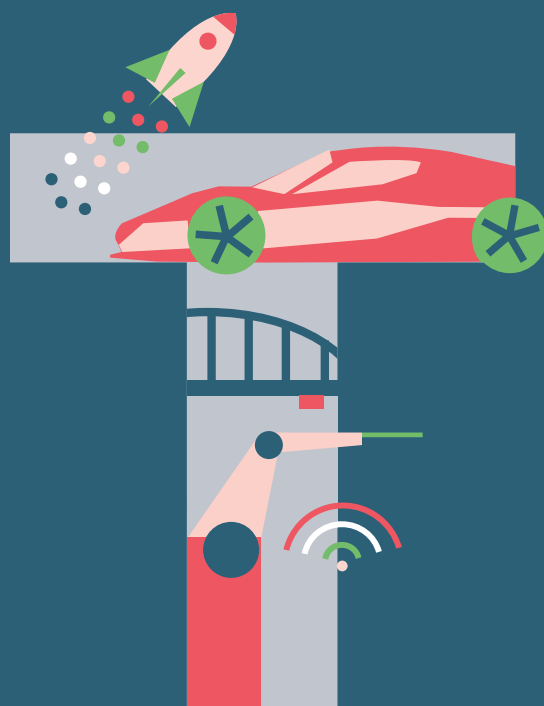


Science & Technology Project 2

For better absorption of EU funds in research and development in Croatia



Contents

Overview

4

Results

5

Impact

9

Highlights

10

Overview

Project budget:

EUR 24 million

Duration:

2013 – 2020

Implemented by:

Ministry of Science and Education (MoSE)
Croatian Agency for SMEs, Innovations and Investments (HAMAG-BICRO)
Unity through Knowledge Fund (UKF) / Croatian Science Foundation (CSF)

Beneficiaries:

MoSE, HAMAG-BICRO, UKF / CSF
Rudjer Boskovic Institute
Institute of Physics
University Computing Centre – SRCE (University of Zagreb)
Children's Hospital Srebrnjak
Research groups
innovative firms/start-ups

