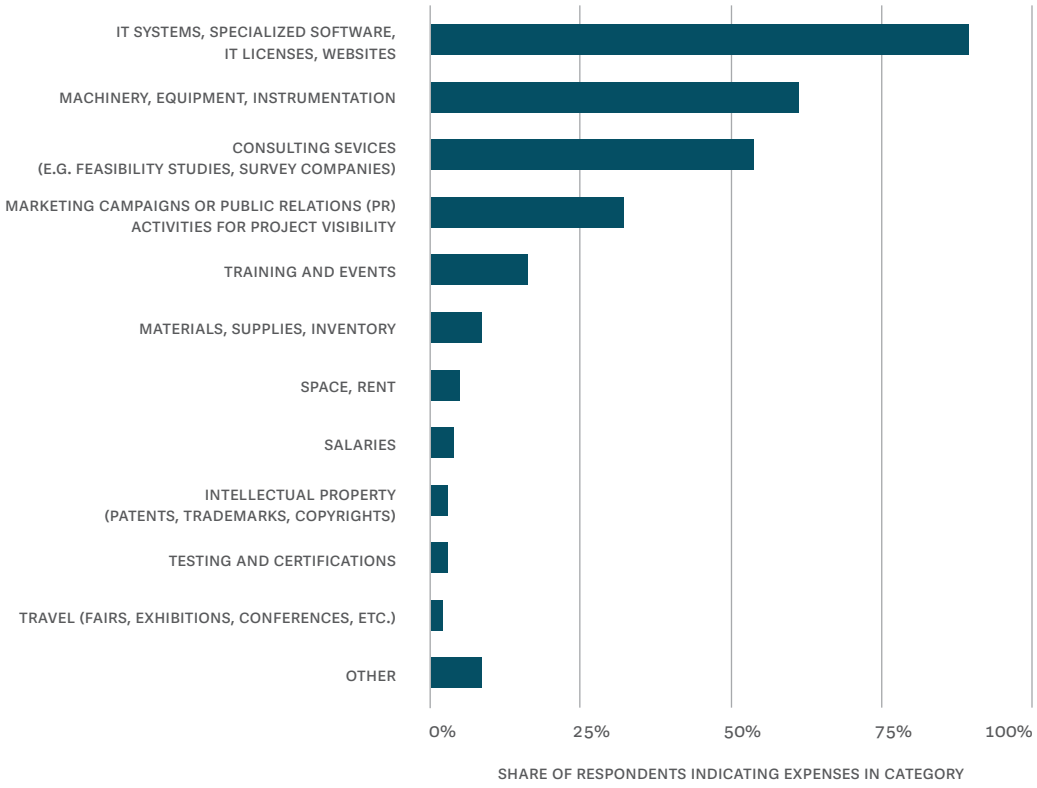
23 The program cost is underestimated because it only includes direct financial transfers. Indirect financial transfers, non-financial transfers, and administrative and operating costs were not reported. Consequently, the ratio of costs covered by the program to costs covered by the beneficiaries is also underestimated.

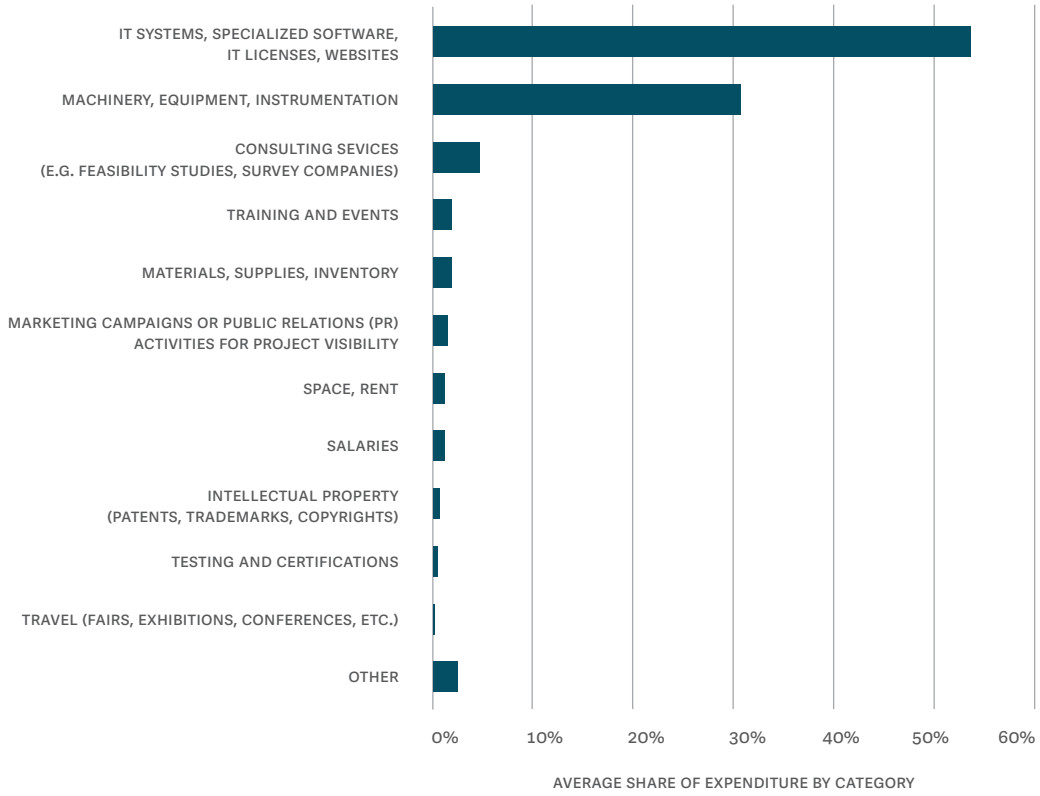
Consistent with program objectives, respondents spent most of the funding on IT systems, specialized software, IT licenses, websites, and other equipment. Ninety percent of respondents had IT system and software expenses (Figure 8.8), which absorbed on average 54 percent of the funding (Figure 8.9). Machinery, equipment, and instrumentation follow closely behind, representing, on average, 31 percent of the funding and in 61 percent of respondents. Respondents allocated the lowest amount of funding to travel (0.02 percent), and travel was part of expenses for only 2 percent of respondents.

Figure 8.8 Most respondents invested in IT systems and software, as well as equipment



Source: Beneficiary surveys. N=106. Other includes promotion and visibility management, education, and procurement and installation of software and hardware.

Figure 8.9 Most of the funding was also dedicated to IT systems, software, and equipment

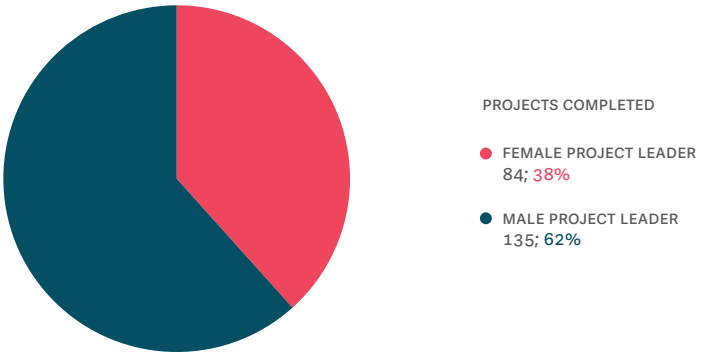


Source: Beneficiary surveys. N=106. Other includes promotion and visibility management, education, and procurement and installation of software and hardware.

Outputs achieved

A total of 219 projects received support from the program, and the majority of project leaders were male. Most projects were completed in 2017 and about a third in 2018. Regarding gender, 38 percent of projects had a female project leader (Figure 8.10), which corresponds to 39 percent of the funding disbursed. Going forward, it would be useful to also track the gender of applicants to gain an insight into the success rate of male and female project leaders.

Figure 8.10 Two-thirds of projects were awarded to male project leaders



Source: MESD data. N=219.

Projects were supported in a variety of areas of economic activity, but the most prominent were manufacturing, construction, and information and communication. Figure 8.11 shows the distribution of survey respondents by main area of economic activity. The least represented areas of economic activity were education, electricity, gas, steam and air conditioning supply, and water supply, sewerage, waste management and remediation activities (1 percent of respondents). In addition, around 40 percent of projects had no link to S3 priority areas, 28 percent were categorized into cross-cutting themes, and 18 percent into the energy and sustainable development priority area (Figure 8.12).

Ninety-three out of 103 respondents improved the capabilities of their employees as a result of their projects. This is an important achievement as the program contemplated training of employees to use the newly implemented ICT systems or solutions as one of its key activities. About 49 percent of respondents achieved this result during the implementation of the project and 85 percent after the implementation of the project. However, this output was not tracked in either edition of the program. In future editions, it would be advisable to revise the indicators used to monitor the progress of the program, including by adding an indicator such as the number of staff trained to use ICT solutions.[24]

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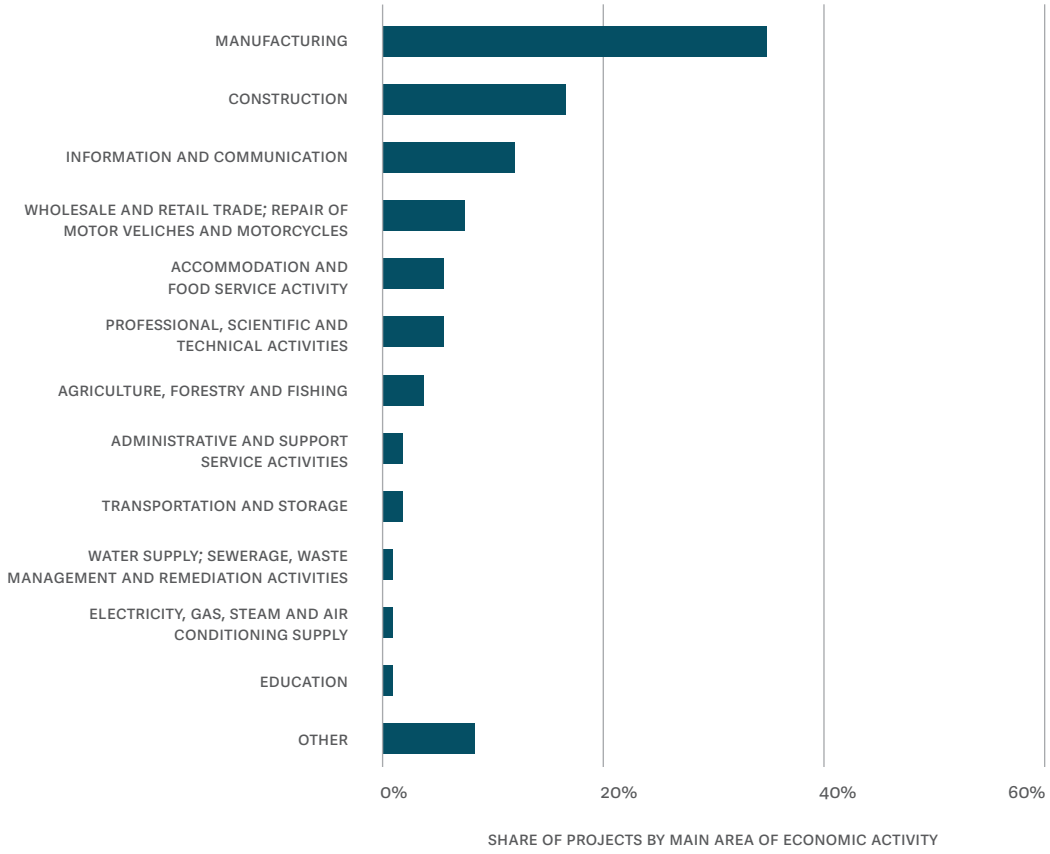
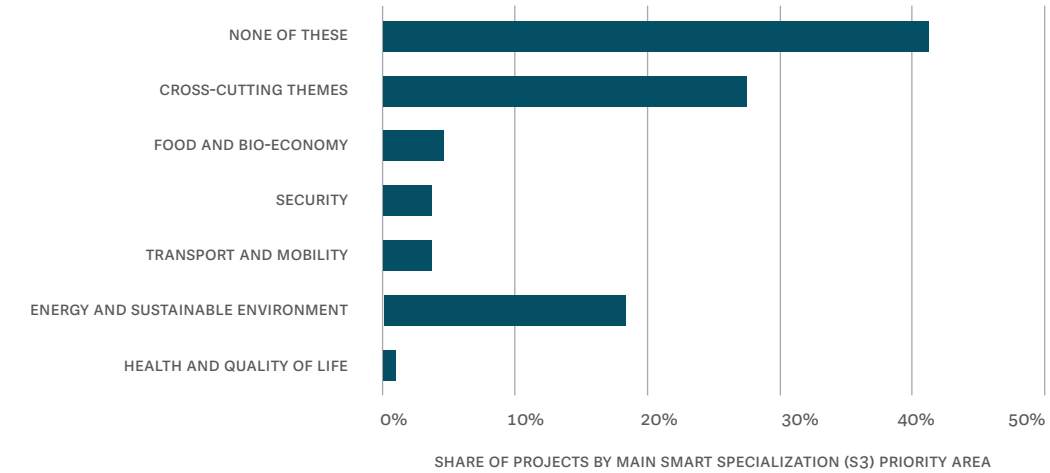
24 The Analysis of Theory of Change and Results Framework (World Bank 2020a) suggests a revised M&E framework for the program.

Figure 8.11 Respondents operate mostly in manufacturing, construction and information and communication activities



Source: Beneficiary surveys. N=109. Other includes private technical protection; Geodetic activity; Tourism, Cooling equipment service; Architectural activities, design and supervision; Research and development on new projects for car industry; Provision of services in charter.

Figure 8.12 Many respondents could not classify their project into any of the S3 thematic priority areas



Source: Beneficiary surveys. N=109.

8.3 Efficiency in the generation of outcomes

Overall, respondents achieved a total of 4,879 outcomes (including both intended and other results) and the average amount of outcomes per project is estimated at 48. Intended outcomes included upgrading products, or services, upgrading existing or developing new processes, developing new business models, developing or adopting a new technology, developing new software, improving sales and increasing the number of employees. Other outcomes include collaborative projects after project completion, market-oriented research, outcomes related to intellectual property protection, transfer agreements, new businesses, prototypes, new designs for a product, process or service, products or services that are new to the firm or new to the market, developing a new innovation unit in the company, company reorganization, improved productivity, reduced production costs, improved export performance, and expansion to new markets.

Intended outcomes achieved

Most respondents achieved key program outcomes, but some intended outcomes were achieved by a rather limited share of respondents. Progress on all intended outcomes are reported in Table 8.1. The most prominent result was 80 new technologies adopted by 78 percent of respondents. Even more, all those that adopted new technologies were able to implement them. A more limited number of beneficiaries were able to develop new or upgrade existing processes (36 and 18 percent respectively) and only 30 percent developed a new software.

Supported enterprises also reported increased sales and number of employees, which is consistent with financial statement data. Sixty-seven percent of respondents reported an average increase in sales related to the project of 25 percent. Regarding employment, respondents reported hiring 312 full-time workers and 15 part-time workers related to the project. According to financial statements submitted to FINA, the number of employees for the beneficiaries of this program increased in 2019 by a cumulative 2,242 employees, compared to the year prior to the start of the project. Out of 205 firms for which FINA data are available, 40 percent had an increase in employees of 30 percent or more, a third had an increase of up to 30 percent, and in 27 percent of firms the number of employees dropped. In the year the project started, firms increased the number of employees compared to the previous year by 6 percent on average, with even higher growth in the first year after project end (28 percent), and a slowdown in the second year after project end (7 percent). Similarly, sales increased by 46 percent on average, with 70 percent of supported firms experiencing an increase in sales of up to 50 percent. On average, sales increased by 11 percent in the year the project started, compared to the previous year, 23 percent in the first year after project end, and 8 percent in the second year after project end.

Table 8.1 Most respondents adopted a new technology and experienced an increase in sales and jobs

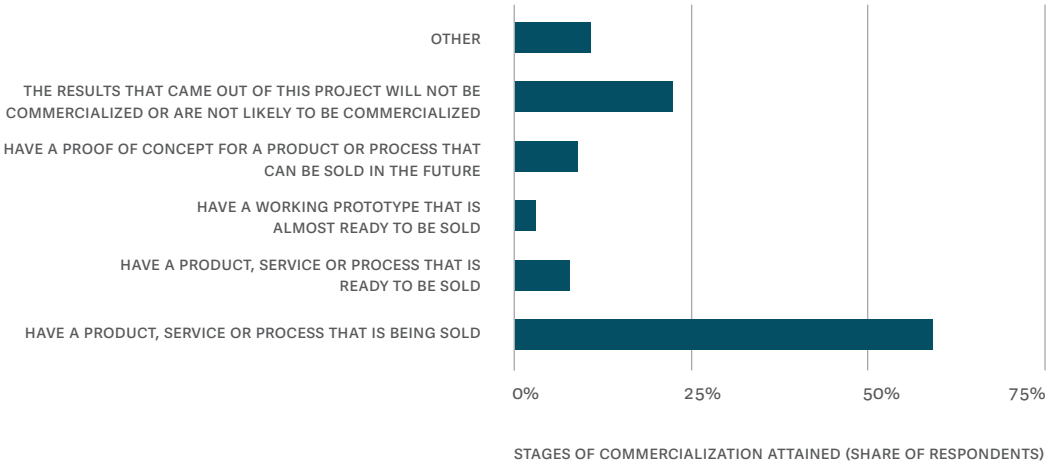
INTENDED OUTCOME	SHARE OF RESPONDENTS THAT ACHIEVED RESULT	NUMBER OF RESPONDENTS THAT ACHIEVED RESULT	TOTAL NUMBER OF RESULTS REPORTED
Upgraded products or services	29%	8	17
Developed new processes	36%	10	26
Upgraded processes	18%	5	11
Developed a new business model	38%	39	39
Adopted a new technology	78%	80	80
Developed new technology	18%	19	239
Developed new software	30%	31	163
Company improved sales (a)	65%	66	66
Company increased number of employees (a)	67%	68	68

Source: Beneficiary surveys. N=103. (a) For these items N=101.

Almost 60 percent of respondents commercialized the results related to the supported project and have a product, service, or process that is already being sold. However, for 22 percent of respondents, the results that came out of their projects will not be commercialized or are not likely to be commercialized (Figure 8.13). Only a handful of respondents (3 percent) had working prototypes almost ready to be sold. Among the most important factors why commercialization of their projects may be a difficult task are the lack of financial and human resources.

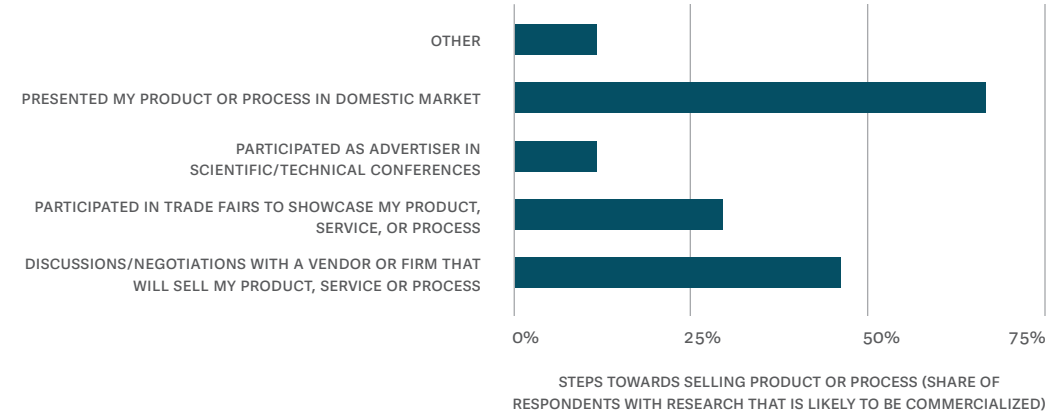
Most of those that have results likely to be commercialized are taking steps towards selling the product or process coming out of the project. Most respondents, 67 percent, presented their product or process in the domestic market. A little under 50 percent had discussions or negotiations with a vendor or firm that will sell their product, service or process, and about 30 percent participated in trade fairs to showcase their products (Figure 8.14).

