An Empirical Assessment of the ERC Proof-of-Concept Programme

Final Report

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While this study was carried out under the auspices of the ERC Scientific Council, the report was jointly prepared by Dr. Wessner (Project Chairman) and Dr. Munari (Project Vice Chairman). The findings and recommendations of the report are submitted for consideration under the responsibility of the authors and do not necessarily reflect the views of the ERC Executive Agency or the ERC Scientific Council.

1. Introduction

Context of the study. This study presents an assessment of the European Research Council (ERC) Proof-of-Concept funding scheme, commissioned to an independent group of experts by the ERC Executive Agency. The European Research Council (ERC) was created under the 2007 – 2013 Framework Programme for Research and Development. It has shown considerable success in providing highly competitive research grants to outstanding European scientists. It is widely recognized as a world-class research funding agency. Its goal is to support the best researchers in any field of research on the sole criterion of scientific quality. It aims to fund research that will have a direct impact on the frontier of knowledge, opening the way to new scientific and technological results that can lead to innovation[1].

The ERC provides funding for frontier research through three main grant schemes that represent the core of its activities: Starting Grants; Advanced Grants; Consolidator Grants. As Commissioner Moedas has noted, "The beauty of the ERC is that progress is made in research without any far-removed administration telling researchers what to do."[2] The scientists decide "what they want to explore and how they want to explore it." With this freedom to explore their work, they may be able to make discoveries or develop new technologies to address complex global problems in areas such as health, migration, and climate change mitigation.

Reflecting this interest in converting scientific discovery to social and commercial innovation, in 2011 the ERC launched a Proof of Concept scheme, designed to encourage ERC grant winners to explore the innovation potential of the ideas developed under their ERC Frontier grants. Since then, a part of the ERC budget, currently 20 million euros, is allocated to ERC Proof of Concept grants (PoC). This funding mechanism is focused on translational research designed to bridge the gap between early ideas/inventions and innovation, and ultimately address societal needs through public procurement or commercial sales. PoC grants are assigned through an annual competitive call with three different cut-off dates. They are up to €150,000 for a period of 18 months. The funding covers activities at the very early stage of turning research outputs into commercial or socially valuable proposition. Over the 2011-2016 period, more than 600 of these add-on grants have been awarded, helping ERC grantees to explore and develop the innovation potential of their ideas.

Objectives of the study. The ERC structure includes an independent Scientific Council backed by an Executive Agency (the ERCEA). Reflecting current global best practice in the evaluation of public policies for research and innovation, in 2016 the Executive Agency assembled a group of independent experts to review the impact of the ERC Proof of Concept grants. The assessment seeks to provide qualitative and quantitative information and analysis on the current and expected performance of the PoC awards. The study findings are intended to inform the ERC Scientific Council's decisions on the performance to date of the PoC awards and identify potential improvements to the current approach.

The goal of the study is thus to better understand how well the PoC scheme contributes to maximise the value of ERC-funded research by facilitating the development of its commercial and social potential. To this end, the study focuses on a series of interrelated dimensions. These include awareness and knowledge of the PoC existence by ERC grantees, participation and activity in the programme, and the impact of the PoC scheme and its impact on PoC projects. Although it is already possible to determine some of the intermediate outcomes of the awards, such as licensing agreements,

[1] *Annual Report on the ERC activities and achievements in 2015*. European Research Council.
[2] Ibid. p. 6.

R&D contracts, consulting agreements, public engagement, additional funding, and the creation of spin-off companies, the time elapsed between the award and the study is not sufficient for a full assessment of the awards' impact. The relatively recent activation of the PoC programme means the bulk of the awardees are not yet at a stage where the broader impacts in terms of market penetration, tax revenue, job creation, and societal benefits can be fully determined. Given this reality, the evaluation presents the achievements to date of the awardees and their assessment of their prospects for future progress and cites individual cases where substantial success has already occurred.

Study methodology. The study methodology consisted of a survey to all 7th Framework Programme (FP7) ERC grantees, including PoC awardees, PoC applicants who did not receive an award, and other ERC Frontier Research grant awardees. The survey thus targeted the PIs of all FP7 ERC main grants, as potential applicants of the ERC PoC funding scheme since its initial foundation An exceptional, best practice feature of the study is that it compares the outcomes of PoC projects with those of two control groups, consisting of a set of projects that applied to the ERC PoC scheme but were not funded and a set of projects that did not apply for it but continued valorisation activities from other sources. In addition, the survey was complemented by a series of interviews, conducted by external independent experts, with a selected group of ERC PoC grant holders. The methodology of the survey and the interviews is described in greater detail below.

The scope of the surveys is also exceptional. Surveys were sent to all 4338 PIs of FP7 ERC Frontier Research Projects (corresponding to 4378 ERC projects). 1821 usable responses were received (response rate 42%), including 242 responses from ERC PoC grant holders and 204 responses from ERC PoC applicants who were not funded. The remaining 1375 responses are thus from other ERC Frontier Research grantees that did not apply to the ERC PoC programme. In addition, as noted above, 33 interviews were conducted separately with PIs of selected PoC projects. The interviews were intended to complement the survey, by providing the opportunity to discuss some of the projects in depth in order to better understand the process that takes ERC PoC grantees towards the valorisation of their ideas.