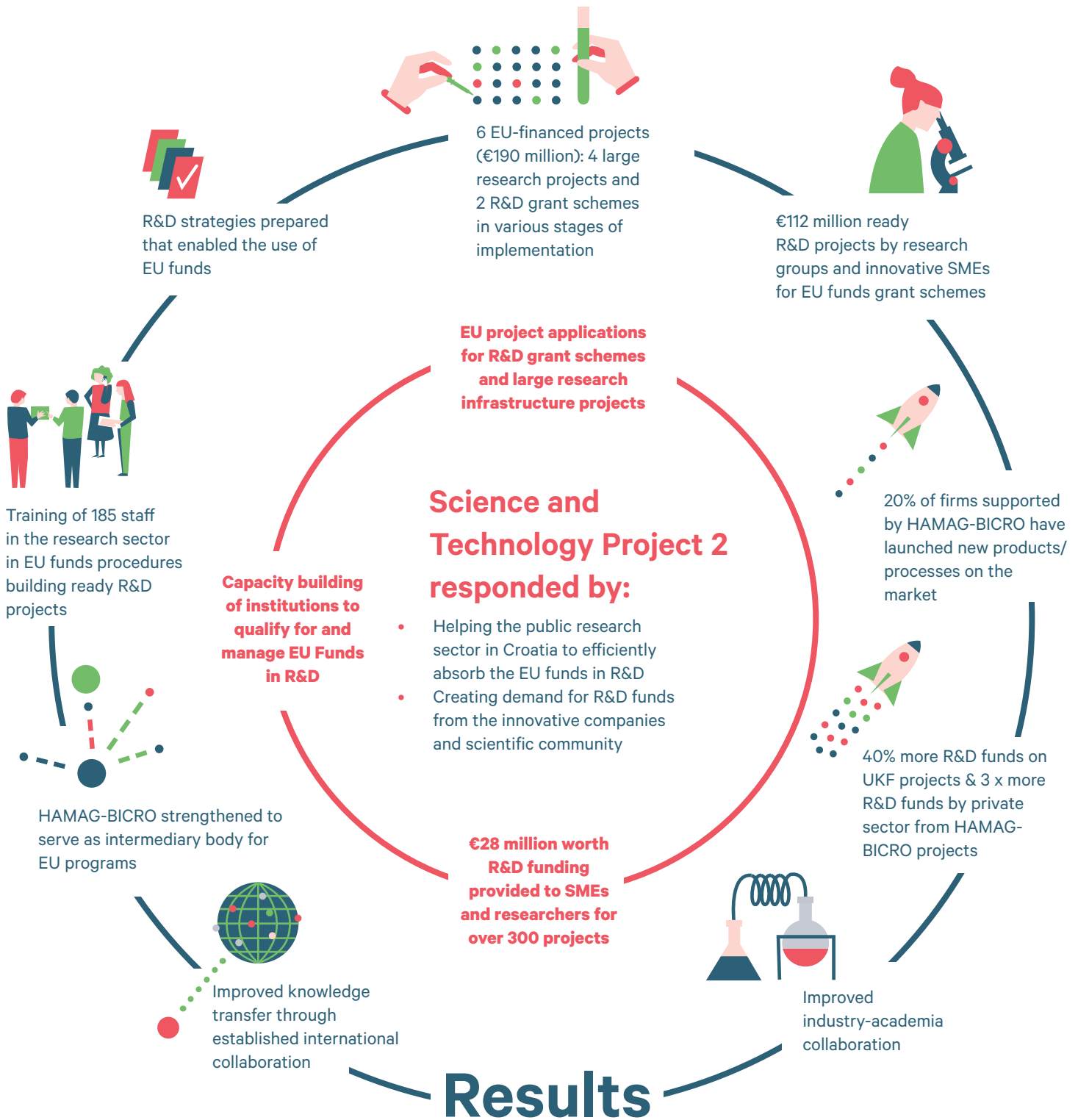


Technical Assistance

- Support to preparation of key strategic framework.
- Support to preparation of schemes and large R&D infrastructure projects.

R&D Financing Programs

- **Proof of Concept** supports verification and validation of technical and commercial viability of research results and establishing an appropriate strategy for commercialization
- **Technology Transfer Office (TTO)** Support Program supports research commercialization, particularly IPR of research results by industry and creation of new start-ups
- **RAZUM** (Development Program for Knowledge-Based Companies) supports private-sector investments in R&D and new technology in startups and SMEs through conditional loans
- **SPREAD** (Sponsored Research and Development) supports collaboration between industry and research organizations through matching grants
- **UKF Research Cooperability** supports collaborative research activities of domestic scientists with the Croatian diaspora and leading international scientific institutions
- **UKF Connectivity** supports the mobility of scientists through visits to prominent institutions to establish cooperation, acquire new skills and create new values for science and technology



The country's improved ability to implement the EU's Cohesion policy, the pool of ready EU projects and increasing the R&D expenditures per Europe 2020 agenda is key to Croatia's innovation and competitiveness. The Second Science and Technology Project (STP 2) responded to these needs by **helping the public research sector in Croatia to efficiently absorb the EU funds in R&D** and creating the demand for those funds from innovative companies and scientific community. To achieve this,

the project financed technical assistance (TA) for the public sector and provided R&D financing to firms and researchers. TA focused on **building capacity of institutions to qualify for and manage EU Funds in R&D** and included training, formulation of strategic documents and **development of EU project applications for R&D grant schemes and large research infrastructure projects** (through preparation of feasibility studies, cost-benefit analysis and technical documentation). The R&D

financing supported programs that have previously proven successful through the Science and Technology Project (closed May 2011) as run by HAMAG-BICRO and UKF, **increased the pool of SMEs and researchers that apply to EU-financed grant schemes**. The programs also improved innovation and science performance, increased business investment in R&D, improved collaboration between private and public sectors and commercialization of research results.