Figure 8.13 Many respondents are selling a product or service, or are using a process resulting from the project



Source: Beneficiary surveys. N=103. Multiple selection question. Other includes accelerated production and improved markets, easier market positioning and direct sale of products, easier training of new employees.

Figure 8.14 Most respondents presented the product or process in the domestic market



Source: Beneficiary surveys. N=78. Multiple selection question. Other includes direct contact with partners who could be interested, improved businesses processes within company, product is not ready, advertising.

Other results

Program beneficiaries achieved several other results. Most prominently, projects were effective in reducing production costs for 66 percent of respondents and in increasing productivity for 93 percent of respondents (Table 8.2). The average reduction in costs was 17 percent and the average improvement in productivity was 25 percent. Another key result was that 41 percent of respondents developed a total of 440 products or services that were new to the firm. However, only 14 percent of respondents developed a product or service that was new to the market.

Results in terms of collaboration were rather limited, but these were not a priority for the program. First, respondents mostly engaged in collaborative projects with other firms, either domestic (45 percent of respondents) or foreign (21 percent) (Table 8.2). Second, 47 percent of respondents collaborated with domestic industry partners. These collaborations were followed by those with domestic research partners (25 percent). As seen in Figure 8.15, the least pursued types of collaboration were those with diaspora industry and diaspora research partners.

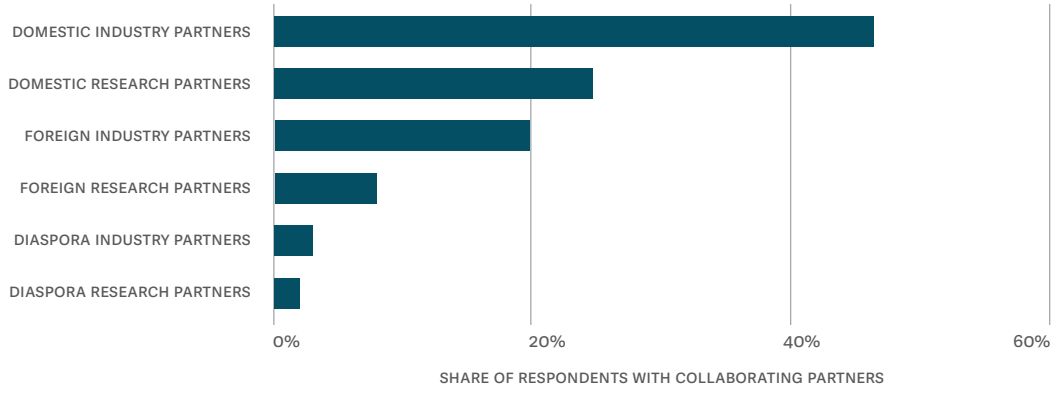
There was a lot of variation in the quality evaluations given to each type of collaboration. Domestic research partners had the highest share of respondents rating them as excellent (16 percent) and an important share rating them as above average (44 percent) (Figure 8.16). However, they also had the highest share of respondents rating them as extremely poor (4 percent). Domestic industry partners, the most pursued type of collaboration, had 12 percent of respondents rating them as excellent, while 2 percent rated this type of collaboration as extremely poor. The purposes of collaborations were mostly technological consultancy (44 percent of respondents), selling a product (42 percent) and preparation of technical documentation (40 percent).

Table 8.2 Almost all respondents improved their productivity, and most reduced their production costs

OTHER PROJECT RESULTS ACHIEVED DURING OR AFTER THE PROJECT	SHARE OF RESPONDENTS THAT ACHIEVED RESULT	NUMBER OF RESPONDENTS THAT ACHIEVED RESULT	TOTAL NUMBER OF RESULTS REPORTED
Collaborative projects with domestic researchers or research institutions	8%	8	78
Collaborative projects with foreign researchers or research institutions	3%	3	17
Collaborative projects with diaspora researchers or research institutions	0%	0	0
Collaborative projects with domestic enterprises	45%	45	797
Collaborative projects with foreign enterprises	21%	22	368
Market-oriented research	14%	14	110
Company defined an intellectual property right strategy for the project	4%	4	4
Patent application	1%	1	1
Patents granted	0%	0	0
Industrial design	4%	4	113
Copyrights	2%	2	15
Transfer agreements	2%	2	4
New enterprise, business or spin-off	3%	3	108
Prototype	7%	7	30
New design for a product, process, or service	14%	14	182
Products or services that are new to the firm	41%	42	440
Products or services that are new to the market	14%	14	63
Company developed a new innovation unit	10%	10	10
Company reorganized the firm or part of it	49%	50	50
Company improved their productivity (a)	93%	94	94
Company reduced the production costs (a)	66%	67	67
Company improved export performance (a)	31%	31	31
Company expanded to new markets	58%	60	60

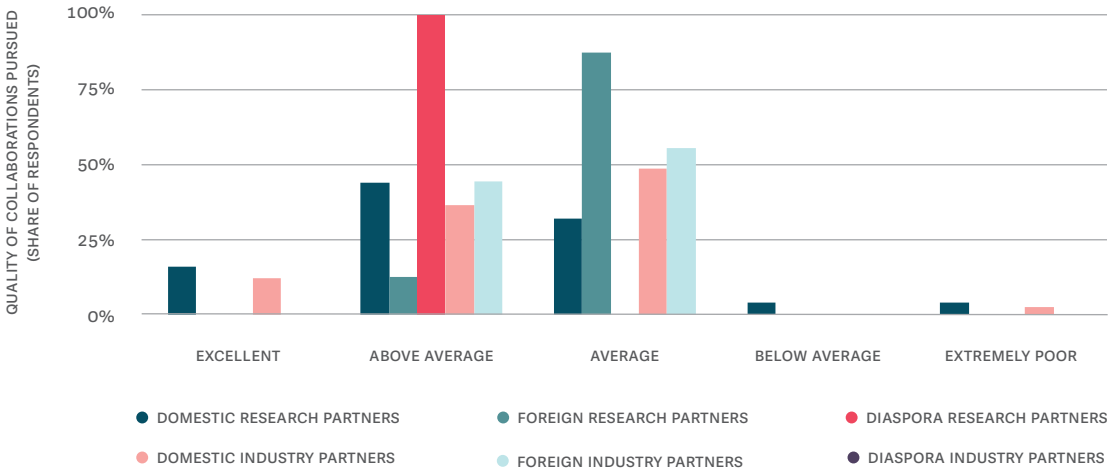
Source: Beneficiary surveys. N=103. (a) For these items N=101.

Figure 8.15 Half of the respondents had domestic industry partners, and a quarter had domestic research partners



Source: Beneficiary surveys. N=101.

Figure 8.16 Satisfaction with research and industry partners ranges mostly from average to above-average



Source: Beneficiary surveys. N=78. Other includes purchase of equipment, purchase of licenses, hardware and software purchase, and education.

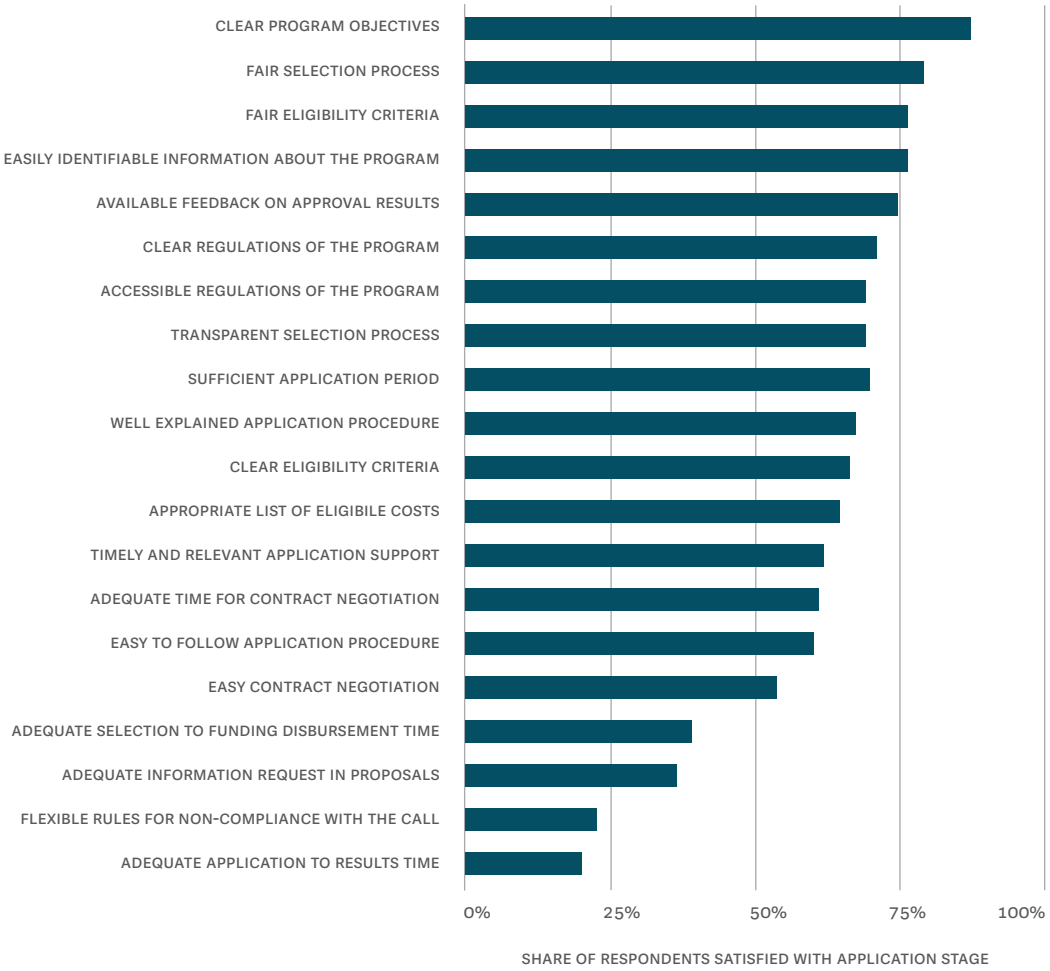
8.4 Perceived quality

Quality of program contributions

Respondents were satisfied with most aspects of the application stage, but fell short in terms of time needed to complete the selection process and disburse funds, flexibility, and information requirements. The program was most successful in five areas with which 75 percent or more of survey respondents were satisfied. These include: the clarity of the program objectives, the fairness of both the selection process and the eligibility criteria, the easiness to identify information about the program, and the availability of feedback regarding the reasons why the projects were approved (Figure 8.17). But there were also areas for improvement, for which a small share of respondents showed satisfaction. The most prominent were the flexibility of rules for non-compliance with the call and the adequacy of the time between the application and the announcement of the results, for which about 20 percent of respondents were satisfied. Over 60 percent of respondents were not satisfied with the time between selection and disbursement of funds.

Some respondents raised the issue of awarding additional points to lagging regions in the selection criteria. Respondents were invited to propose changes to the selection criteria through open-ended questions. Those that wrote in responses were concerned that the criteria related to lagging regions were given too much importance. One of the respondents also raised the issue of awarding points for increasing the number of employees, even though technology upgrades funded through the program may actually contribute to automatization of certain processes, which would not lead to any additional hiring, at least in the short term.

Figure 8.17 Respondents were least satisfied with the time needed to complete the selection process, flexibility, time to disburse funds, and information requirements

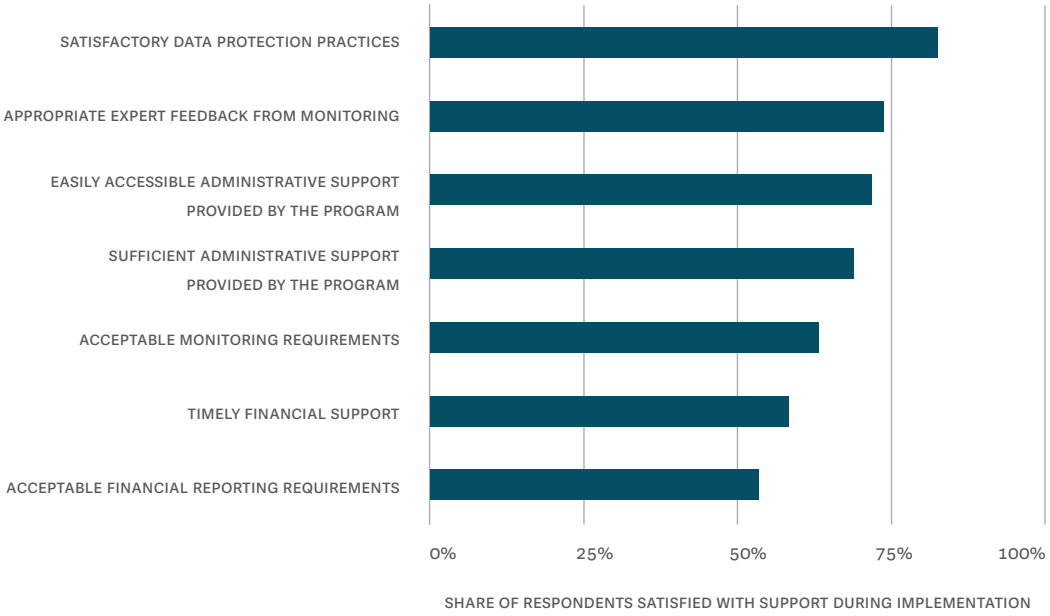


Source: Beneficiary surveys. N=110. Note: The level of satisfaction was measured in a scale of 1-5, where 1 is strongly disagree and 5 strongly agree. The figure shows the percentage of respondents who agreed or strongly agreed with the statements.

Program contributions during implementation, including the provision of funding according to the contract, the amount of financial support, and amount of time allowed for project implementation were rated satisfactorily by a large share of respondents. The funding was delivered according to the terms of the contract signed with the program for the vast majority of survey respondents (92 percent). Also, the amount of financial support provided by the program was sufficient to successfully complete the project objectives of almost 90 percent of respondents. For most of those for whom the amount of financial support was insufficient (64 percent), an increase of funds of up to 50 percent would have been enough to complete their project objectives. Among the main reasons why the funding was insufficient were increased costs of inputs and unexpected costs. Finally, the amount of time allowed by the program for project implementation, including any extensions, was sufficient to successfully complete the projects of 93 percent of respondents.

Also, during implementation, most respondents were satisfied with the program's data protection practices, the expert feedback from monitoring, and the administrative and financial support. The area with the smallest number of satisfied respondents was the adequacy of financial reporting requirements (Figure 8.18).

Figure 8.18 Over half of the respondents were satisfied with all aspects of implementation

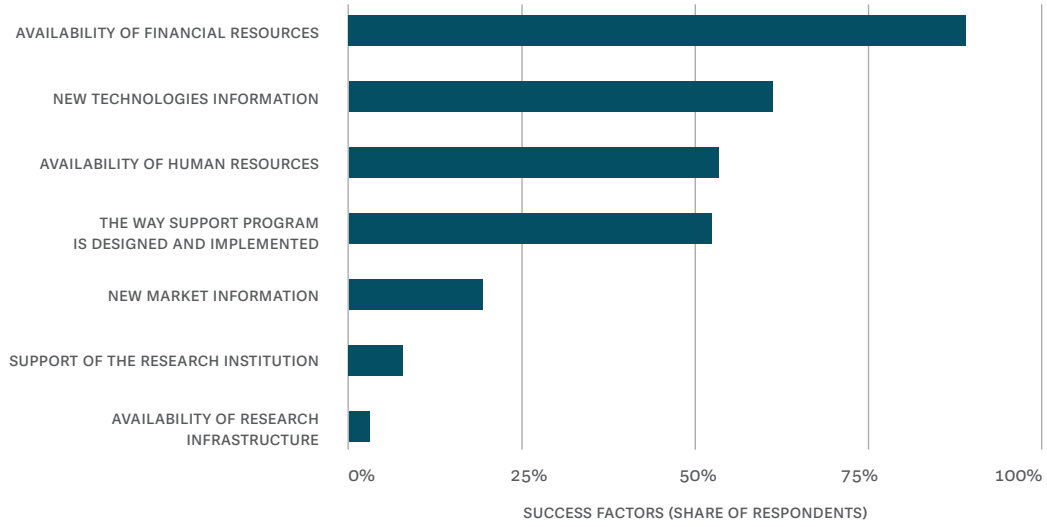


Source: Beneficiary surveys. N=103. Multiple selection question. Note: The level of satisfaction was measured in a scale of 1-5, where 1 is strongly disagree and 5 strongly agree. The figure shows the percentage of respondents who agreed or strongly agreed with the statements.

The most important success factors were the availability of financial resources and information on new technologies. For 89 percent of respondents, the availability of financial resources contributed to the achievement of results. For 61 percent, information on new technologies did. However, the support of research institutions was a success factor for only 8 percent of respondents, and the availability of research infrastructure for only 3 percent (Figure 8.19).

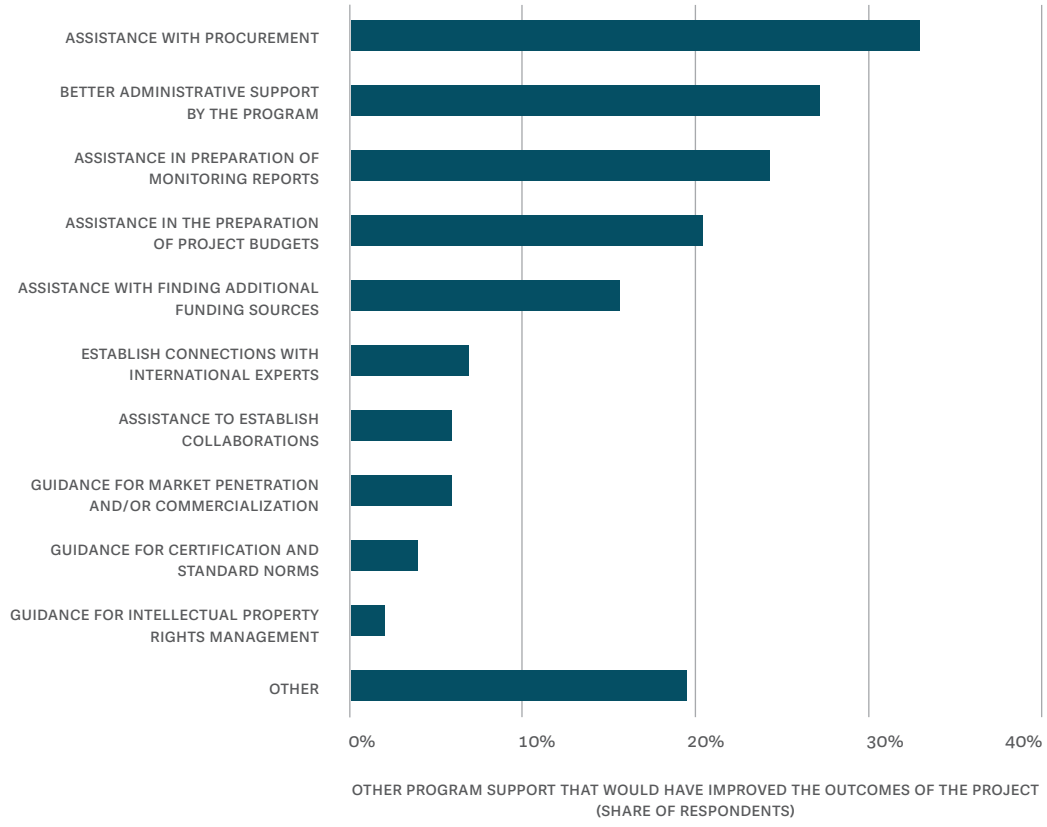
Around one-third of respondents needed assistance with procurement and better administrative support from the program. Other areas of opportunity for the program's improvement include assistance in the preparation of monitoring reports and project budgets. Many fewer respondents need guidance for intellectual property rights management or for certification and standard norms (Figure 8.20).