Summary of Results Achieved

- **Key R&D strategies** (ex-ante conditionality) developed and approved by the European Commission (EC)
- **€190 million worth six project applications** prepared¹ for EU financing as approved by the EC
- **€112 million worth project pipeline** developed by research groups and innovative SMEs for funding under ongoing and future EU grant schemes
- **185 staff in the public sector trained** in EU funds rules and regulations directly working with researchers and innovative firms on building the pool of ready R&D projects for financing
- **€28 million worth R&D funding** provided through UKF/CSF and HAMAG-BICRO for over 300 projects, generating new products/designs/processes, attracting new financing and improving scientific results
- **20% of firms supported** by HAMAG-BICRO² have launched new products/processes on the market
- **40% additional R&D funding** provided on UKF-supported projects (with 60% share from abroad) and R&D funds from the private sector tripled as a result of HAMAG-BICRO supported projects
- **Improved industry-academia collaboration:** i) 88 researchers collaborating on 250 private sector projects financed by HAMAG-BICRO, and ii) 19 partners from the private sector collaborating on 59 UKF projects
- **Improved knowledge transfer** through established international collaboration of 317 domestic scientists from 38 institutions and 89 scientists (44 from diaspora) from 73 leading foreign institutions

- 1 The contribution for the preparation has been full or partial.
2 As analyzed by HAMAG-BICRO.

Ex-Ante Conditions for the Use of EU Funds Met

The project supported formulation of key sector strategies linked with the use of EU Funds and contributed to the credibility of national documents through sound analyses and evidence-based policy-making. Sector strategies prepared:

- (I) **National Education, Science and Technology Strategy** - adopted by the Parliament (October 2014), was among the first ex-ante conditionality (of 25 of them) for the use of EU funds accepted by the European Commission as compliant with the Common Provisions Regulation criteria;
- (II) **National Innovation Strategy** - prepared with contribution under STP 2 and adopted in December 2014 - responding to the Europe 2020 Strategy, which sets clear targets for EU Member States for innovation agenda;
- (III) **Research and Innovation Strategy for Smart Specialization (S3)**, prepared as key ex-ante conditionality for the use of EU funds in R&D sector; and
- (IV) **National Research Infrastructure Roadmap** – a country's guide to building public research infrastructures, including the budgeting plan.

Large R&D Infrastructure and Grant Scheme Projects Developed

In addition to policy documents, project readiness and quality of documentation are among essential elements to a successful EU programs absorption and management, due to a limited timespan for the programs' physical and financial implementation. **STP2 contributed to the preparation of €190 million worth R&D project proposals, whose implementation was financed from EU funds** of which €171 million for four large research infrastructure projects (ERDF 2014-20). The infrastructure project selection was based on project readiness criteria and relevance for Croatia research sector and all four were scrutinized by the EU's JASPERS for quality.

These projects will upgrade the physical infrastructure and facilities, as well as laboratories to the best performing institutions, which will enable the scientific community to conduct world-class research and expand their collaboration internationally as well as with the businesses.

* **O-ZIP** Open scientific infrastructure platforms for innovative applications in economy and society
CALT Centre for Advanced Laser Techniques

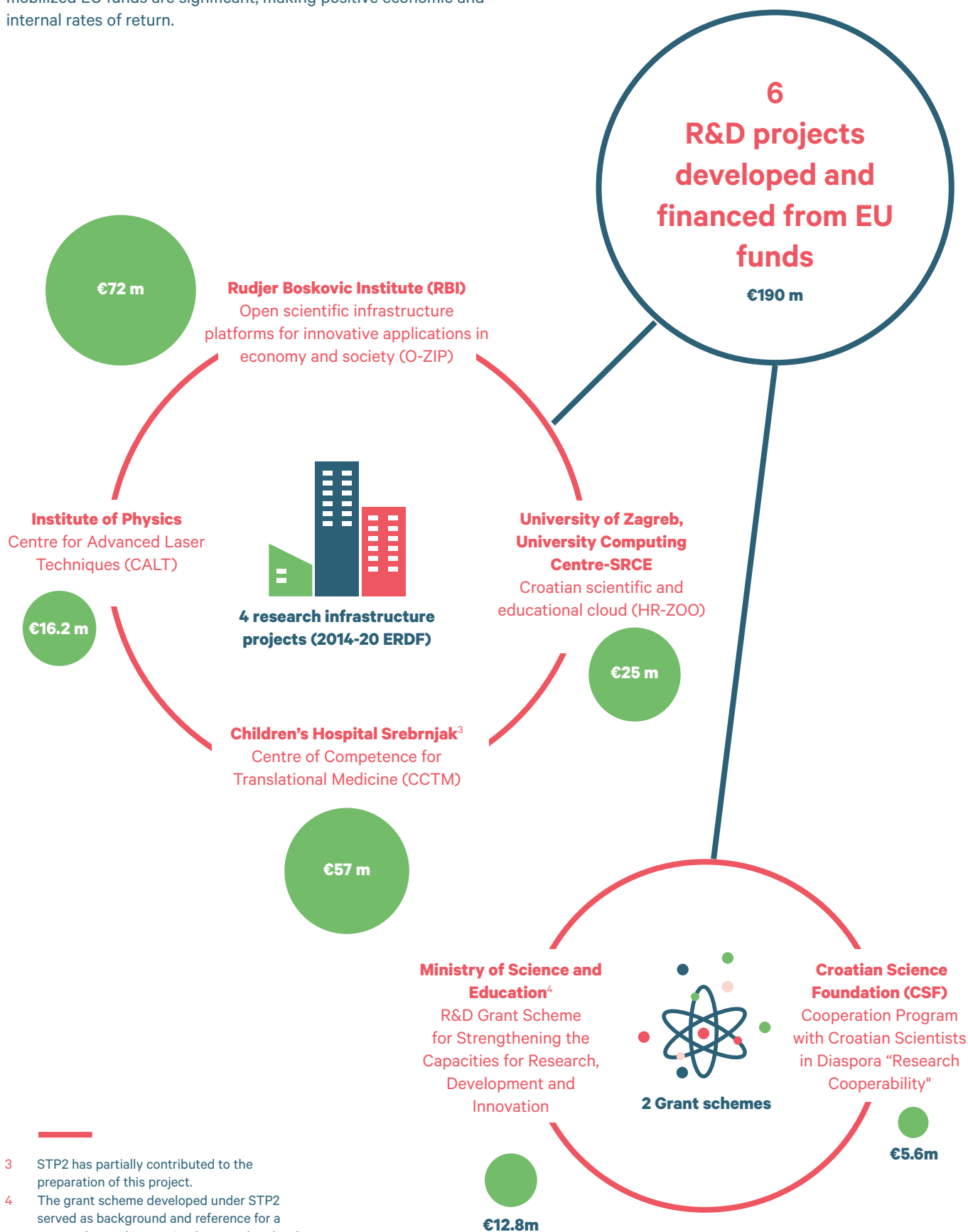
O-ZIP*

RBI employs over 500 researchers and stands out by its scientific productivity and success in attracting EU funds (the largest number of Horizon 2020 projects). The O-ZIP project will include construction and refurbishment of all major buildings at the RBI (much damaged in the March 2020 earthquake) and provide state-of-the-art scientific equipment so that 50% of the capital research equipment owned by RBI could be brought up to date for the most propulsive areas of research.

CALT*

The Institute of Physics' CALT has become a national strategic project because lasers and photonics are one of five Key Enabling Technologies identified by the EU.