Figure 8.19 Availability of financial resources and information on new technology were the most common success factors



Source: Beneficiary surveys. N=103. Multiple selection question.

Figure 8.20 Respondents need assistance with procurement and better administrative support

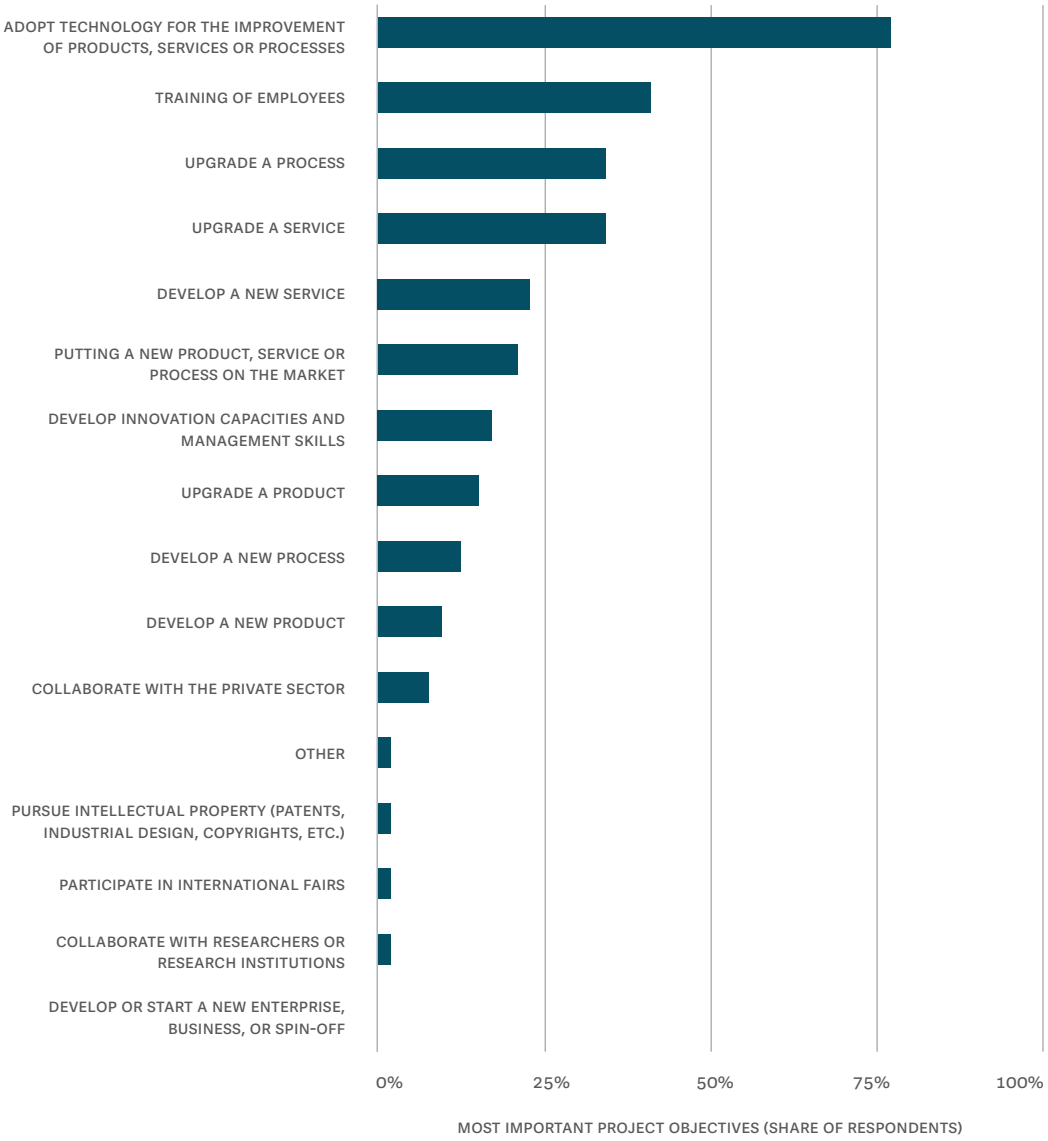


Source: Beneficiary surveys. N=103. Other includes did not need additional support, reduce delays in all processes, information regarding possible investments within each specific type of project.

Overall project quality

In line with the program's objectives, adopting technology for the improvement of products, services, or processes was among the top three project objectives for 77 percent of respondents. However, fewer than half of respondents had as their main objectives to upgrade a process, develop innovation capacities and management skills, or enter into new markets (Figure 8.21).

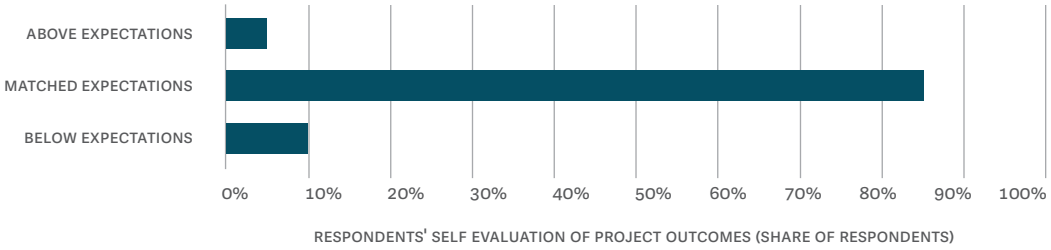
Figure 8.21 Technology adoption was the most common project objective



Source: Beneficiary Survey. N=105. Multiple selection question. Other includes entry into new markets and introduction of a new system in business operations.

Overall, respondents evaluated their projects neutrally. Project outcomes matched the expectations of 85 percent of respondents. Projects were above expectations for only 5 percent of respondents (Figure 8.22).

Figure 8.22 Project outcomes fell short of expectations for a significant portion of respondents



Source: Beneficiary Survey. N=101.

9 Innovations in Newly Established SMEs

Innovations in Newly Established SMEs

The Innovations in Newly Established SMEs program seeks to support commercialization of radical innovation and significant improvements of products and services in young firms. The program provides funding for firms no older than three years to commercialize products and services which are new on the market and which have growth and export potential. The program is co-financed under OPCC 2014-2020 and is one of the delivery instruments of the Croatian Smart Specialization Strategy 2016-2020 (S3). Phase I of the program was launched in 2016 and with an allocation of HRK 64.4 million it provided funding to a total of 57 projects. Phase II was launched in December 2018 and provided HRK 200 million in grants to 127 projects in the range of HRK 150,000 to HRK 1.4 million. The following analysis refers to Phase I of the program.

The survey response rate for this program was 58 percent. This rate is calculated based on the number of firms that completed over 50 percent of the survey. Beneficiaries that responded to the survey received 57 percent of the funding disbursed. On average, respondents received approximately the same value grant compared to all NSME-1 beneficiaries (HRK 1.1 million). All beneficiaries whose projects were reported by MESD as completed (53 projects) received the survey in June 2020, and 35 opened it, generating a cooperation rate of 67 percent.

The program implementers did not provide data on the administrative and operating costs for this program, which limits the scope of the analysis. In the absence of administrative cost data, it is not possible to calculate the amount and composition of program costs, average administrative and operating cost per project, the ratio of costs covered by the program to costs covered by beneficiaries, and direct transfers per unit of administrative and operating costs. Therefore, the analysis is limited to presenting the data collected in the beneficiary surveys, including costs incurred by beneficiaries, program outputs, outcomes, beneficiary satisfaction, and alignment with program objectives.

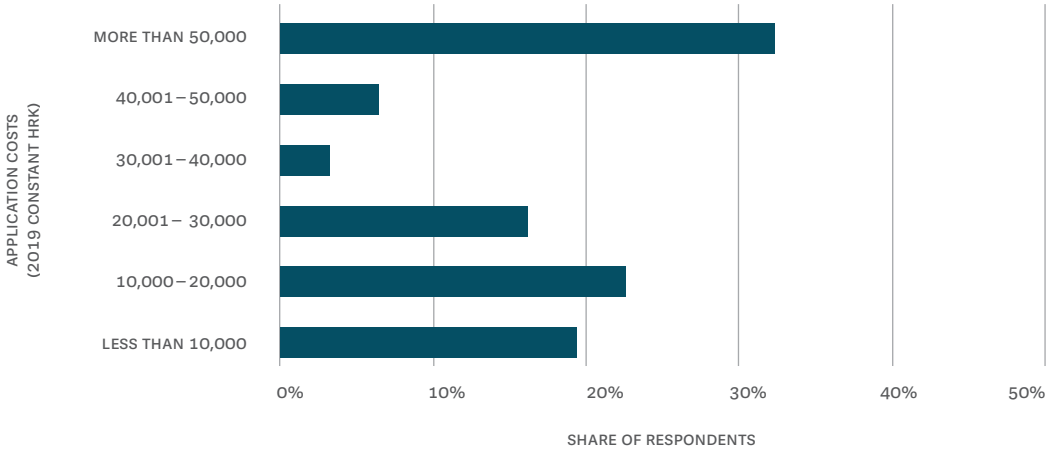
9.1 Use of inputs

Costs covered by beneficiaries

The cost of application to this call was relatively high, possibly due to extensive use of consultants. The average application cost covered by respondents was HRK 46,633 per project. Almost a third of respondents spent more than HRK 50,000 preparing their applications, while only 19 percent spent less than HRK 10,000 (Figure 9.1). The high application

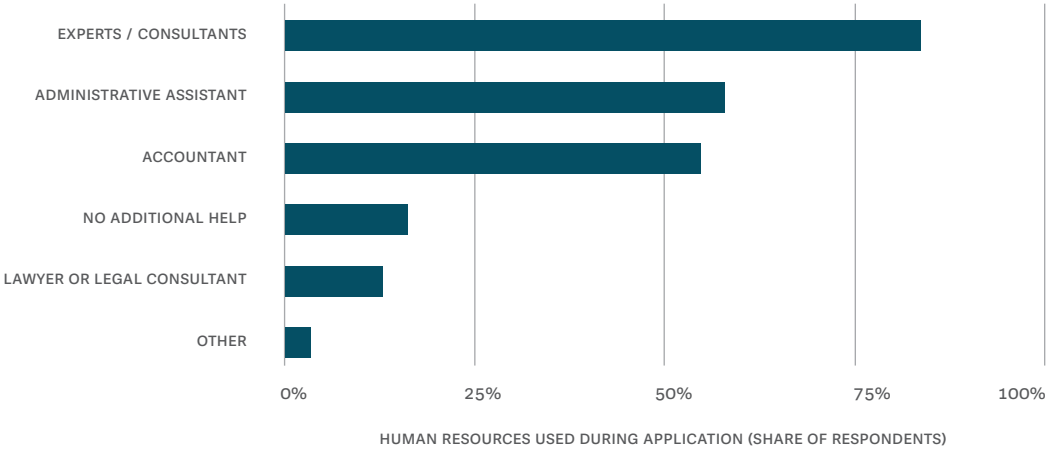
cost may be explained by the additional expertise needed to prepare the application: over 80 percent of respondents used experts or consultants and over 50 percent used accountants and administrative assistants. Only 16 percent did not need any additional help (Figure 9.2). Seventy-eight percent of respondents who used experts for their application were satisfied with the services received, but about 50 percent found the costs somewhat high. Extensive use of consultants is a sign that the application process may be too complex or demanding, especially for small firms (World Bank 2020b). This creates barriers to application, particularly for young, small firms, that have limited resources.

Figure 9.1 Application costs are high, especially for a program targeting young firms with limited resources



Source: Beneficiary surveys. N=31.

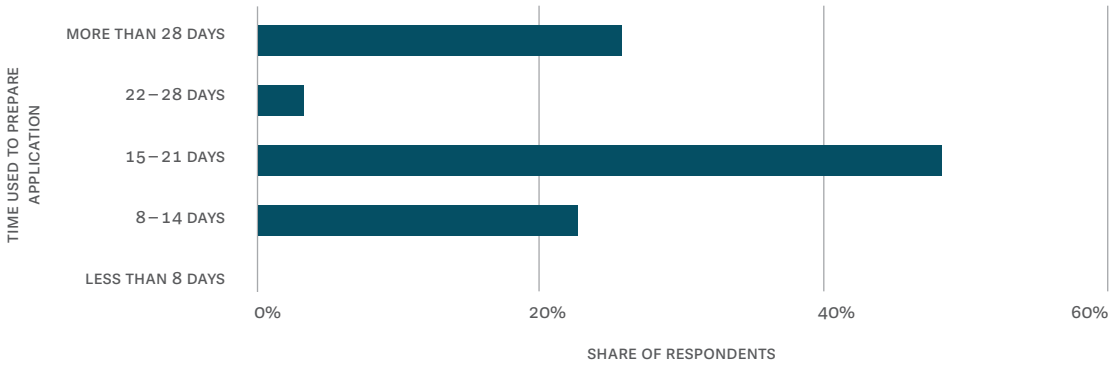
Figure 9.2 Most respondents hired an expert or consultant, which indicates complexity in the application process



Source: Beneficiary surveys. N=31. Multiple selection question. Other includes other type of assistant.

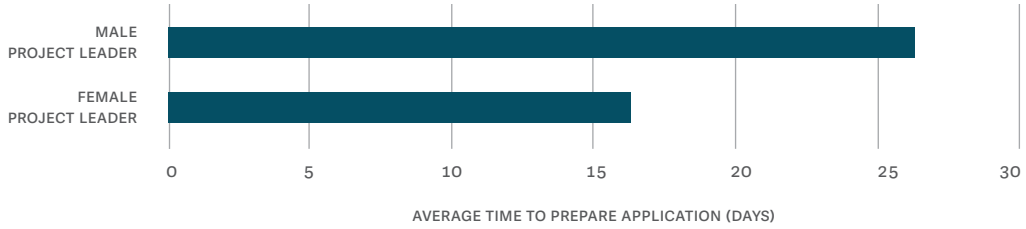
Beneficiaries took, on average, 24 days to prepare their applications. Almost half of the respondents took between 2 and 3 weeks (or 15-21 days) to complete them, and 23 percent did so in 8-14 days (Figure 9.3). Also, on average, it took more time for respondents with male project leaders to prepare their applications (26 days) than those with female project leaders (16 days), but this difference is not statistically significant (Figure 9.4).

Figure 9.3 The application process was time-consuming for many respondents



Source: Beneficiary surveys. N=31.

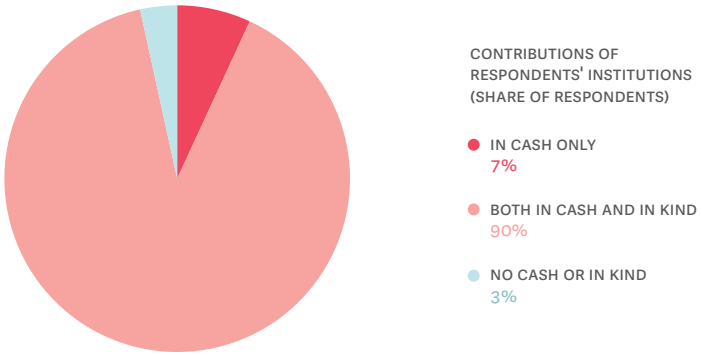
Figure 9.4 Female project leaders took less time to prepare the application



Source: Beneficiary surveys. N=31.

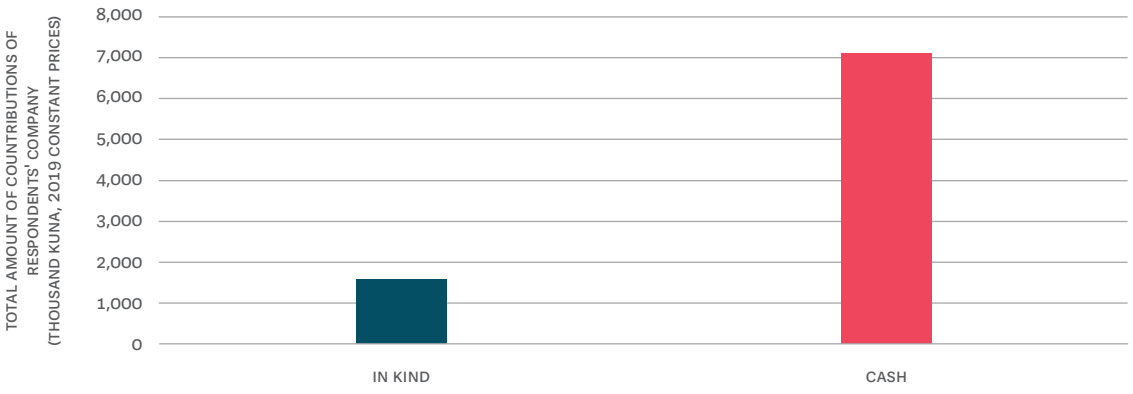
Most respondents made a combination of in-kind and cash contributions to the project, with the latter being valued much higher (Figure 9.5). There were a few respondents (3 percent) who reported making no contributions, despite the fact that the call required at least 10 percent of matching contributions to the project. Respondents valued their companies' in-kind contributions at almost HRK 1.6 million and the cash contributions at HRK 7.1 million (Figure 9.6). The average in-kind contribution amounted to approximately HRK 60,500 per project, while the average cash contribution was much higher, amounting to almost HRK 253,600 per project. This is a steep cost for young firms, considering the fact that the average revenue from sales in beneficiary firms in the year before the project start was around HRK 913,000.

Figure 9.5 Most respondents made a combination of in-kind and cash contributions...



Source: Beneficiary surveys. N=29.

Figure 9.6 ... but the estimated value of cash contributions was much higher

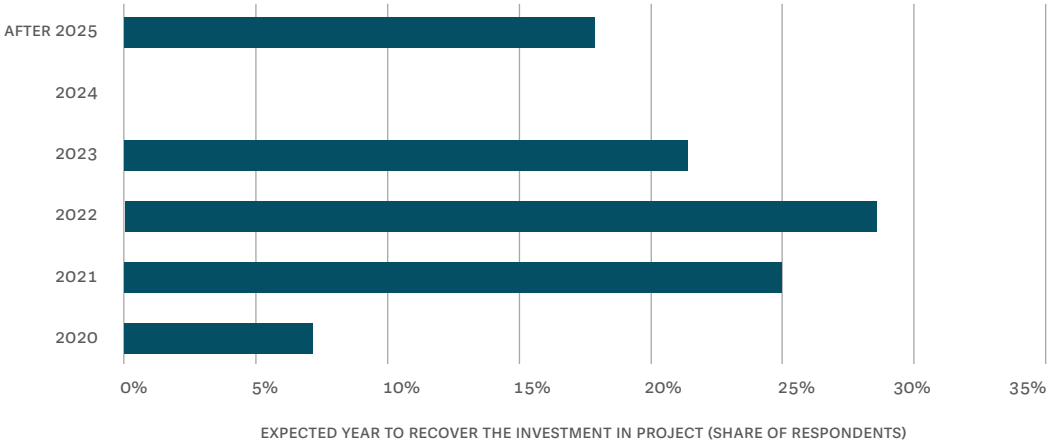


Source: Beneficiary surveys. N=28.

Beneficiaries participating in the survey received at least three times the amount they invested in the project. Considering the costs covered by beneficiaries (including application costs and the cost of matching contributions), the average costs covered by respondents was approximately HRK 360,709 per project. The costs covered by the program, including direct financial transfers only, were approximately HRK 1.1 million per project.[25] This means that, on average, for every HRK that beneficiaries put into the project, they received HRK 3 from the program in direct financial transfers.

The majority of respondents expect that it will take them a longer period of time to recover their investment. Almost two-thirds of respondents expect to recover project investments in 2022 or later (Figure 9.7). 6 percent of respondents completed their projects in 2017, 51 percent in 2018, and 43 percent in 2019, therefore they expected to recover their investments in 4 years or more from project closing, on average.

Figure 9.7 Many respondents expect to recover their investment over a longer period of time



Source: Beneficiary surveys. N=28.

9.2 Efficiency in the generation of outputs

Investments in beneficiaries

The analysis of efficiency in the generation of outputs is limited due to missing data. The program transferred approximately HRK 58.8 million directly to beneficiaries, which translates to about HRK 1.1 million per project. Because the program did not provide

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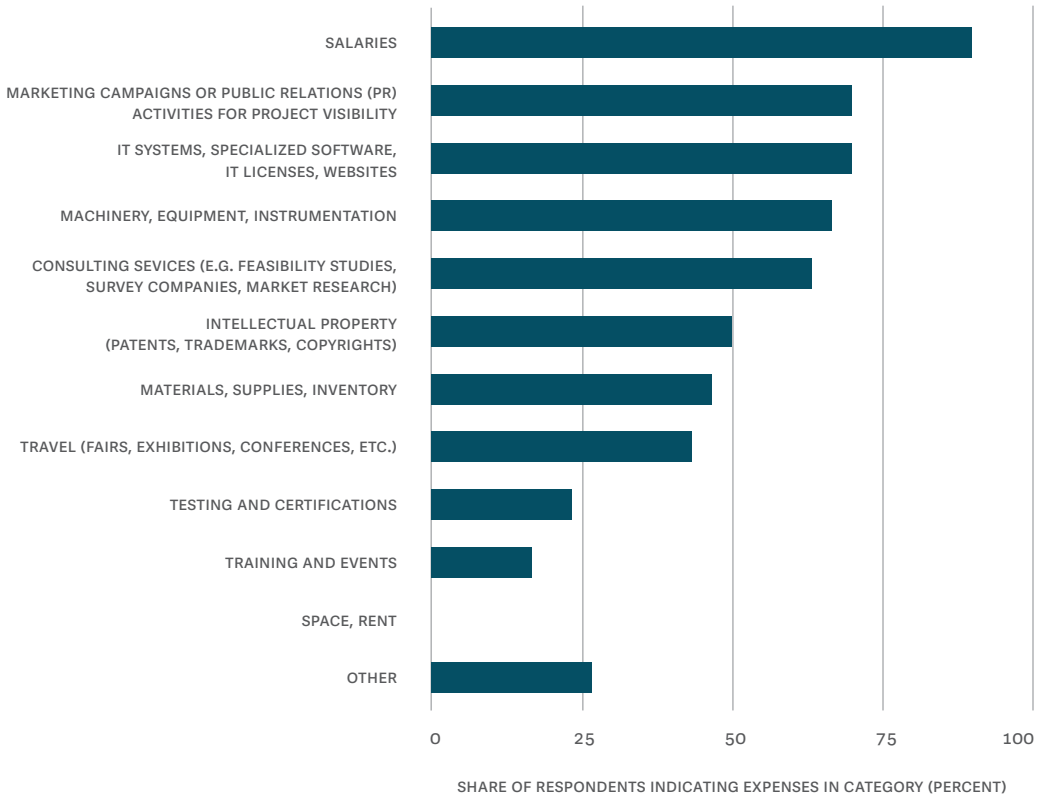
25 The program cost is underestimated because it only includes direct financial transfers. Indirect financial transfers, non-financial transfers, and administrative and operating costs were not reported. Consequently, the ratio of costs covered by the program to costs covered by the beneficiaries is also underestimated.

information about other types of transfers to beneficiaries (indirect and non-financial transfers) and administrative and operative costs, the efficiency indicator on total transfers per unit of administrative and operative costs was not calculated. The program should consider gathering these data to analyze how much beneficiaries get for every HRK put into designing and running the program.

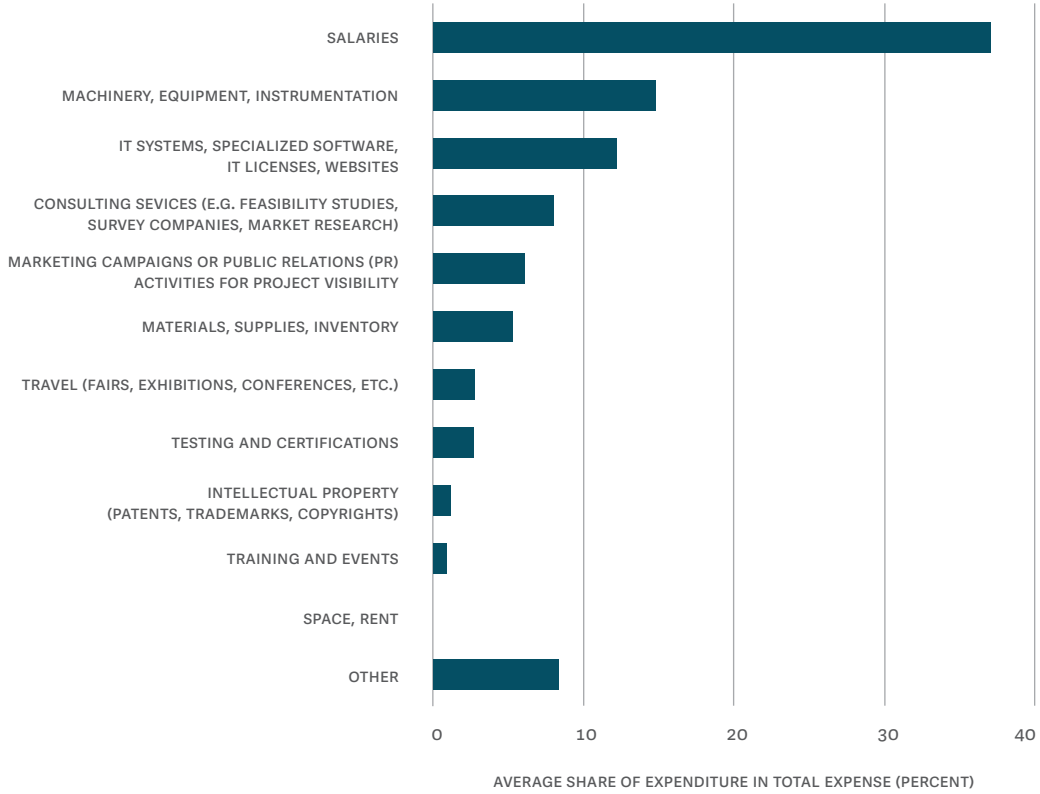
Investment in intellectual property, testing and certifications, and travel to fairs and exhibitions was lower than expected considering the objectives of the project. Around half of the respondents invested in intellectual property protection for an average of about 1 percent of their budget. In contrast, 90 percent of survey respondents had expenses in salaries (Figure 9.8), and on average they took up the largest portion of the budget (37 percent, Figure 9.9). A majority of respondents also reported expenses in marketing, IT systems, equipment, and consulting services.

Figure 9.8 Most respondents reported investing in salaries, marketing, IT systems, equipment, and consulting



Source: Beneficiary surveys. N=30.Other includes external development, public procurement, project implementation, auditing, production, testing services, rent of server infrastructure, and external services.

Figure 9.9 Salaries on average took up the largest share of the budget, followed by equipment, IT systems, and consulting services



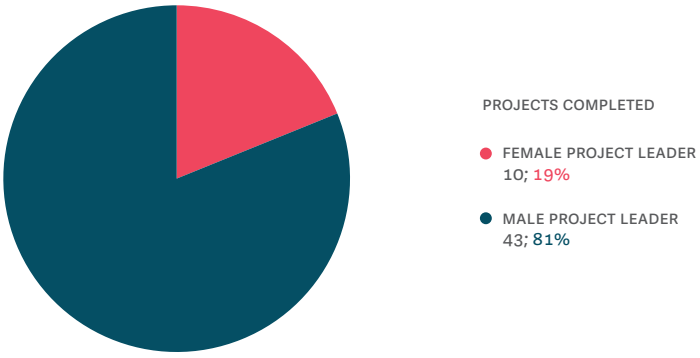
Source: Beneficiary surveys. N=30. Other includes external development, public procurement, project implementation, auditing, production, testing services, rent of server infrastructure, and external services.

Outputs achieved

A total of 53 projects received support from this program, and most were led by male project leaders. Only 19 percent of projects had a female project leader (Figure 9.10), which obtained only 19 percent of the funds disbursed by the program, the lowest share of the two programs analyzed targeting firms. Projects were completed between 2017 and 2019, with most of them being completed in 2018.

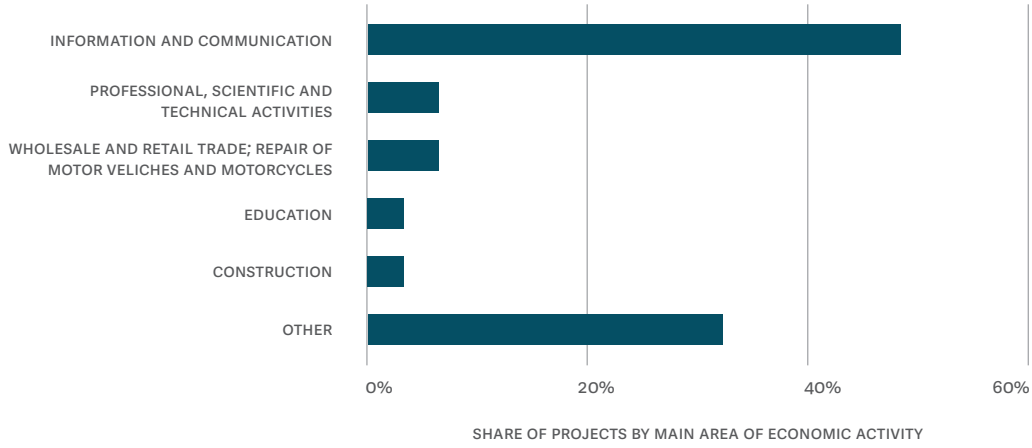
Projects were distributed in about five areas of economic activity and an important share aligned to cross-cutting areas of the Smart Specialization Strategy. In line with the program's objectives, almost half of the survey respondents had Information and Communication as their project's main area of economic activity (Figure 9.11). In contrast, a much lower percentage (3 percent) of projects chose construction and education as their main areas of economic activity. Phase 1 of the program did not make any reference to S3, but 42 percent of projects were aligned to the ICT sub-area under the cross-cutting area of the S3 strategy (Figure 9.12). 19 percent of respondents were not able to make a link between their project and any S3 priority areas.

Figure 9.10 Female project leaders are less represented among completed projects



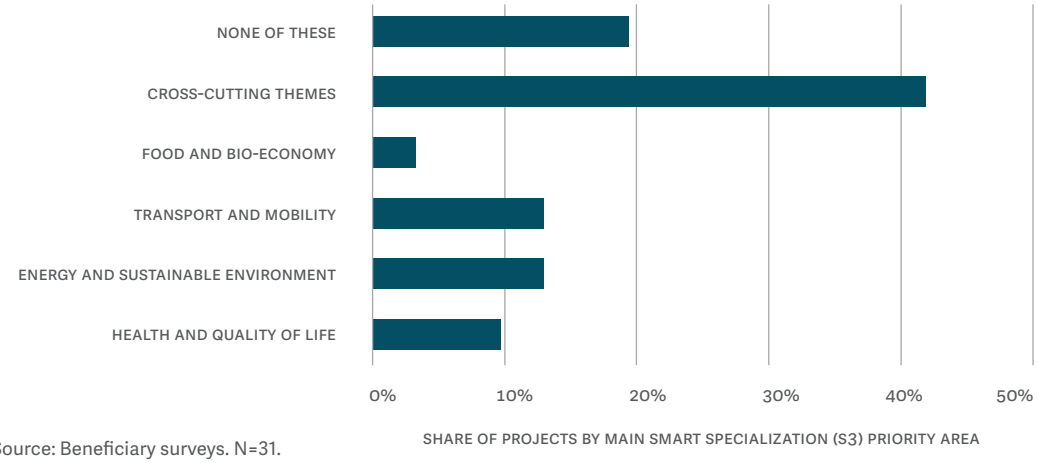
Source: MESD data. N=53.

Figure 9.11 A significant portion of projects was implemented in the information and communication sectors



Source: Beneficiary surveys. N=21. Other includes bicycling and health, tourism, assistance to disabled persons, e-mobility solutions.

Figure 9.12 Respondents most frequently aligned their projects with cross-cutting S3 themes, primarily ICT



Source: Beneficiary surveys. N=31.

Most respondents achieved outputs in terms of additional workers hired, but fell short of expectations on IPR protection indicators. Nine outputs were tracked for this program: market-oriented research; transfer agreements; new enterprise, business or spin-off; patent applications; patents granted; industrial designs; copyrights; additional full-time workers; and additional part-time workers (Table 9.1). In total, 121 outputs were achieved by 28 respondents. This means that, on average, respondents achieved four outputs per project. Seventy-seven percent of respondents hired a total of 50 full-time workers and 19 percent hired six additional part-time workers. Another output achieved by many projects was the production of market-oriented research where 54 percent of respondents conducted 21 investigations. Consistent with the low investment of respondents in IPR protection shown in Figure 9.8 and Figure 9.9, only 22 percent of respondents registered patents, and only 25 percent listed copyrights or industrial designs. Outputs related to technology transfer, including transfer agreements and spin-offs were achieved by the fewest respondents.

Table 9.1 Most respondents hired additional workers but IPR-related outputs fell short of expectations

INTENDED OUTPUT	SHARE OF RESPONDENTS THAT ACHIEVED RESULT	NUMBER OF RESPONDENTS THAT ACHIEVED RESULT	TOTAL NUMBER OF RESULTS REPORTED
Market-oriented research	54%	15	21
Transfer agreements	7%	2	3
New enterprise, business or spin-off	15%	4	5
Patent applications	36%	10	12
Patents granted	22%	6	6
Industrial designs	25%	7	8
Copyrights	25%	7	10
Additional full-time workers hired	77%	20	50
Additional part-time workers hired	19%	5	6

Source: Beneficiary surveys. N=28.

9.3 Efficiency in the generation of outcomes

Respondents achieved a significant number of intended and other outcomes. Overall, respondents achieved a total of 838 outcomes (including both intended and other results), equivalent to an average of 30 outcomes per project. Since the focus of the program was on commercialization of significantly novel products or services, intended outcomes relate mostly to the introduction of new products, services, processes, access to new markets and sales.

Intended outcomes achieved

A large share of respondents made achievements in all intended outcomes, most notably new products or services new to the firm and new to the market. Ninety-three percent of respondents developed a total of 67 products or services that are new to the firm and 82 percent of respondents developed 42 products that are new to the market (Table 9.2). In that respect, the program was relatively successful in achieving its primary objective. A large share of companies also reported developing new business models, developing and adopting technologies, accessing new markets and increasing sales. On average, respondents reported a 64 percent increase in sales, 59 percent increase in export performance, and 4 new markets reached. According to financial statement data, the median percentage increase in sales in all supported firms was 201 percent, compared to the year before the start of the project. Median sales increased by 74 percent in the year the

project started compared to the previous year, 90 percent in the year the project ended, and 28 percent in the first year after project end. This reflects the focus of the program on innovative, newly established SMEs, which expanded rapidly, mostly from a low sales baseline prior to the start of the project.

Table 9.2 Many respondents managed to introduce new products or services after project completion

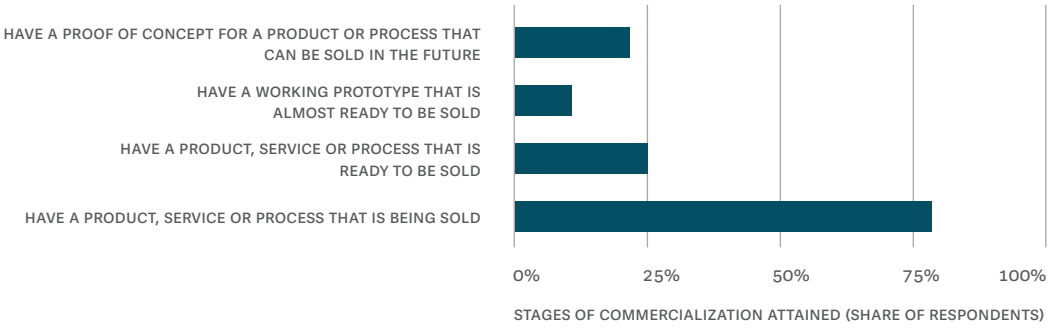
INTENDED OUTCOME	SHARE OF RESPONDENTS THAT ACHIEVED RESULT	NUMBER OF RESPONDENTS THAT ACHIEVED RESULT	TOTAL NUMBER OF RESULTS REPORTED
New design for a product, process, or service	50%	14	33
Products or services that are new to the firm	93%	26	67
Products or services that are new to the market	82%	23	42
New processes	36%	10	26
New software development	54%	15	33
New technology development	36%	10	16
Companies that developed a new business model	71%	20	20
Companies that adopted a new technology	79%	22	22
Companies that accessed new markets	86%	24	24
Companies that increased sales	79%	22	22
Companies that improved their export performance	64%	18	18

Source: Beneficiary surveys. N=28.

The results of all respondents' projects were likely to be commercialized, and a large majority had products or services already being sold. A high percentage of respondents (79 percent) had a product, service or process that is already being sold (Figure 9.13). Also, a few other respondents had products, services or processes ready to be sold, proofs of concept that could be sold in the future, or working prototypes almost ready to be sold.

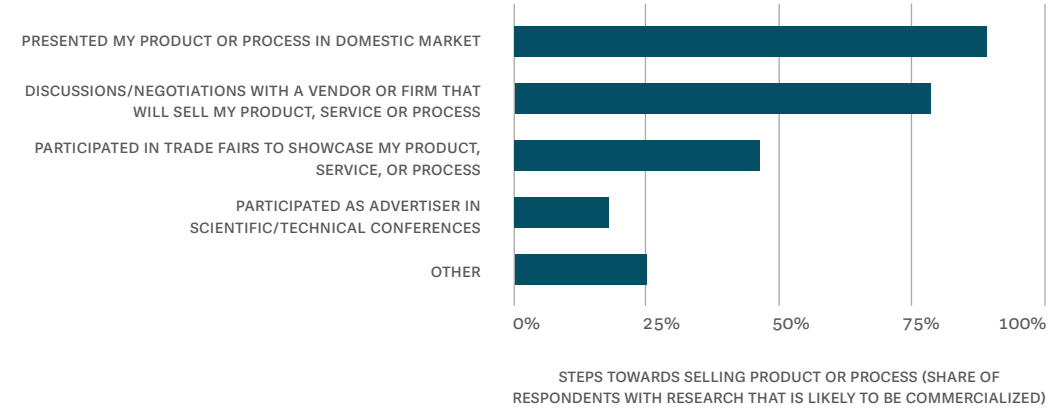
To sell their products or processes, most beneficiaries presented them in domestic markets and had discussions with vendors. 90 percent of respondents presented their product or process in the domestic market and 79 percent had discussions or negotiations with a vendor or firm that will sell their product, service, or process (Figure 9.14). Fewer respondents, 46 percent, participated in trade fairs to showcase their product, service, or process.

Figure 9.13 Most firms are already selling a product or service supported by the project



Source: Beneficiary surveys. N=28.

Figure 9.14 Most firms have presented their new products or services to a domestic market and were negotiating with vendors



Source: Beneficiary surveys. N=28. Other includes presentation of goods and services to foreign companies, marketing and advertising, and crowdfunding campaign.

Most firms supported by the program recorded positive outcomes in terms of job creation and firm survival. Financial statement data from 2015 to 2019, available for 52 out of 53 firms supported by the program, show a cumulative net gain of 140 employees or 131 FTE employees in 2019, compared to the year before the start of the project. The median percentage increase in the number of employees was 100 percent, meaning that around half the firms doubled the number of employees. In the year the project started, the number of employees increased by 64 percent on average compared to the previous year, and continued to increase in the year the project ended (59 percent), as well as in the year after project end (8 percent). It must be noted that, since the program targeted young firms, about half of them had only one or two employees on record one year prior to the start of the project. By 2019, 90 percent of the surviving firms still had no more than 10 employees. Only one firm out of 53 did not survive, yielding a survival rate among beneficiaries of 98 percent.