Impact evaluation by Zagreb Institute of Economics concluded that preparation of infrastructure projects for EU financing will have large positive effects not only for the R&D human capital and scientific productivity of beneficiary institutions but for the entire research community in Croatia. Additional investments and mobilized EU funds are significant, making positive economic and internal rates of return.



³ STP2 has partially contributed to the preparation of this project.

⁴ The grant scheme developed under STP2 served as background and reference for a grant scheme that was implemented under the 2007-13 European Regional Development Fund (ERDF).

Merit-Based R&D Financing Improved the EU Funds Absorption

EU grant schemes represent challenging aspects of EU funds absorption because their success depends on sufficient number of candidates with good quality project proposals and capacity for implementation that meet strict EU programs criteria. Therefore, the STP 2 supported R&D financing programs that have maintained and increased the pool of knowledge-based SMEs and researchers capable of qualifying at various EU funding schemes in Croatia and competing at prestigious central EU funds resources.

Firms that were beneficiaries under HAMAG-BICRO programs prepared project pipeline worth €45.6 million

and are becoming users of IRI – *Capacity Building for Research, Development and Innovation program* and IRI 2 – *Increasing the Development of new Products and Services Resulting from R&D Activities*, financed under ERDF. For instance, the company Geolux, a small high-tech company and a beneficiary of the Proof of Concept program, has been using IRI to finance its R&D-based innovation for the hydrological sensors. Geolux has made a breakthrough with its software-based product abroad and the market is now seeking further tailor-made solutions, which prompts further R&D.

ERC

is the most prestigious program in the European context and finances pioneering projects, with average success rate of 12%. Since 2007, there were only six (6) ERC grantees in Croatia, of which three (3) were based on outstanding results and collaboration established under UKF financing.

UKF beneficiaries have developed R&D project pipeline worth €66.3 million

targeting the highly competitive EU Horizon 2020 Program and other EU and national programs. Of these, €22.7 million were already awarded and are in implementation, and additional €5.6 million worth projects were developed for financing from other international sources. Through international collaboration with the world's best institutions, the research performance and capacity of UKF beneficiaries have grown to attract highly competitive HORIZON 2020 projects and other European foundations programs, notably the **ERC (European Research Council), Marie Curie funds, and FET (Future and Emerging Technologies)**. Other resources were awarded from INTERREG programs of European Territorial Cooperation (ETC) and European and Structural Investment (ESI) funds. For instance, 28 researchers from UKF-funded projects are collaborating in the EU-funded Centers of Excellence, with a financial allocation of €6 million allocated to scientific fields directly resulting from UKF projects.



Impact

of R&D Financing

Innovation requires time and financing, although early results of R&D financing could be reported upon completion of R&D cycle. More often, firms and researchers keep conducting intensive R&D and combining many financing resources to develop a new or improved product, process or service. Monitoring and evaluation conducted by UKF and HAMAG-BICRO, combined with impact evaluation by the Institute of Economics provide the **early results and value added of STP 2 merit-based R&D financing**, as follows:

| DIMENSION | HAMAG-BICRO | UKF/CSF |
|---|---|---|
| R&D intensity allows desired scientific & technological complexity leading to better results | <ul style="list-style-type: none">• 34% of businesses and spin-off companies supported reached the final stage of product development;• 20% of supported firms launched innovative products on the market;• 82 products / processes / designs have been developed by supported firms for which IPR will be sought;• Most of RAZUM and SPREAD projects had new product/service, and 44% of them produced new designs. | <ul style="list-style-type: none">• Improved scientific output: 208 articles published in peer-reviewed journals, of which 189 (90%) in peer-reviewed journals with Impact Factor (incl. the highest ranked journals: <i>Nature Physics, Nature Immunology, Immunity, Nano Letters; Embo Journal, Nature Communications</i>);• Improved research quality and relevance - UKF beneficiaries on average receive higher number of citations as compared to non-beneficiaries. |
| More intensive collaboration of business and academia, international collaboration resulting in knowledge transfer | <ul style="list-style-type: none">• Beneficiaries from the private sector under HAMAG-BICRO programs improved their collaboration with academia through participation of 88 researchers from the public R&D sector. | <ul style="list-style-type: none">• Increased knowledge transfer through international collaboration: 317 domestic scientists collaborated with 89 foreign scientists (incl. diaspora) from 73 top foreign institutions (incl. <i>Yale University, Harvard Medical School, Stanford University, Mack-Planck-Institute, Massachusetts Institute of Technology</i>). |
| R&D funds mobilization increased (see above: EU funds and project pipeline) | <ul style="list-style-type: none">• R&D funds from the private sector tripled. E.g. PoC private raised 73% of funds during implementation and 64% afterwards. PoC public raised 46% of funds during implementation and 300% after closure. | <ul style="list-style-type: none">• UKF projects brought additional 40% of funds, of which 60% share from abroad. |

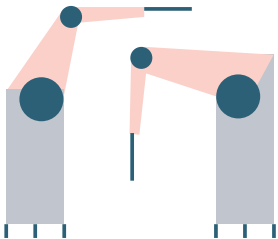
R&D intensity, mobilized funds and intensified collaboration increase R&D employment in companies and research institutions and improve skills and competences, i.e. the R&D human resources base.

Highlights

Examples of R&D Financed Beneficiaries

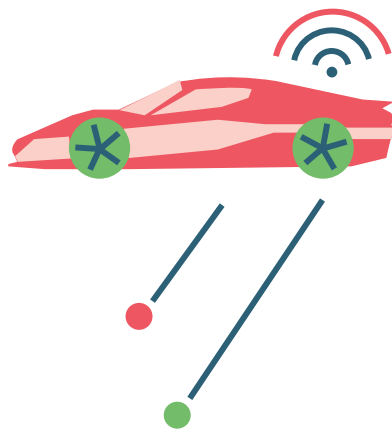
The neurosurgeon robot Ronna G4

UKF collaboration between Faculty of Mechanical Engineering and Naval Architecture (University of Zagreb) and the Royal Institute of Technology (KTH, Sweden) contributed to the development of a neurosurgeon robot Ronna G4, which performs surgeries since 2016 at Dubrava Clinical Hospital. Ronna G4 boasts cognitive ability of an IQ of over 100, and can create a plan of its own behavior according to surgeon's guidance. Because of that, it locates areas in patients and performs sensitive procedures, facilitating operations and making them less costly as the surgeon is freed from demanding technical procedures. Ronna G4 reached the level of autonomy four, one step away from complete autonomy, and won Best Integration and Innovation Award at Hamlyn Symposium of medicine robotics in London (June 2018), placing Croatia on the map of prominent research and development centers in medicine robotics. (STP)



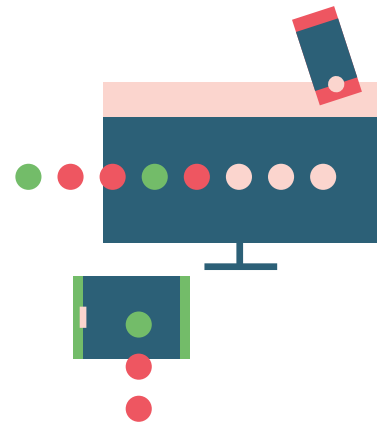
Rimac Automobili

SPREAD and Proof of Concept financing helped the company Rimac Automobili (RA) further the development of smart efficient and flexible inverter and its innovative lithium-ion battery pack. Rimac Automobili focuses on development and production of electrical hypercars as well as high performance components (notably battery systems and drivetrains). The company started in 2009 and expanded in a short period of time with new manufacturing plants, R&D facilities, and space to host a growing team of engineers. The company's revenues in 2018 increased by 34.6 percent, with the share of exports of over 85 percent. RA has seen an exponential growth in 2019, with 536 employees, of which more than 50 percent working on R&D, and an increase in revenues by 170 percent compared to 2018, of which over 98 percent in exports. Due to the company's technology know-how and its excellence in R&D and production, it attracts foreign investors, most recently including Porsche's investment of €16.8 million with equity (2018), and a €80.0 million investment by Hyundai and Kia in May 2019. (STP 2)