Other results

The most prominent other results, in addition to intended outcomes, were the efforts to build the capacity of workers and to reorganize the firms and increase productivity. Seventy-nine percent of respondents improved the capability of employees (Table 9.3). Also, a large share of companies (68 percent) were reorganized and improved their productivity by 40 percent on average. Respondents had a fair number of collaborations with domestic enterprises, but very few with researchers or research institutions.

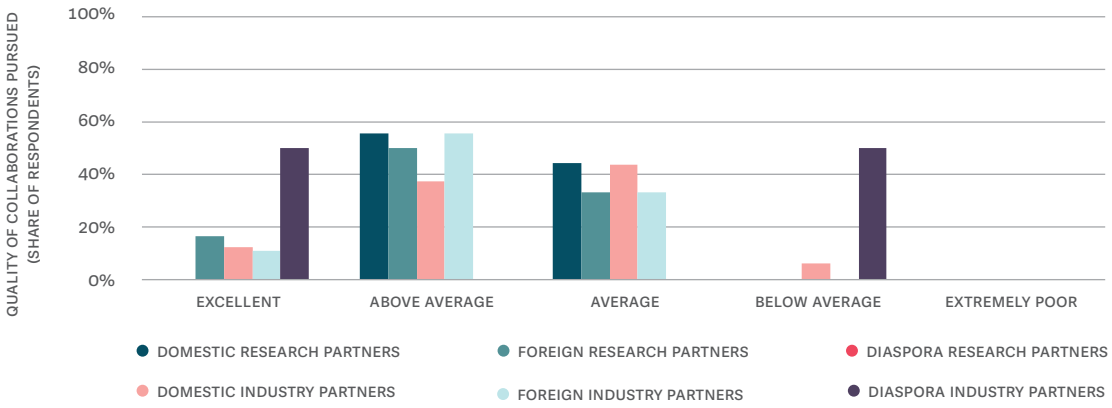
Table 9.3 Among other results, respondents improved capabilities, reorganized, improved productivity, and engaged in collaborations

OTHER PROJECT RESULTS ACHIEVED DURING OR AFTER THE PROJECT	SHARE OF RESPONDENTS THAT ACHIEVED RESULT	NUMBER OF RESPONDENTS THAT ACHIEVED RESULT	TOTAL NUMBER OF RESULTS REPORTED
Collaborative projects with domestic researchers or research institutions	25%	7	8
Collaborative projects with foreign researchers or research institutions	11%	3	3
Collaborative projects with diaspora researchers or research institutions	0%	0	0
Collaborative projects with domestic enterprises	64%	18	302
Collaborative projects with foreign enterprises	50%	14	16
Companies that defined an intellectual property right strategy for the project	32%	9	9
Define an intellectual property right strategy for the project	32%	9	9
Prototype	61%	17	41
Upgraded products or services	29%	8	17
Upgraded processes	18%	5	11
Companies that developed a new innovation unit in the firm	36%	10	10
Companies that improved the capabilities of employees	79%	22	22
Companies that reorganized all or part of firm	68%	19	19
Companies that improved their productivity	68%	19	19
Companies that reduced the production costs	46%	13	13

Source: Beneficiary surveys. N=28.

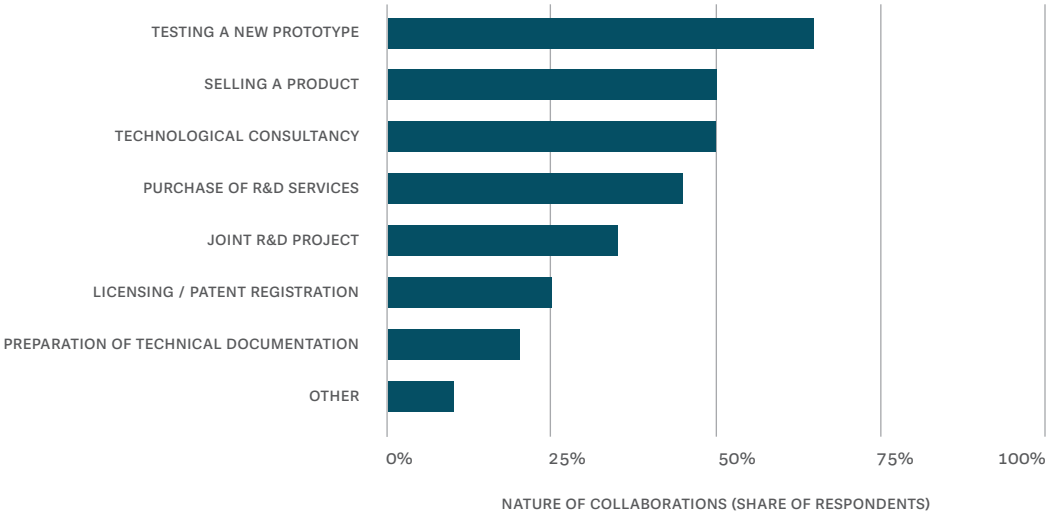
Even though collaborations with enterprises were far more common than with researchers, respondents were more satisfied with the latter. While formal partnerships co-financed by the program to work jointly on the project were not permitted, 61 percent of respondents had domestic industry partners and 32 percent domestic research partners. Fifty-six percent of respondents rated their collaborations with domestic researchers as above average and 44 percent as average, while 38 percent rated collaborations with industry above average and 44 as average (Figure 9.15). Most collaborations pursued were for testing prototypes or selling products (Figure 9.16).

Figure 9.15 Respondents were more satisfied with research than with industry partners



Source: Beneficiary surveys. N=20.

Figure 9.16 Collaborations mostly relate to protoype testing, selling a product, and technological consultancy



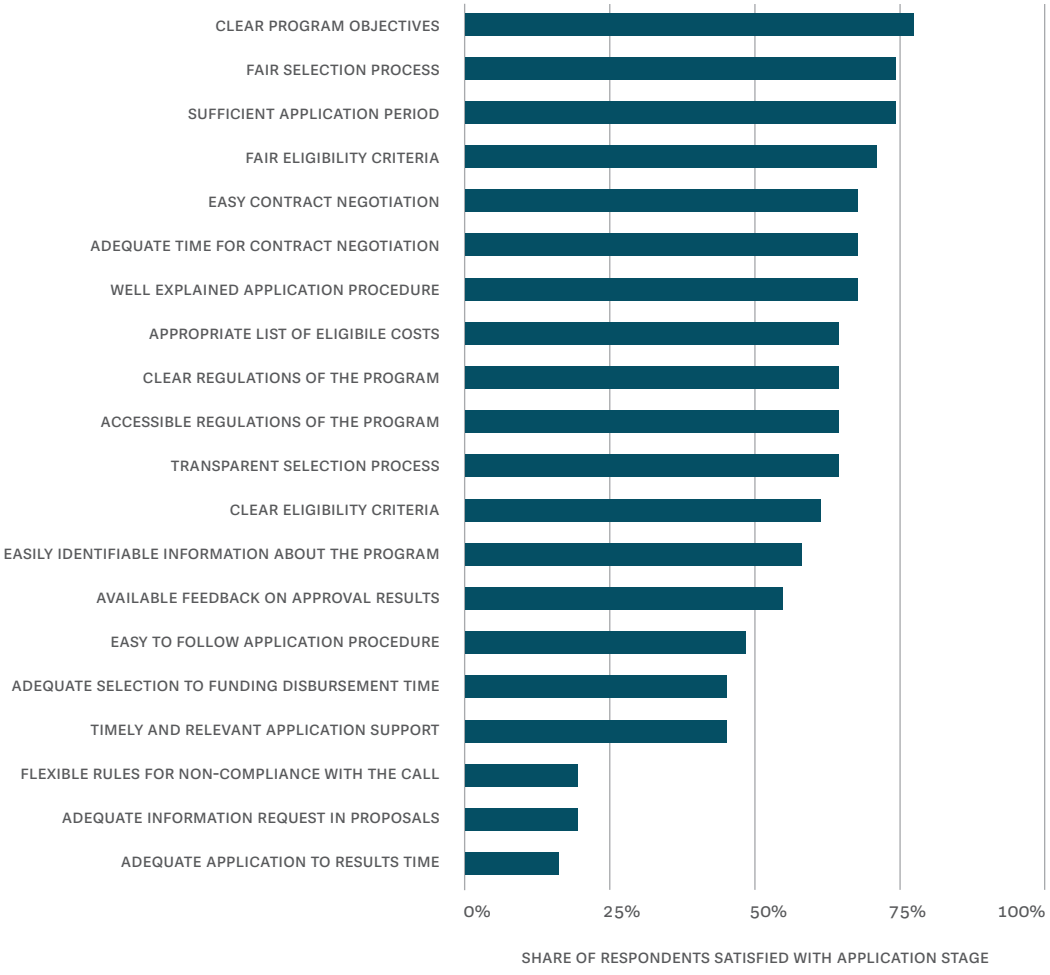
Source: Beneficiary surveys. N=20. Other includes project management and brokerage with customers.

9.4 Perceived quality

Quality of program contributions

Over 50 percent of respondents were satisfied with the quality of the program in most areas of the application stage. Over 70 percent of respondents agreed or strongly agreed that the program objectives were clear (77 percent), the selection process was fair (74 percent), and the time for application was sufficient (74 percent) (Figure 9.17). Also, over 50 percent of respondents were satisfied with several other program areas at the application stage, including fair and clear eligibility criteria, contract negotiation and clear and accessible program regulations, among others.

Figure 9.17 Respondents were satisfied with most areas of the application process



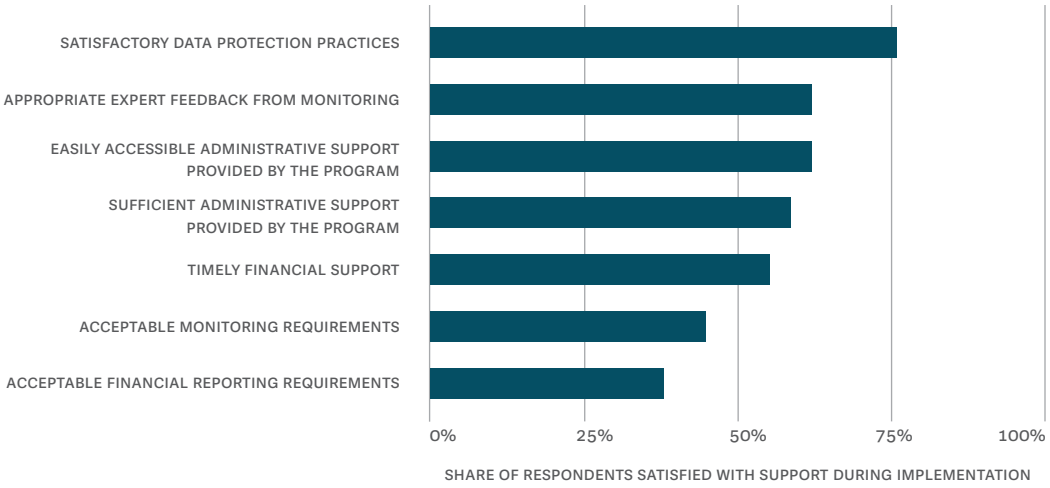
Source: Beneficiary surveys. N=31. Note: The level of satisfaction was measured in a scale of 1-5, where 1 is strongly disagree and 5 strongly agree. The figure shows the percentage of respondents who agreed or strongly agreed with the statements.

Respondents provided very few suggestions to change selection criteria, but some could be considered for future program design. For example, one respondent pointed out that the criteria favor more mature projects, which may discriminate against certain types of innovation. Another one pointed out that the selection criteria may be putting too much weight on firm revenues, considering that the target population are young firms.

Low satisfaction with information requirements, flexibility, and time needed to publish results confirms that the application process may have been overly burdensome. Only a few respondents were satisfied with the adequacy of the time between the application and the announcement of results (16 percent). Indeed, after the call was closed for applications, the timeframe for the selection process was extended from 120 days to 180 days. As reported in World Bank (2020b, p. 64), such delays can cause significant disruptions to business planning, especially in young firms and start-ups, which face precarious financial positions early on in their life cycle. The adequacy of the information requested in the proposals and lack of flexibility were also rated poorly, a sign that the required information may have been overly burdensome, and that young firms with few employees may require simpler processes and more support in application preparation.

Over half of respondents were very satisfied with the support received during implementation, except for monitoring and financial reporting requirements. Almost 90 percent of respondents received the funding according to the terms of the contract signed with the program. Also, respondents were satisfied with the data protection practices (76 percent satisfied), the expert feedback from monitoring (62 percent), and the administrative support provided by the program (62 percent) (Figure 9.18). Fewer respondents were satisfied with the monitoring and financial reporting requirements. Burdensome reporting and auditing requirements reduce the attractiveness of programs, which impairs the efforts of policymakers to reach a critical mass of beneficiaries that could make a difference in desired outcomes (World Bank 2020b).

Figure 9.18 Respondents were satisfied with most areas of the application process

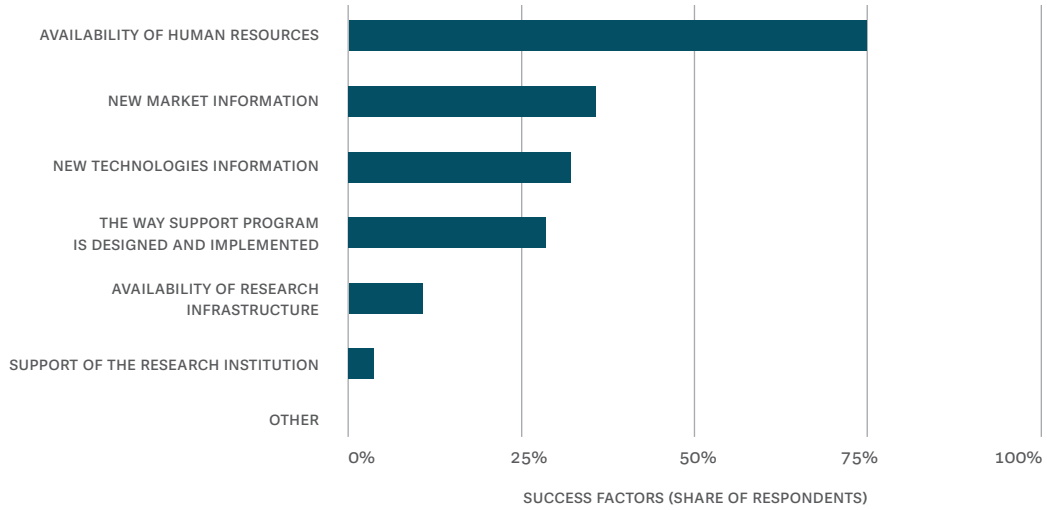


Source: Beneficiary surveys. N=29. Note: The level of satisfaction was measured in a scale of 1-5, where 1 is strongly disagree and 5 strongly agree. The figure shows the percentage of respondents who agreed or strongly agreed with the statements.

The time and funding provided for project implementation were mostly sufficient. For the majority of respondents (93 percent), the amount of time allowed by the program for project implementation, including any extensions, was sufficient to successfully complete their projects. For 70 percent of respondents, the amount of financial support provided by the program was sufficient to successfully complete their project objectives. An increase of the funds of up to 40 percent would have been enough to complete the project objectives of 39 percent of those for whom the amount of financial support was insufficient. For rest of the respondents who received insufficient funds (61 percent), an increase between 41 and 60 percent would have been enough. Among the reasons why funding was insufficient, the most prominent were unexpected costs, inadequate budget clearing by responsible authority, and increased project scope beyond the original plan.

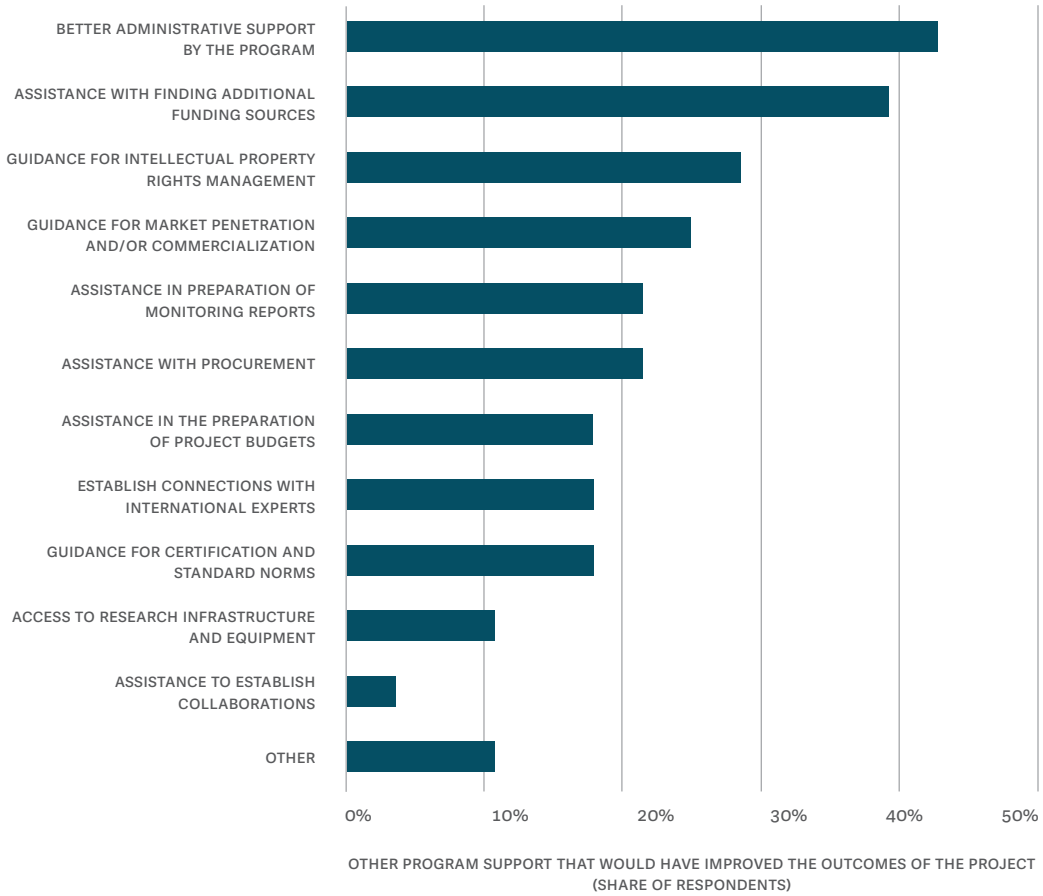
More than the availability of funding, the availability of human resources was a success factor for a large share of respondents. For 75 percent of respondents, the availability of human resources was a factor that contributed to the achievement of results (Figure 9.19). This is consistent with the investment pattern of firms, which was dominated by salaries (Figure 9.8 and Figure 9.9). It appears that, for the target population of this program, the availability of funding for additional human resources was a binding constraint. Information about new markets and new technologies and the way the program is designed were success factors for about a third of respondents. However, having better administrative support and assistance to identify additional funding sources would have improved the outcomes of the project for about 40 percent of respondents (Figure 9.20). For 29 percent of respondents, more guidance for IPR protection would have been useful, which may partly explain the relatively low achievement of IPR-related outputs.

Figure 9.19 Human resources were identified as critical success factors



Source: Beneficiary surveys. N= 28.

Figure 9.20 Respondents would welcome better administrative support and assistance with finding additional funding

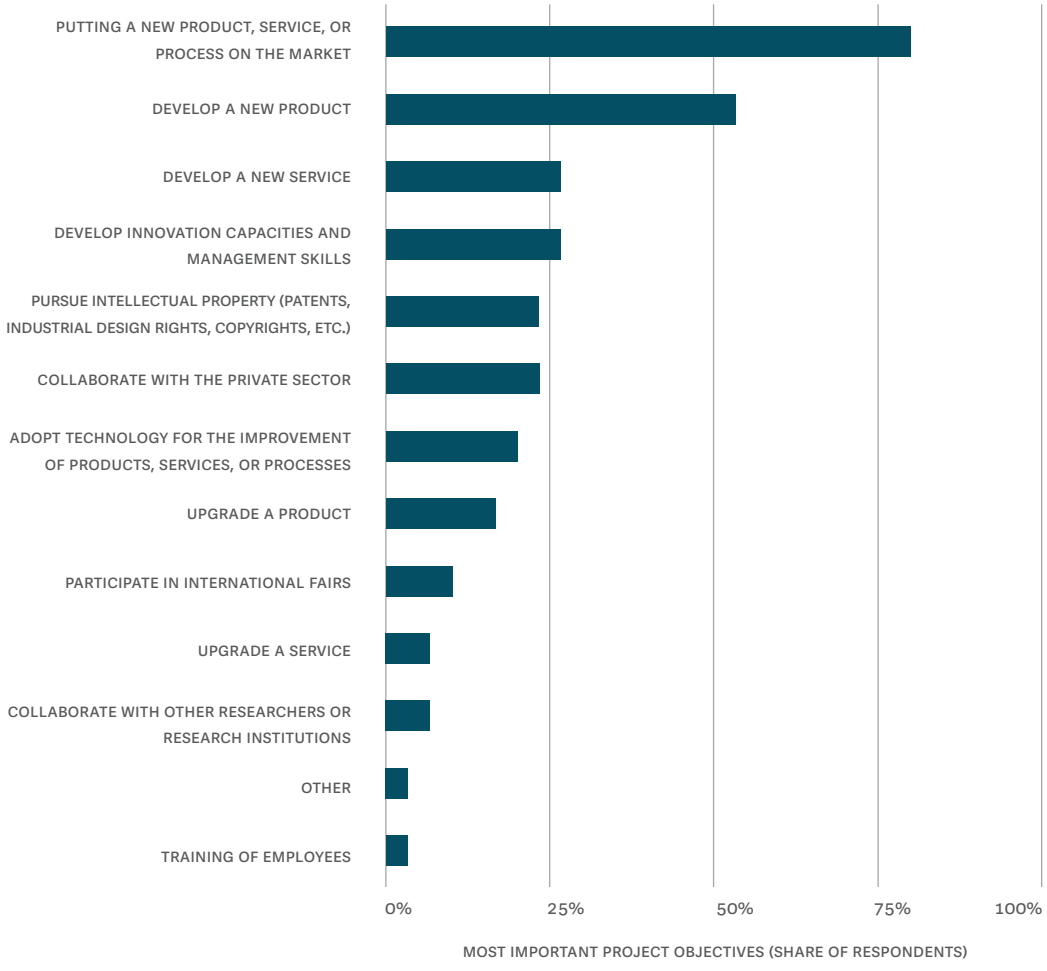


Source: Beneficiary surveys. N= 28. Other includes prompt resolution of requests for amendments and to the objections to the final ZNS, communication in general and timeliness of approval and money payments.

Overall project quality

In line with the program's objectives, the main objective of most respondents' projects was to put a new product or service on the market. This was among their most important objectives for 80 percent of respondents (Figure 9.21). The consistency between the program objective and the project objectives indicates that the program objective was set in a clear and coherent manner. For 53 percent of respondents, developing a new product was a main objective, and for 27 percent, developing a new service was. These also match the program's objectives. A few respondents had main objectives that were not aligned with the program's priorities, such as upgrading a product or service or collaborating with researchers.

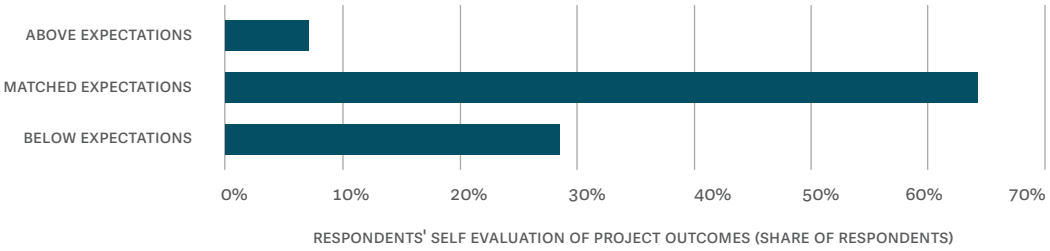
Figure 9.21 The main project objective for most respondents was aligned with the program objective



Source: Beneficiary surveys. N=30.

Project outcomes fell short of expectations for more respondents, rather than exceeding them. For over 60 percent of respondents, their project's outcome matched their expectations. However, for about 30 percent, the outcome of their project was below their expectations, compared to 7 percent for whom expectations were exceeded (Figure 9.22).

Figure 9.22 For many respondents, project outcomes fell short of expectations



Source: Beneficiary surveys. N=28.

10 Recommendations

Recommendations

The analysis of outputs and outcomes has revealed gaps in M&E practices for STI programs in Croatia. In general, while outputs and outcomes of policy interventions are tracked to some extent, they are often incomplete and do not capture all the results achieved by beneficiaries. At the same time, institutions do not contemplate the full costs of interventions, beyond financial transfers provided to beneficiaries. This makes it difficult to assess the success of an intervention, relative to the amount of resources invested in designing, implementing, and monitoring it. Recommendations to improve ToCs and results frameworks have already been presented in World Bank (2020a). This report builds on those recommendations to highlight the actions needed to increase the capacity of institutions to conduct efficiency analyses in the future.

The analysis has also shown scope for improving the efficiency of analyzed support programs. Some challenges are shared by all or multiple programs, particularly related to the satisfaction of beneficiaries with different aspects of program design and implementation. The beneficiary survey has provided a point of reference for the costs incurred to apply and participate in a program, which for some programs are quite high. Finally, the analysis has revealed some inconsistencies between the intended and actual outcomes of certain programs, which may prompt policymakers to reconsider their design in future editions.

10.1 Increasing the capacity to conduct efficiency analyses

Recommendation 1 | Conduct regular efficiency analyses

Efficiency analyses should be conducted on a regular basis to allow policymakers to make evidence-based decisions and adjustments. Timely information on the efficiency in the use of inputs and generation of outputs and outcomes can help track the progress of a support program, and inform the necessary adjustments to maximize program results. For example, the scale of the program may be too small to make a meaningful contribution to achieving the desired outcomes. Ideally, this exercise should be conducted annually, particularly for programs with a large funding allocation and a large pool of beneficiaries.

Recommendation 2 | Generate and track program-level cost data

As a first step, institutions should start systematically generating and tracking reliable program-level cost data. Without data on the programs' costs, including administrative and operating costs, it is impossible to estimate the efficiency of a program and assess

whether its benefits outweigh its costs. Program-level cost data provided by institutions varied considerably in terms of quality and depth. MESD was not able to provide any program-level cost data. MSE and HRZZ had to rely on estimates to obtain a figure for program-level fixed costs, and HRZZ could not provide a breakdown of costs by activity. To be able to produce reliable and accurate analyses of program efficiency, each institution should review its financial information systems with a view towards generating basic program-level cost data. The cost template used for this analysis can be a starting point towards setting up such an information system.

Recommendation 3 | Define benchmarks and targets for outputs and outcomes

Each program should have a defined set of benchmarks and targets for each intended output and outcome. Intended outputs and outcomes should be carefully defined, based on an explicit theory of change for the program. Each output and outcome should be associated with a benchmark or target, against which policymakers can gauge the progress and success of the program, as well as contribution to higher-level objectives, such as those defined in the S3 or the OP. The Analysis of Theory of Change and Results Framework (World Bank 2020a) provides a starting point for this, but adjustments may be needed as programs are further refined.

Recommendation 4 | Conduct beneficiary surveys on a regular basis

Beneficiary surveys should be used to gather data that is not otherwise available through regular reporting. Project implementation and post-implementation reports should allow program managers to collect data on outputs and outcomes achieved by beneficiaries. However, some information, for instance estimated application costs, or more subjective data, such as satisfaction with different elements of program design and implementation, should be collected through a survey where beneficiaries can anonymously express their views. Beneficiary surveys should be part of the M&E strategy of every program.

Recommendation 5 | Improve quality of data on outcomes

The quality of the data used to measure the efficiency in the generation of outcomes should be improved by conducting more impact evaluations. This report presented the analysis based on monitoring data for outcome indicators, reported only for beneficiaries responding to the survey. However, this does not constitute evidence that outcomes were achieved because of the program. To measure to what extent the program contributed to the achievement of outcomes, it is necessary to conduct impact evaluations. These require collecting data on outcomes from a group of non-beneficiaries that is similar to the beneficiaries supported. Such data should be collected from applicants that were not selected for funding, and they should be informed of this practice already at application stage.

10.2 Improving efficiency of support programs

Recommendation 6 | Channel funds towards more influential research

Programs that target researchers should track the quality of scientific papers produced as a result of the project. The five programs analyzed that provide funding for R&D projects in PROs track the number of scientific publications produced during and after project completion. However, programs do not systematically monitor the influence of the publications produced, as measured by citations. Such metrics could then be aggregated to make informed decisions on, for example, allocation of funds among scientific fields.

Recommendation 7 | Incentivize international collaborations

International collaborations should be encouraged more, either through existing or new interventions. In most programs, international collaborations lagged behind domestic collaborations. At the same time, international collaborations matter for the quality of scientific outputs, as shown in World Bank (2019). A new program to support international collaborations could be introduced into the policy mix, or existing programs could introduce specific activities to incentivize international collaboration.

Recommendation 8 | Encourage science-industry linkages

Science-industry collaborations should also be incentivized in order to bridge the divide between the research and private sector. Programs such as SIIF and STRIP were successful at initiating collaborations between researchers and industry for most of their beneficiaries, but lacked critical mass and scale to make a difference in terms of intellectual property or new products introduced at the national level. On the other hand, programs that reach a large number of researchers, such as RP and IRP, do not prioritize or incentivize industry-science linkages. Existing programs that focus on industry-science collaboration, such as SIIF or STRIP, should be scaled up, provided they are able to overcome current difficulties related to delays in the selection process. Additionally, HRZZ could introduce new programs to their portfolio, or adapt existing programs, to incentivize collaboration of researchers with industry, such as programs for temporary secondment of researchers to the private sector.

Recommendation 9 | Focus on supporting technology transfer and research commercialization

Policymakers should adapt programs to stimulate the generation of more outcomes related to IPR protection, technology transfer, and research commercialization. SIIF and STRIP aimed to support activities related to commercialization of research and IPR protection. However, respondents achieved relatively few outcomes in this respect, especially

compared to other types of outcomes such as collaborations or scientific publications. This could be partially explained by the low level of investments of beneficiaries in these activities (see for example sections 3.3, 4.3, and 5.3). In future programs, policymakers should put greater emphasis on the importance of these outcomes, including by increasing the role of the private sector,[26] and creating a better incentive structure for researchers and their home institutions to engage in commercialization efforts.[27]

Recommendation 10 | Reduce application costs of programs targeting firms

Programs targeting firms should reduce application costs for beneficiaries, including by simplifying application and selection processes. The analysis of use of inputs has shown that application costs for firms are relatively high, with an average of HRK 47,000 for the NSME-1 program, and HRK 30,000 for the ICT-R program (see section 2.1). Many firms had to use additional human resources to manage the application process and provide the information required in application forms. This increased cost may reduce the efficiency and attractiveness of the program and confirms the finding of World Bank (2020a) that the application process is overly complex and burdensome. The level of detail and effort required in application forms is often a function of the selection criteria, which are mandatory for all programs funded under OPCC. Therefore, the simplification in application information should go hand-in-hand with the simplification of the selection criteria and an increased flexibility in the selection processes. A more hands-on approach to workshops and program dissemination events may also help applicants deal with complex issues such as state aid calculation.

Recommendation 11 | Introduce more flexibility in the application process

At application stage, programs should provide greater flexibility for applicants to revise their proposals and incorporate feedback. Flexibility at application stage was consistently among the areas with lowest satisfaction rates at application stage. As suggested in World Bank (2020b), policymakers should adjust the project proposal review process to allow minor modifications in project applications, based on the feedback provided by selection experts. This would help increase the quality of projects, build up the capacity of applicants, and anticipate possible implementation issues.

Recommendation 12 | Reduce reporting burdens on beneficiaries during implementation

During implementation, programs should reduce the burden on beneficiaries related to financial reporting and monitoring requirements. Financial reporting requirements

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26 The issue of structuring support for commercialization of public research is elaborated extensively in World Bank (2020a), pp.89-93.

27 The recommendation to revise the career development framework for researchers to stimulate commercialization and technology transfer has also been raised in World Bank (2019).

during implementation had the smallest share of satisfied respondents in all programs, except for SIIF. As indicated by World Bank (2020a), burdensome reporting requirements reduce the attractiveness of public support programs and deter potential beneficiaries from participating. When it comes to financial reporting, the burden on beneficiaries could be alleviated by reducing the number of documents that they need to provide against payments. In terms of monitoring, policymakers should endeavor not to request data from beneficiaries that is already available through other public sources and repositories (e.g. data on citations of publications, financial statement data for firms, etc.). Results frameworks developed in World Bank (2020b) provide specific and consistent proposals for means of data collection and verification, which would help to streamline reporting requirements for beneficiaries.

Recommendation 13 | Provide better administrative support

Improving administrative support will require investments into the human resource base and promoting a culture of proactive program management. In all programs, respondents reported a need for better administrative services from the program in order to improve program outcomes**.** This calls for an evaluation of existing administrative services to beneficiaries, but also strengthening the human resource base in institutions participating in STI financing. Support should be provided by highly specialized and well-trained staff, and they should be given sufficient autonomy to take action based on their professional judgment, rather than being forced to follow bureaucratic rules.

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Annexes

Annex 1: Definitions of Key Indicators

	INDICATORS	DEFINITION
COSTS COVERED BY THE PROGRAM	Total program costs	Total program costs encompass all the costs related to a policy intervention. They are calculated as the sum of transfers to beneficiaries (direct financial transfers, indirect financial transfers, and non-financial transfers) and administrative and operating costs.
	Direct financial transfers	Direct financial transfers represent the value of funds transferred directly to beneficiaries.
	Indirect financial transfers	Indirect financial transfers are financial benefits that the program provides to beneficiaries indirectly, such as tax deductions, discounts, etc.
	Non-financial transfers	Non-financial transfers are benefits that the program provides to beneficiaries in the form of free services, space, or goods.
	Administrative and operating costs	Administrative and operating costs are the costs associated with designing, implementing and monitoring a support program. They are calculated as the sum of personnel costs, fixed costs, and external service costs.
	Personnel costs	Personnel costs are costs of all permanent staff working on a program. They are calculated as the number of days or weeks of staff engagement on the program, multiplied by the daily or weekly gross salary. If salary rates are per month, they are adjusted as follows: monthly rate x 12/225.
	Fixed costs	Fixed costs represent the value of goods and services, office equipment, ICT infrastructure, office space and rent pertaining to the program.
	External service costs	External service are costs for external services that were outsourced for design or implementation (e.g. cost of external reviewers in the selection process, and similar).
	Average administrative and operating cost per project	This ratio is calculated by dividing administrative and operating costs with the number of supported projects.
COSTS COVERED BY BENEFICIARIES	Application costs	Application costs are all the expenses incurred by the beneficiary in preparing their application (e.g. time to prepare paperwork, costs of consultants, assistants, materials, etc.).
	Contributions from beneficiaries	Contributions from beneficiaries represent the value of in-kind or cash investments that the beneficiary invested into the project.
	Average cost covered by beneficiary per project	This ratio is calculated as the sum of application costs and contributions from beneficiaries, divided by the number of survey respondents.
	Ratio of costs covered by the program and costs covered by beneficiaries	This ratio is calculated as total program costs divided by the sum of application costs and contributions from beneficiaries.

	INDICATORS	DEFINITION
INVESTMENTS IN BENEFICIARIES	Value of funds disbursed	The total value of funds disbursed to beneficiaries by the program.
	Use of funding by beneficiaries	This indicator provides an overview of the investment of funds provided to beneficiaries into different cost categories (e.g. researcher salaries, machinery, supplies, travel, etc.)
	Average transfer per project	This ratio is calculated as the value of funds disbursed divided by the number of completed projects.
	Transfers per unit of administrative and operating costs	This ratio is calculated as the value of funds disbursed divided by the value of administrative and operating costs.
INTENDED OUTPUTS ACHIEVED	Projects completed	This is the total number of completed projects.
	Outputs relevant to the program	These are outputs that are defined in the results framework, based on the explicit theory of change developed for the program. The project may achieve additional outputs beyond those that are considered relevant, and those outputs are classified as "other outputs".
	Average number of outputs achieved per project	This ratio is calculated as the number of relevant outputs divided by the number of completed projects.

	INDICATORS	DEFINITION
QUALITY OF PROGRAM CONTRIBUTIONS	Satisfaction with program design, call for proposals, selection process	This indicator measures the satisfaction of beneficiaries in 20 dimensions of program design, call for proposals, and selection process. The level of satisfaction was measured in a scale of 1-5, where 1 is strongly disagree and 5 strongly agree. The figure shows the percentage of respondents who agreed or strongly agreed with the statements. The share of respondents satisfied is defined as the percentage of respondents who agreed or strongly agreed with the statements.
	Satisfaction of contributions at implementation stage	This indicator measures the satisfaction of beneficiaries in seven dimensions of program implementation. The level of satisfaction was measured in a scale of 1-5, where 1 is strongly disagree and 5 strongly agree. The share of respondents satisfied is defined as the percentage of respondents who agreed or strongly agreed with the statements.
	Funding received according to contract	This indicator measures the percentage of survey respondents that indicated receiving funding for the project according to the terms of the contract signed with the program.
	Sufficient funding and time	The indicator on sufficient funding measures the percentage of survey respondents that indicated that the amount of financial support provided by the program was sufficient to successfully complete project objectives. The indicator on sufficient time measures the percentage of survey respondents that indicated that the amount of time allowed by the program for project implementation, including any extensions, was sufficient to successfully complete project objectives.
	Success factors	This indicator measures the percentage of survey respondents that selected the top factors that contributed to the achievement of the results.
	Support needed and not present	This indicator measures the percentage of survey respondents that indicated program support or services that were needed during implementation that would have improved the outcomes of the project, and were not present.
OVERALL PROJECT QUALITY	Alignment of project and program objectives	This indicator measures the overlap between program objectives and project objectives indicated by survey respondents.
	Evaluation of project outcome	This indicator measures the percentage of respondents that indicated whether the project outcomes were below their expectations, matched their expectations, or above expectations.

Annex 2: Questionnaire for Researchers Survey

A. Introduction

Dear Sir or Madam

As announced in the letter by the Ministry of Science and Education, the World Bank is implementing this survey to gather information from beneficiaries of science and innovation programs. This information will be used by the World Bank to analyze public spending for science, technology and innovation in Croatia.

The World Bank will keep all individual information confidential and present the analysis in an aggregated manner. Furthermore, survey information will be used for research purposes only, in compliance with the World Bank Access to Information Policy and the European Union General Data Protection Regulation Law (GDPR).

For the purpose of this survey we are reaching out to you, as the project leader or principal investigator for the project [**project name**], funded in [**year**] by [**name of the program**].

If you have any questions about the survey or would like further information as you answer, you can contact our helpline on +385 91 5630 530 or by email at croatia_survey@worldbank.org. You will have this contact information at the bottom of each page throughout the survey.

If you agree to participate in the survey, click on "Next" to start.

B. General information about the project leader / beneficiary

Intro: This section of the survey will ask you general information about you.