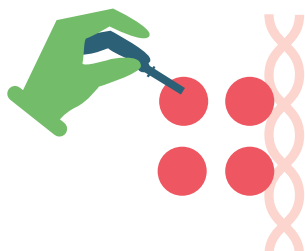
Shoutem – a spin-off of Pet minuta (Five)

RAZUM financing helped a mobile products company Pet minuta (Five minutes) develop its application Shoutem, a tool for creating microblogging communities. Back in 2009, Pet minuta was a company of 15 employees so additional R&D financing helped them hire staff and bring Shoutem to a new level creating a spin-off. This led to a \$1.7 million venture capital investment by the RSG Capital in 2011 into Shoutem. The founders with a vision continued to develop Pet minuta and Shoutem independently and in parallel, expanding successfully their offices and presence in New York City. Today, Shoutem is a mobile app development platform with more than 5000 apps published to iTunes and Google Play. Five (as the company is called today) has become a 180+ people mobile development agency based in New York and Zagreb and is working with US-based clients such as Rosetta Stone, Marriott, Penguin Random House, Napster, PIMCO and others. (STP)



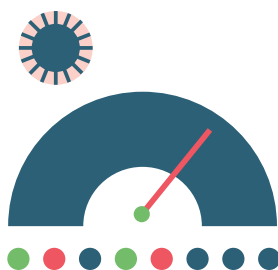
Genos

Proof of Concept financing helped Genos, a lead research company in the field of high-throughput glycomics, to test GlycanAge – a marker of biological age – and its validity on a large population to obtain proof of concept for a simpler and cost-effective blood sampling method. This led to the development of the commercial product GlycanAge – a marker that provides more predictive information on our hidden biochemical age and serves as a better indicator of health and aging process. Genos, initially a startup in 2007, meanwhile performed research that included over 80.000 individuals worldwide and has been a partner in about 12 international R&D projects financed through the competitive European Framework Programmes. The product has an international patent and trademark protection. From STP 2, GENOS used SPREAD funds for research of genetic predispositions and development of tests for prevention of sport injuries. Genos has become a beneficiary of EU-funded Center of Competence. (STP, STP2)



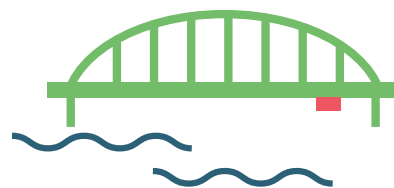
Commercialization of research results

UKF collaboration between the Faculty of Science, Faculty of Electrical Engineering (University of Zagreb) and the National Autonomous University of Mexico (UNAM) resulted in a spin off company. This company has developed multi-channel floating picoammeters that can operate at high voltage, and were sold to a number of prominent institutions all around the world such as CERN and Yale. The product was exported to Israel, Finland, Germany, Spain, Romania, India and USA. (STP 2)



Geolux – A champion of Proof of Concept


Proof of Concept financing helped Geolux, a small high-tech company of eight employees, to develop an innovative sensor for hydrological instruments. Geolux focused on a flexible, software-based device, where any feature can be easily upgraded through software updates. Geolux holds about 10 percent of the world market in hydrological instruments and 30 percent of the relevant market in China. The company grows 30-50% by year and the state subsidies make 5-10% of its income. This helps them put the product on the market much quicker and earlier and stay competitive. (STP 2)





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