1. Please mark the option that applies to your case:

- I am the project leader for [project name] [skip to B5]
- I am not the project leader, but can provide detailed information about [project name]

2. What is your scientist number from the Registry? (*If you don't have this number, write 0)*

3. What was your role in this project?

4. Your year of birth

5. Position in the institution or company where you currently work

- Full professor (tenured)
- Full professor (untenured)
- Associate professor
- Assistant professor
- Scientific adviser (tenured)
- Scientific adviser (untenured)
- Senior scientific associate
- Research associate
- Postdoctoral researcher
- Research or teaching assistant
- Doctoral student
- Other (specify in space below)

6. Department or division in the institution or company where you currently work

7. Tenure in the institution or company where you currently work *(select zero if less than 1 year)*

8. Are you currently working in the same institution or company that you were working at the end of the project (in [project end])?

- Yes
- No

9. Position in the institution or company at end of the project (in [project end])

- Full professor tenure
- Full professor
- Associate professor
- Assistant professor
- Scientific adviser tenure
- Scientific adviser
- Senior scientific associate
- Research associate
- Postdoctoral researcher
- Research assistant or teaching and research assistant
- Doctoral student
- Other (specify in space below)

10. Department or division in the institution or company where you were working at the end of the project (in [project end])

11. If B8=yes, skip to 13.
If B8=no, ask:
Tenure in the institution or company where you were working at the end of the project (in [project end]) (s*elect zero if less than 1 year)*

12. Have you received funding from public programs for the continuation of this project after [project end]? (e.g. funds for research, scholarships, etc.)

- Yes
- No (skip to B14)

13. From which program did you get funding for the continuation of this project after [project end]?

	PROGRAM NAME	FUNDING START YEAR
1		
2		

14. List any other public support programs from which you received funding for any project (different than [project name]) related to science, technology or innovation between 2010 and 2020. [this question is not mandatory]

	PROGRAM NAME	FUNDING START YEAR
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

C. About the application process

Intro: We will now ask you questions about the application process to [name of program].

1. Please indicate the extent to which you disagree or agree with the following statements.

	STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
It was easy to identify and obtain information about the program	O	O	O	O	O
Program's objectives were clear	O	O	O	O	O
Support available to clarify doubts and help with application was timely and relevant	O	O	O	O	O
Application procedure was well explained	O	O	O	O	O
Application procedure was easy to follow and fill	O	O	O	O	O
Application period was sufficient	O	O	O	O	O
The quantity and type of information required in proposals were adequate	O	O	O	O	O
Eligibility criteria were clear	O	O	O	O	O
Eligibility criteria were fair	O	O	O	O	O
Selection process was fair	O	O	O	O	O
Selection process was transparent	O	O	O	O	O
It was easy to access the regulations of the program	O	O	O	O	O
The regulations of the program were clear	O	O	O	O	O
Time between application and final results of selection was adequate	O	O	O	O	O
Time between communication of results of selection and funding was adequate	O	O	O	O	O
The rules in cases of non-compliance with the call for proposals were flexible	O	O	O	O	O
There was feedback on the reasons why the project was approved	O	O	O	O	O
Contract negotiation procedure took adequate time	O	O	O	O	O
Contract negotiation was easy	O	O	O	O	O
The list of eligible costs was appropriate for the development of the project	O	O	O	O	O

	STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
It was difficult to identify and obtain information about the program	O	O	O	O	O
Program's objectives were unclear	O	O	O	O	O
Support available to clarify doubts and help with application was late and irrelevant	O	O	O	O	O
Application procedure was confusing	O	O	O	O	O
Application procedure was difficult to follow and fill	O	O	O	O	O
Application period was insufficient	O	O	O	O	O
The quantity and type of information required in proposals were excessive	O	O	O	O	O
Eligibility criteria were confusing	O	O	O	O	O
Eligibility criteria were unfair	O	O	O	O	O
Selection process was unfair	O	O	O	O	O
Selection process was not transparent	O	O	O	O	O
It was difficult to access the regulations of the program	O	O	O	O	O
The regulations of the program were unclear	O	O	O	O	O
Time between application and final results of selection was too long	O	O	O	O	O
Time between communication of results of selection and funding was too long	O	O	O	O	O
The rules in cases of non-compliance with the call for proposals were very rigid	O	O	O	O	O
There was no feedback on the reasons why the project was approved	O	O	O	O	O
Contract negotiation procedure took too long	O	O	O	O	O
Contract negotiation was too burdensome	O	O	O	O	O
The list of eligible costs was not appropriate for the development of the project	O	O	O	O	O

2. Think about all the expenses incurred in preparing your application such as the time to prepare paperwork, consultants, assistants, materials, etc. Please provide your best estimate of the total cost, in Kuna, of preparing your application for this project. For example, if the total expense was ten thousand Kuna, write 10000.

3. Approximately, how many full working days (8 hours each) did it take you to prepare the application?

4. What kind of human resources did you use to prepare your application? Select all that apply.

- Administrative assistant
- Lawyer or legal consultant
- Accountant
- Experts
- Other (please specify in the space below)
- The project team prepared the application without any additional help

5. Were the costs for applying to the program (monetary and non-monetary) adequate when compared with the benefits?

- Yes
- No

6. Now you will be asked about the eligibility criteria for participating in the program. If you do not remember it, you can check it again on the link.

   Do you think some eligibility criteria should be added, deleted or changed?

	YES	NO	IF YES
Changed	O	O	What eligibility criteria would you change, and why?
Added	O	O	What eligibility criteria would you add, and why?
Deleted	O	O	What eligibility criteria would you delete, and why?

7. Now you will be asked about the selection criteria for participating the program. If you do not remember it, you can check it again on the link.

   Do you think some selection criteria should be added, deleted or changed?

	YES	NO	IF YES
Changed	O	O	What selection criteria would you change, and why?
Added	O	O	What selection criteria would you add, and why?
Deleted	O	O	What selection criteria would you delete, and why?

D. Project execution and resources allocated to the project

Intro: Now you will be asked about project execution and resources allocated to the project.

1. What is the main scientific field of this project?

NATURAL SCIENCES
- Mathematics
- Computer and information sciences
- Physical sciences
- Chemical sciences
- Earth and related environmental sciences
- Biological sciences
- Other natural sciences

ENGINEERING AND TECHNOLOGY
- Civil engineering
- Electrical engineering, electronic engineering, information engineering
- Mechanical engineering
- Chemical engineering
- Materials engineering
- Medical engineering
- Environmental engineering
- Environmental biotechnology
- Industrial Biotechnology
- Nano-technology
- Other engineering and technologies

MEDICAL AND HEALTH SCIENCES
- Basic medicine
- Clinical medicine
- Health sciences
- Health biotechnology
- Other medical sciences
- Agricultural sciences
- Agriculture, forestry, and fisheries
- Animal and dairy science
- Veterinary science
- Agricultural biotechnology
- Other agricultural sciences

SOCIAL SCIENCES
- Psychology
- Economics and business
- Educational sciences
- Sociology
- Law
- Political Science
- Social and economic geography
- Media and communications
- Other social sciences

HUMANITIES
- History and archaeology
- Languages and literature
- Philosophy, ethics and religion
- Art (arts, history of arts, performing arts, music)
- Other humanities

If answered "Other natural sciences," Please specify which field within Other natural sciences

If answered "Other engineering and technologies," Please specify which field within Other engineering and technologies

If answered "Other medical sciences," Please specify which field within Other medical sciences

If answered "Other agricultural sciences," Please specify which field within Other agricultural science

If answered "Other social sciences," Please specify which field within Other social sciences

If answered "Other humanities," Please specify which field within Other humanities

2. Are there other scientific fields related to this project?

- Yes
- No (skip to D4)

3. What are other scientific fields related to this project? Select all that apply

NATURAL SCIENCES
- Mathematics
- Computer and information sciences
- Physical sciences
- Chemical sciences
- Earth and related environmental sciences
- Biological sciences
- Other natural sciences

ENGINEERING AND TECHNOLOGY
- Civil engineering
- Electrical engineering, electronic engineering, information engineering
- Mechanical engineering
- Chemical engineering
- Materials engineering
- Medical engineering
- Environmental engineering
- Environmental biotechnology
- Industrial Biotechnology
- Nano-technology
- Other engineering and technologies

MEDICAL AND HEALTH SCIENCES
- Basic medicine
- Clinical medicine
- Health sciences
- Health biotechnology
- Other medical sciences
- Agricultural sciences
- Agriculture, forestry, and fisheries
- Animal and dairy science
- Veterinary science
- Agricultural biotechnology
- Other agricultural sciences

SOCIAL SCIENCES
- Psychology
- Economics and business
- Educational sciences
- Sociology
- Law
- Political Science
- Social and economic geography
- Media and communications
- Other social sciences

HUMANITIES
- History and archaeology
- Languages and literature
- Philosophy, ethics and religion
- Art (arts, history of arts, performing arts, music)
- Other humanities

4. How did you distribute the funding received? Leave 0 (zero) if not applicable. *(Percentages must add up to 100)*

	PERCENT
Machinery, equipment, instrumentation	
Space, rent incl. labs, research infrastructure	
Materials, supplies, inventory	
IT systems, specialized software, IT licenses, websites	
Researchers' salaries	
Other salaries	
Consulting services (e.g. feasibility studies, survey companies)	
Training and events	
Testing and certifications	
Intellectual property (patents, trademarks, copyrights)	
Marketing campaigns or public relations (PR) activities for project visibility	
Travel (fairs, exhibitions, conferences, etc.)	
Other (please specify in space below)	

5. Was the funding you received for this project delivered according to the terms of the contract signed with the program?

- Yes
- No (please specify in the space below)

6. Which of the following are the most important objectives of your project? (Select and rank 3 objectives. Write 1 for the most important, 2 for the second most important, 3 for the third most important.)

- Improve chances to get EU funding
- Improve labor opportunities
- Publish scientific papers in peer-reviewed journals
- Present scientific papers in seminars and conferences
- Produce market-oriented research
- Develop a cadre of young researchers
- Collaborate with the private sector
- Collaborate with other researchers or research institutions
- Develop a new product, service, or process
- Upgrade a product, service, or process
- Develop or start a new enterprise, business, or spin-off
- Pursue intellectual property (patents, industrial design right, copyrights, etc.)
- Other (please specify in the space below)

7. Did your institution make in kind or in cash contributions to this project?

IN CASH
- Yes
- No
- I don't know
- Does not apply

IN KIND (E.G. RESEARCHERS, ADMIN SUPPORT, ETC.)
- Yes
- No
- I don't know
- Does not apply

If answer is no, I don't know or does not apply, skip to 9

8. Please estimate the resources your institution contributed to this project (in Kuna). For example, if your institution contributed with ten thousand Kuna, enter 10000.

	AMOUNT IN KUNA
Cash	
In kind (e.g. researchers, admin support, etc.)	

9. Was the amount of financial support provided by the program sufficient to successfully complete your project objectives?

- Yes (skip to D12)
- No

10. By what percentage should the financial support have been increased to successfully complete your project objectives?

11. What were the most important reasons why the amount of financial support provided by the program was not sufficient?

Select and rank up to 3 reasons. Write 1 for the most important, 2 for the second most important, 3 for the third most important.

- Inadequate budget planning
- Increased costs of inputs (e.g. survey, materials, lab tests, staff, etc.)
- Unable to get financial support from my institution
- Unexpected costs occurred
- Budget clearing by responsible authority was inadequate
- Project's scope increased beyond the original plan
- Issues with procurement
- Other (please specify in space below)

Please explain in more detail why the amount of financial support provided by the program was not sufficient

12. Was the amount of time allowed by the program for project implementation, including any extensions, sufficient to successfully complete your project objectives?

- Yes (skip to D14)
- No

13. What were the most important reasons why the amount of time allowed by the program was not sufficient?

Select and rank up to 3 reasons. Write 1 for the most important, 2 for the second most important, 3 for the third most important.

- I could not reduce my teaching workload
- I could not reduce other projects' workload I was engaged in
- I could not reduce other activities within my Institution (e.g. participation in boards)
- Other (please specify in space below)

14. Please indicate the extent to which you disagree or agree with the following statements.

During project implementation...

	STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
Administrative support provided by [program name] was easily accessible	O	O	O	O	O
Administrative support provided by the program was sufficient to help the project advance smoothly	O	O	O	O	O
Financial support was provided on time	O	O	O	O	O
Financial reporting requirements were acceptable	O	O	O	O	O
Monitoring requirements (e.g. narrative, indicators, etc.) were acceptable	O	O	O	O	O
Expert feedback from monitoring (visits, reports, discussions) under [program name] was appropriate	O	O	O	O	O
Data protection practices were satisfactory	O	O	O	O	O
Administrative support provided by [program name] was difficult to access	O	O	O	O	O
Administrative support provided by the program was insufficient to help the project advance smoothly	O	O	O	O	O
Financial support was provided with delays	O	O	O	O	O
Financial reporting requirements were burdensome	O	O	O	O	O
Monitoring requirements (e.g. narrative, indicators, etc.) were burdensome	O	O	O	O	O
Expert feedback from monitoring (visits, reports, discussions) under [program name] was inappropriate	O	O	O	O	O
Data protection practices were unsatisfactory	O	O	O	O	O

15. What program support or services did you need during implementation that would have improved the outcomes of your project, and were not present?
Mark all that apply.

- Assistance in the preparation of project budgets
- Assistance to hire foreign researchers
- Better administrative support by [program name]
- Assistance with procurement
- Access to research infrastructure and equipment
- Assistance in preparation of monitoring reports
- Assistance with finding additional funding sources
- Assistance to establish collaborations
- Other (please specify in space below)

16. In the future, how would you prefer program support or services to be provided?

- [the leading institution] should provide technical experts
- Eligible activities of the project should include hiring experts for program support
- Both of the above

E. Results

Intro: In this last section of the survey, we will ask you about the results of your project.

1. Indicate the project results that you achieved in the following periods:

- **During the project**
- **After project until today**

All spaces need to be filled with a number. If you did NOT achieve a result, leave 0.

	DURING THE PROJECT	AFTER PROJECT UNTIL TODAY
Collaborative projects with domestic researchers or research institutions		
Collaborative projects with foreign researchers or research institutions		
Collaborative projects with diaspora researchers or research institutions		
Collaborative projects with domestic enterprises		
Collaborative projects with foreign enterprises		
Training activities (courses, workshops, etc.)		
Number of seminars, workshops and conferences attended domestically		
Number of seminars, workshops and conferences attended abroad		
Doctoral or master's titles or theses		
Scientific publications in peer-reviewed journals		
Market-oriented research		
Patent applications		
Patents granted		
Industrial designs		
Copyrights		
Transfer agreements		

	DURING THE PROJECT	AFTER PROJECT UNTIL TODAY
New enterprise, business or spin-off		
Prototype		
New products, processes, or services		
Upgraded products, processes, or services		
New design for a product, process, or service		
New software development		
New technology development		
Other results (please specify in space below)		

2. Choose the most important factors that contributed to the achievement of the results. Select and rank up to 3 factors. Write 1 for the most important, 2 for the second most important, 3 for the third most important.

- Availability of financial resources
- Availability of human resources such as researchers or mentors
- Support of the research institution
- The way support program is designed and implemented
- Availability of research infrastructure
- Other (please specify in the space below)

3. How many scientific research papers related to this project have you (or other team members) published in peer-reviewed journals so far? *Select 0 if you have not published any paper related to this project.*

4. How many, if any, collaborating partners did/do you have in the context of this project? *Select 0 (zero) if you do not have any in a category.*

Partners are defined as parties with which you have a formal or informal agreement related to the project and who contribute to the project either in cash or in kind.

- Domestic research partners
- Foreign research partners
- Diaspora research partners
- Domestic industry partners
- Foreign industry partners
- Diaspora industry partners

If no collaborating partners were selected, skip to E7

Please specify the number of...

- Domestic research partners
- Foreign research partners
- Diaspora research partners
- Domestic industry partners
- Foreign industry partners
- Diaspora industry partners

5. Evaluate the overall quality of collaborations related to this project.

	EXTREMELY POOR	BELOW AVERAGE	AVERAGE	ABOVE AVERAGE	EXCELLENT
Domestic research partners	O	O	O	O	O
Foreign research partners	O	O	O	O	O
Diaspora research partners	O	O	O	O	O
Domestic industry partners	O	O	O	O	O
Foreign industry partners	O	O	O	O	O
Diaspora industry partners	O	O	O	O	O

6. What was the nature of the collaborations related to this project? *Mark all that apply*.

- Joint R&D project
- Purchase of R&D services
- Technological consultancy
- Licensing/patent registration
- Test of a new prototype
- Preparation of technical documentation
- Co-author research publication
- Selling a product
- Other (please specify in space below)

7. Which of the following stages of commercialization have you attained for research related to this project? *Mark all that apply.*

- Have a product, service or process that is being sold
- Have a product, service or process that is ready to be sold
- Have a working prototype that is almost ready to be sold
- Have a proof of concept for a product or process that can be sold in the future
- Other (please specify in the space below)
- No research came out of the project which is likely to be commercialized

If no research came out of the project which is likely to be commercialized, skip to E9

8. Have you taken any of the following steps towards selling the product or process coming out of the project? *Mark all that apply*.

- Discussions/negotiations with a vendor or firm that will sell my product, service or process
- Participated in trade fairs to showcase my product, service, or process
- Participated as advertiser in scientific/technical conferences
- Presented my product or process in domestic market
- Other (please specify below)

9. How do you evaluate the outcome of this project based on your expectations?

- Above my expectations
- It matched my expectations
- Below my expectations

What is the main reason?

10. If E3<=15,

This is the last question of the survey. You previously indicated that scientific papers related to this project were published in peer-reviewed journals. Please list the publication(s) related to this project.

NO.	TITLE	NAME OF THE JOURNAL	YEAR OF PUBLICATION
1			
2			
3			
4			

If E3>15,

This is the last question of the survey. You previously indicated that scientific papers related to this project were published in peer-reviewed journals. Please list the 5 most important publications related to this project.

NO.	TITLE	NAME OF THE JOURNAL	YEAR OF PUBLICATION
1			
2			
3			
4			

If answered by project leader, survey is ended like this:

11. Kindly let us know if any questions need clarification, if you encountered any technical issues while answering, or any other suggestions to improve this survey.

We thank you for your time spent taking this survey.
Your response has been recorded

If participant was not project leader, survey continues like this:

Since you were not the project leader, it would be useful to have your telephone and email in case we (the World Bank) need to contact you for any clarifications on the information you provided. This information is optional and will be treated on a confidential basis.

Best telephone number to reach you for survey clarifications (optional)

LANDLINE _____ **MOBILE** _____

Best email address to reach you for survey clarifications (optional)

E-MAIL _____

We thank you for your time spent taking this survey.
Your response has been recorded.

Annex 3: Questionnaire for Firms Survey

A. Introduction

Dear Sir or Madam,

As you were informed by the Ministry of Economy, Entrepreneurship and Crafts in May 2020, the World Bank is implementing this survey to gather information from beneficiaries of science and innovation programs. This information will be used by the World Bank to analyze public spending for science, technology and innovation in Croatia.

The World Bank will keep all individual information confidential and present the analysis in an aggregated manner. Furthermore, survey information will be used for research purposes only, in compliance with the World Bank Access to Information Policy and the European Union General Data Protection Regulation Law (GDPR).

For the purpose of this survey we are reaching out to you, as the project leader/main beneficiary for the project [project name], funded in [year] under [name of the program].

If you have any questions about the survey or would like further information as you answer, you can contact our helpline on +385 91 5630 530 or by email at croatia_survey@worldbank.org. You will have this contact information at the bottom of each page throughout the survey.

If you agree to participate in the survey, click on "Next" to start.

B. General information about the project leader/ beneficiary

Intro: This section of the survey will ask you general information about you.

1. Please mark the option that applies to your case:

- **I am the project leader for [project name] [skip to Q3]**
- **I am not the project leader , but I can provide detailed information about [project name]**

2. What was your role in this project?

3. Year of birth

4. Position in the company or institution where you currently work

5. Department or division in the company or institution where you currently work

6. Tenure in the company or institution where you currently work *(select zero if less than 1 year)*

7. Are you currently working in the same company or institution that you were working at the end of the project (in [project end])?

- **Yes**
- **No**

8. Position in the company or institution at end of the project (in [project end])

9. Department or division in the company or institution where you were working at the end of the project (in [project end])

10. If B7=yes, skip to B11.
If B7=no, ask:
Tenure in the company or institution where you were working at the end of the project (in [project end]) (s*elect zero if less than 1 year)*

11. Have you received funding from public programs for the continuation of this project after [project end]? (e.g. other grants)

- **Yes**
- **No (skip to B13)**

12. From which program did you get funding for the continuation of this project after [project end]?

	PROGRAM NAME	FUNDING START YEAR
1		
2		

13. List any other public support programs (in addition to this one) from which you received funding for any project related to science, technology or innovation between 2015 and 2020
[this question is not mandatory]

	PROGRAM NAME	FUNDING START YEAR
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

14. At the end of [year of completion], how many full and part time employees did [insert company name] have in the company, including you? *Write 0 (zero) if there were no full-time or part-time employees.*

	NUMBER
Full-time employees	
Part-time employees	

15. Please indicate the highest level of education obtained by the chief executive officer of [insert company name]

- Primary, elementary education or lower
- Secondary education
- Industrial/crafts vocational (1-3 years)
- Technical/vocational (4+ years)
- Grammar school
- Bachelor's or equivalent level
- Master's or equivalent level
- Doctoral or equivalent level
- I don't know

C. About the application process

Intro: We will now ask you questions about the application process to [name of program].

1. Please indicate the extent to which you disagree or agree with the following statements.

	STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
It was easy to identify and obtain information about the program	O	O	O	O	O
Program's objectives were clear	O	O	O	O	O
Support available to clarify doubts and help with application was timely and relevant	O	O	O	O	O
Application procedure was well explained	O	O	O	O	O
Application procedure was easy to follow and fill	O	O	O	O	O
Application period was sufficient	O	O	O	O	O
The quantity and type of information required in proposals were adequate	O	O	O	O	O
Eligibility criteria were clear	O	O	O	O	O
Eligibility criteria were fair	O	O	O	O	O
Selection process was fair	O	O	O	O	O
Selection process was transparent	O	O	O	O	O
It was easy to access the regulations of the program	O	O	O	O	O
The regulations of the program were clear	O	O	O	O	O
Time between application and final results of selection was adequate	O	O	O	O	O
Time between communication of results of selection and funding was adequate	O	O	O	O	O
The rules in cases of non-compliance with the call for proposals were flexible	O	O	O	O	O
There was feedback on the reasons why the project was approved	O	O	O	O	O
Contract negotiation procedure took adequate time	O	O	O	O	O
Contract negotiation was easy	O	O	O	O	O
The list of eligible costs was appropriate for the development of the project	O	O	O	O	O

	STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
It was difficult to identify and obtain information about the program	O	O	O	O	O
Program's objectives were unclear	O	O	O	O	O
Support available to clarify doubts and help with application was late and irrelevant	O	O	O	O	O
Application procedure was confusing	O	O	O	O	O
Application procedure was difficult to follow and fill	O	O	O	O	O
Application period was insufficient	O	O	O	O	O
The quantity and type of information required in proposals were excessive	O	O	O	O	O
Eligibility criteria were confusing	O	O	O	O	O
Eligibility criteria were unfair	O	O	O	O	O
Selection process was unfair	O	O	O	O	O
Selection process was not transparent	O	O	O	O	O
It was difficult to access the regulations of the program	O	O	O	O	O
The regulations of the program were unclear	O	O	O	O	O
Time between application and final results of selection was too long	O	O	O	O	O
Time between communication of results of selection and funding was too long	O	O	O	O	O
The rules in cases of non-compliance with the call for proposals were very rigid	O	O	O	O	O
There was no feedback on the reasons why the project was approved	O	O	O	O	O
Contract negotiation procedure took too long	O	O	O	O	O
Contract negotiation was too burdensome	O	O	O	O	O
The list of eligible costs was not appropriate for the development of the project	O	O	O	O	O

2. Think about all the expenses incurred in preparing your application such as the time to prepare paperwork, consultants, assistants, materials, etc. Please provide your best estimate of the total cost, in Kuna, of preparing your application for this project. For example, if the total expense was ten thousand Kuna, write 10000.

3. Approximately, how many full working days (8 hours each) did it take you to prepare the application?

4. What kind of human resources did you use to prepare your application? Select all that apply.

- Administrative assistant
- Lawyer or legal consultant
- Accountant
- Experts/ consultants
- The project team prepared the application without any additional help (skip to C7)
- Other (please specify in the space below)

5. How satisfied are you with the work of consultants or third parties hired to prepare your application?

- Very dissatisfied
- Somewhat dissatisfied
- Not dissatisfied or satisfied
- Somewhat satisfied
- Very satisfied

6. What do you think about the cost of these consultants or third parties that helped you prepare the application?

- Very high
- Somewhat high
- Adequate
- Somewhat low
- Very low

7. Were the costs for applying to the program (monetary and non-monetary) adequate when compared with the benefits?

- Yes
- No

8. Now you will be asked about the eligibility criteria for participating in the program [name of the program]. If you do not remember it, you can read it again on the link.

Do you think some eligibility criteria should be added, deleted or changed?

	YES	NO	IF YES
Changed	O	O	What eligibility criteria would you change, and why?
Added	O	O	What eligibility criteria would you add, and why?
Deleted	O	O	What eligibility criteria would you delete, and why?

9. Now you will be asked about the selection criteria for participating in the program [name of the program]. If you do not remember it, you can read it again in this link:

Do you think some selection criteria should be added, deleted or changed?

	YES	NO	IF YES
Changed	O	O	What selection criteria would you change, and why?
Added	O	O	What selection criteria would you add, and why?
Deleted	O	O	What selection criteria would you delete, and why?

10. Why did you request financial support from this program? *Mark all that apply.*

Note that financial institutions include private investors, venture capitalists, banks, and other financial agencies that provide funding.

- O Financial institutions **did not give me credit**
- O Financial institutions **gave me credit**, but it is very expensive or takes too long to get the funding
- O Obtaining a grant from public sources was the **only option**
- O We needed **mentoring, information, or technical advice** for upgrading or learning new technologies
- O It was a good **opportunity to lower the actual cost** of the project through lower tax payments
- O Other (specify in the space below)

11. Please mark the reason(s) why financial institutions did not give you credit. *Please mark all that apply.*

- I do not have a collateral
- I do not have a long credit history
- The project is risky and returns are uncertain
- Other (please specify in the box below)

D. Project execution and resources allocated to the project

Intro: Now you will be asked about project execution and resources allocated to the project.

1. What is the main area of economic activity related to this project?

ECONOMIC AREA	NACE CODE
Agriculture, Forestry and Fishing	A
Mining and Quarrying	B
Manufacturing	C
Electricity, Gas, Steam and Air Conditioning Supply	D
Water Supply; Sewerage, Waste Management and Remediation Activities	E
Construction	F
Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles	G
Transportation and Storage	H
Accommodation and Food Service Activities	I
Information and Communication	J
Financial and Insurance Activities	K
Real Estate Activities	L
Professional, Scientific and Technical Activities	M
Administrative and Support Service Activities	N
Public Administration and Defense; Compulsory Social Security	O
Education	P
Human Health and Social Work Activities	Q
Other (Please specify in the next page)	

If "Other" is selected, then ask:

1b Please specify the main area of economic activity this project is related to.

2. Are there other areas of economic activity related to this project?

- Yes
- No (skip to D4)

3. What are other areas of economic activity related to this project? Select all that apply.

ECONOMIC AREA	NACE CODE
Agriculture, Forestry and Fishing	A
Mining and Quarrying	B
...	
Other (please specify in next page)	

If "Other" is selected, then ask:

3.b Please specify which other area of economic activity this project is related to.

4. What is the main Smart Specialization (S3) priority area for this project?

HEALTH AND QUALITY OF LIFE

- Pharmaceuticals, biopharmaceuticals and medical equipment and devices
- Health services and new methods of preventive medicine and diagnostics
- Nutrition

ENERGY AND SUSTAINABLE ENVIRONMENT

- Energy technologies, systems and equipment
- Environmentally friendly technologies, equipment and advanced materials

TRANSPORT AND MOBILITY

- Added value manufacturing of road and rail vehicles parts and systems
- Environmentally friendly transport solutions
- Intelligent transport systems and logistics

SECURITY

- Cyber-Security
- Defence dual-use
- Mine action program

FOOD AND BIO-ECONOMY

- Sustainable food production and processing
- Sustainable wood production and processing

CROSS-CUTTING THEMES

- KET
- ICT

- None of these

5. How did you distribute the funding received? Leave zero if not applicable. *(Percentages must add up to 100)*

	PERCENT
Machinery, equipment, instrumentation	
Space, rent	
Materials, supplies, inventory	
IT systems, specialized software, IT licenses, websites	
Salaries	
Consulting services (e.g. feasibility studies, survey companies, market research)	
Training and events	
Testing and certifications	
Intellectual property (patents, trademarks, copyrights)	
Marketing campaigns or public relations (PR) activities for project visibility	
Travel (fairs, exhibitions, conferences, etc.)	
Other (please specify in space below)	

6. Was the funding you received for this project delivered according to the terms of the contract signed with the program? For example, amount received, disbursement times and conditions, etc. according to the terms of contract.

- Yes
- No (please specify in the space below)

7. Which of the following are the most important objectives of your project? (Select and rank 3 objectives. Write 1 for the most important, 2 for the second most important, 3 for the third most important.)

RELATED TO TRANSFER

- Collaborate with the private sector
- Collaborate with researchers or research institutions
- Participate in international fairs
- Training of employees
- Develop innovation capacities and management skills

RELATED TO IP

- Pursue intellectual property (patents, industrial design right, copyrights, etc.)
- Putting a new product, service, or process on the market

RELATED TO NEW PRODUCTS AND SPINOFFS

- Develop a new product
- Develop a new service
- Develop a new process
- Upgrade a product
- Upgrade a service
- Upgrade a process
- Adopt technology for the improvement of products, services, or processes
- Develop or start a new enterprise, business, or spin-off
- Other (please specify in the space below)

8. Did your company make in kind or in cash contributions to this project?

IN CASH

- Yes
- No
- I don't know
- Does not apply

IN KIND (E.G. , STAFF, ADMIN SUPPORT, OFFICES, ETC.)

- Yes
- No
- I don't know
- Does not apply

If answered No, I don't know, or Does not apply, skip to D10

9. Please estimate the resources your company contributed to this project (in Kuna). For example, if your company contributed with ten thousand Kuna, enter 10000.

	AMOUNT IN KUNA
Cash	
In kind (e.g. , staff, admin support, offices, etc.)	

10. Was the amount of financial support provided by the program sufficient to successfully complete your project objectives?

- Yes [skip to D13]
- No

11. By what percentage should the financial support have been increased to successfully complete your project objectives?

12. What were the most important reasons why the amount of financial support provided by the program was not sufficient?

Select and rank up to 3 reasons. Write 1 for the most important, 2 for the second most important, 3 for the third most important.

- Inadequate budget planning
- Increased costs of inputs
- Unable to get financial support from my institution
- Unable to ensure cofinancing
- Unexpected costs occurred
- Budget clearing by responsible authority was inadequate
- Project's scope increased beyond the original plan
- Issues with procurement
- Other (please specify in space below)

Please explain in more detail why the amount of financial support provided by the program was not sufficient

13. Was the amount of time allowed by the program for project implementation, including any extensions, sufficient to successfully complete your project objectives?

- Yes [skip to D15]
- No

14. What were the most important reasons why the amount of time allowed by the program was not sufficient?

Select and rank up to 3 reasons. Write 1 for the most important, 2 for the second most important, 3 for the third most important.

- Did not have enough financial resources
- Could not find qualified staff
- Delays in supply of raw materials
- Delays in production process
- Inadequate planning
- Other (please specify in space below)

15. Please indicate the extent to which you disagree or agree with the following statements.

During project implementation…

	STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
Administrative support provided by [program name] was easily accessible					
Administrative support provided by the program was sufficient to help the project advance smoothly					
Financial support was provided on time					
Financial reporting requirements were acceptable					
Monitoring requirements (e.g. narrative, indicators, etc.) were acceptable					
Expert feedback from monitoring (visits, reports, discussions) under [program name] was appropriate					
Data protection practices were satisfactory					
Administrative support provided by [program name] was difficult to access					
Administrative support provided by the program was insufficient to help the project advance smoothly					
Financial support was provided with delays					
Financial reporting requirements were burdensome					
Monitoring requirements (e.g. narrative, indicators, etc.) were burdensome					
Expert feedback from monitoring (visits, reports, discussions) under [program name] was inappropriate					
Data protection practices were unsatisfactory					

16. What program support or services did you need during implementation that would have improved the outcomes of your project, and were not present? Mark all that apply.

- Guidance for intellectual property rights management
- Guidance for certification and standard norms
- Guidance for market penetration and/or commercialization
- Establishing connections with international experts
- Assistance in the preparation of project budgets
- Better administrative support by [program name]
- Assistance with procurement
- Access to research infrastructure and equipment
- Assistance in preparation of monitoring reports
- Assistance with finding additional funding sources
- Assistance to establish collaborations
- Other (please specify in space below)

E. Results

Intro: In this last section of the survey, we will ask you about the results of your project.

1. Indicate the project results that you achieved in the following periods:

- **During the project**
- **After project until today**

All spaces need to be filled with a number. If you did NOT achieve a result, leave 0.

	DURING THE PROJECT	AFTER PROJECT UNTIL TODAY
Collaborative projects with domestic researchers or research institutions		
Collaborative projects with foreign researchers or research institutions		
Collaborative projects with diaspora researchers or research institutions		
Collaborative projects with domestic enterprises		
Collaborative projects with foreign enterprises		
Market-oriented research		
Patent applications		
Patents granted		
Industrial designs		
Copyrights		
Transfer agreements		
New enterprise, business or spin-off		
Prototype		
Products or services that are new to the firm		
Products or services that are new to the market		
New processes		
Upgraded products or services		

Upgraded processes
New design for a product, process, or service
New software development
New technology development
Other results (please specify in space below)

2. Indicate the project results that you achieved in the following periods:

- **During the project**
- **After project until today**

Mark all that apply.

	DURING THE PROJECT	AFTER THE PROJECT
Develop a new business model		
Adopted a new technology		
Defined an intellectual property right strategy for the project		
Expanded to new markets		
Develop a new innovation unit in the firm		
Improved the capabilities of employees		
Reorganized the firm or part of it		

3. Choose the most important factors that contributed to the achievement of the results.

   Select and rank **up to 3** factors. Write 1 for the most important, 2 for the second most important, 3 for the third most important.

- Availability of financial resources
- Availability of human resources
- Support of research institutions
- The way support program is designed and implemented
- Availability of research infrastructure
- New technologies information
- New market information
- Other (please specify in the space below)

4. If the project led to the adoption of a new process or a new technology, were you be able to implement this new process or technology in your firm?

- Yes
- No

5. Which of the following stages of commercialization have you attained for results related to this project? *Mark all that apply*.

- Have a product, service or process that is being sold
- Have a product, service or process that is ready to be sold
- Have a working prototype that is almost ready to be sold
- Have a proof of concept for a product or process that can be sold in the future
- Other (please specify in the space below
- The results that came out of this project will NOT be commercialized or are NOT likely to be commercialized

6. Choose the most important factors why commercialization of the project may be a difficult task. Select and rank up to 3 factors. Write 1 for the most important, 2 for the second most important, 3 for the third most important.

- The project did not provide enough support for commercialization
- Lack of time
- Lack of financial resources
- Lack of human resources
- Lack of information about markets
- Lack of companies interested
- Legal complexity/ambiguity concerning commercialization
- Competition
- The project is not ready to be commercialized
- Other (please specify in space below)

7. Have you taken any of the following steps towards selling the product or process coming out of the project? *Mark all that apply*.

If the results that came out of this project will NOT be commercialized or are NOT likely to be commercialized skip to E9

- Discussions/negotiations with a vendor or firm that will sell my product, service or process
- Participated in trade fairs to showcase my product, service, or process
- Participated as advertiser in scientific/technical conferences
- Presented my product or process in domestic market
- Other (please specify below)

8. What percentage of the company's sales do you expect from the commercialization of the main result of the project?

- Expected percentage of sales from commercializing the main results of the project

_____

- I don't know

9. Was this project effective in...

IMPROVING THE SALES OF THE COMPANY?
- Yes
- No
- I don't know

IMPROVING THE PRODUCTIVITY OF THE COMPANY?
- Yes
- No
- I don't know

REDUCING THE PRODUCTION COSTS OF YOUR COMPANY?
- Yes
- No
- I don't know

IMPROVING THE EXPORT PERFORMANCE OF THE COMPANY?
- Yes
- No
- I don't know

ALLOWING THE COMPANY TO ACCESS NEW MARKETS?
- Yes
- No
- I don't know

If E9a,b,c,d,e=NO or I don't know, skip to E11

10. Please indicate the following effects of the project, approximately:

- If E9a=YES, By how much (in percentage) did the sales increase?
- If E9b=YES, By how much (in percentage) did productivity improve?
- If E9c= YES, By how much (in percentage) did production costs decrease?
- If E9d= YES, By how much (in percentage) did export performance improve?
- If E9e= YES, How many new markets did the company reach?

11. On average, when do you expect to recover the investment made for this project?

12. Has this project contributed to increase the numbers of employees in your company?

- Yes
- No (skip to E14)
- I don't know (skip to E14)

13. How many additional workers were hired due to the project?
Mark 0 (zero) if no additional full or part-time workers were hired.

	NUMBER
Full-time workers	
Part-time workers	

14. How many, if any, collaborating partners did/do you have in the context of this project? Mark 0 (zero) if you do not have any in a category.

Partners are defined as parties with which you have a formal or informal agreement related to the project and who contribute to the project either in cash or in kind.

- Domestic research partners
- Domestic industry partners
- Diaspora research partners
- Diaspora industry partners
- Foreign research partners
- Foreign industry partners

If all answered zero, skip to E17

15. Evaluate the overall quality of collaborators related to this project. Use a scale from 1 to 5, where 1= extremely poor, 2=below average, 3= average, 4=above average, and 5=excellent.

	1	2	3	4	5
Domestic research partners	O	O	O	O	O
Domestic industry partners	O	O	O	O	O
Diaspora research partners	O	O	O	O	O
Diaspora industry partners	O	O	O	O	O
Foreign research partners	O	O	O	O	O
Foreign industry partners	O	O	O	O	O

16. What was the nature of the collaborators related to this project? *Mark all that apply*

	YES	NO
Joint R&D project	O	O
Purchase of R&D services	O	O
Technological consultancy	O	O
Licensing/patent registration	O	O
Test of a new prototype	O	O
Preparation of technical documentation	O	O
Selling a product	O	O
Other (please specify in space below)	O	O

17. How do you evaluate the outcome of this project based on your expectations? Please specify the main reason.

- O Above my expectations
- O It matched my expectations
- O Below my expectations

What is the main reason?

18. Kindly let us know if any questions need clarification, if you encountered any technical issues while answering, or any other suggestions to improve this survey.

If answered by project leader, survey is ended like this:

We thank you for your time spent taking this survey.
Your response has been recorded

If participant was not project leader, survey continues like this:

Since you were not the project leader, it would be useful to have your telephone and email in case we (the World Bank) need to contact you for any clarifications on the information you provided. This information is optional and will be treated on a confidential basis.

19. Best telephone number and email to reach you for survey clarifications (optional)

LANDLINE _____

MOBILE _____

EMAIL _____

We thank you for your time spent taking this survey.
Your response has been recorded.

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