The presentation and discussion of the survey findings in this study follows the sequence of the survey questions and it is articulated into the following areas: a) awareness of the PoC programme; b) motivations to apply or not; c) valorisation activities and outputs; d) valorisation outcomes; e) access to additional developmental funding; f) skills development and other outcomes; g) the PIs'assessment and recomendations for improving the ERC PoC funding scheme itself.

Structure of the report. The report is organised as follows: Section 1 is the Introduction, Section 2 presents an executive summary of key findings from the survey and the interviews. Section 3 describes the structure of the ERC PoC programme and presents a set of statistics on PoC applications and PoC grants over the period 2011-2016. Section 4 presents in detail the main findings of the survey of ERC grant holders. Section 5 summarizes the key insights emerging from the interviews with selected PIs of ERC PoC projects. Section 6 concludes with a set of recommendations on potential improvements for the current scheme and its future development. The Annexes at the end of the document present further details on the methods and data at the basis of the survey and the interviews.

2. Executive Summary of Key-Findings

Core Survey Findings

This substantial survey has documented first, the high levels of awareness regarding the Proof of Concept programme and second, the success of PoC awardees in advancing their projects towards greater valorisation and actual commercialisation. It is evident from both the surveys and the interviews that the PoC awards have a positive effect on the development of products, processes, and services resulting from the ERC awards. Over a quarter of the awardees (26.75% out of 228 PoC respondents) report that they have fully achieved their PoC objectives and more than half (almost 52%) report that they have partly achieved the goals they established when they made their application. Measures of success in valorisation include the creation of applications for patent protection, the receipt of patents, licensing agreements, R&D collaborations and contracts, consulting agreements, and importantly, new company formation and public engagement. Each of these categories are discussed in greater detail below. As a reminder, in interpreting the study findings, it is important to keep in mind the nature of the challenge undertaken by the PoC program. It is widely recognized that early stage finance of promising research-based projects and companies involves substantial risk, from technical challenges, management issues, the need for additional financial resources, and of course market acceptance of the product, process, or service itself. As a result, high failure rates are characteristic of early-stage projects. This, of course, is the space in which PoC awards are made. Accordingly, it is important to manage expectations of success, especially early success, in light of the challenges faced by the management team and those related to the technology itself.

Commercialising IP

The evidence clearly suggests that PoC awards foster the creation of new intellectual property, notably patent applications and granted patents, with some 42% of grant holders reporting at least one such patent application. This generation of intellectual property is also reflected in the creation of licensing agreements, achieved by some 18% of PoC awardees. Moreover, the agreements themselves often involve the creation of the startup or a spin-off to exploit the technology created by the PoC award. Very substantial numbers, almost half the cases, involve cooperation of the awardee or their spin-off with third party SMEs, while just under a quarter of the cases involve large enterprises. This suggests very robust interest in the intellectual property created by the PoC awards. Underscoring the value of the IP created, some licensing agreements are already generating payments. While the vast majority of licensing agreements are generating income under 100,000 euros, a few cases report total income from licensing agreement greater than 1 million euros. The consulting agreements reported by awardees are also sources of income in over a quarter of the cases, although the income generated in two-thirds of the cases is under 50,000 euros. Finally, there are significant numbers of collaborations with industry, especially in the form of research contracts.

New Company Formation

One of the more powerful manifestations of the impact of PoC awards involves the creation of new companies. Some 45 PoC grantees reported that their project led to the creation of a new company. Another 14 PoC grantees reported that a pre-existing company was involved in the project. A significant percentage of PoC grantees report that they anticipate creating a new company to exploit the results of the project within the next two years. New company creation by PoC grantees is significantly higher as compared with the control group. Moreover, the creation of new companies from PoC projects is relatively recent, with some 70% of the cases created after 2014 (again underscoring the short timeframe for much, but not all, of this analysis).

Some 75% of these new companies involve the project's Principal Investigator among initial shareholders, while just under half also report involving post-doc researchers and PhD and Masters students as shareholders. Importantly, the companies are attracting funding in their initial establishment also from outside financial investors such as seed funds and business angels. Nearly 20% of cases reported outside business investors, a promising sign of market potential. Firm foundation is a significant achievement, expecially when it comes with the support of external investors, as it indicates market potential. At the same time, as noted above, it is important to keep in mind the high-risk environment faced by the new firms.

Sales

In addition, many of these firms' products/services are already reaching the market. Almost half of the companies created from PoC projects report actual sales through new products and new services. Given the relatively short time elapsed since the PoC awards were received, it is important to note that the majority of these firms reported their first sales very recently, that is in 2016/2017. While these sales are relatively modest, with most reporting sales under 100,000 euros, they nonetheless represent a significant and promising achievement. Another promising feature is the diversity of the client base, with about two-thirds of these sales going to large enterprises and/or SMEs as well as to research facilities, and, to a lesser extent, hospitals.

An Early Positive Impact

Given the lead times associated with the valorisation of research, the significant rates of firm formation and actual sales are very encouraging. It will be important to track the trajectory of these companies over time. Even in the relatively short period of this assessment, the initial impact of the PoC awards is clearly positive. This no doubt reflects the quality of the ERC-funded research, but it also attests to the impact of the awards on the culture and attitudes of the investigators, enhancing their capacity to exploit the social and commercial applications of the research and to help drive the results to the market.

The Funding Challenge

Even with this initial success, a major hurdle faced by the projects, and reported by the PIs, is the need to attain additional development funding. More than two-thirds of the PoC awardees (70% of 217 PoC respondents) thought additional funding from public or private sources to sustain the development of the ideas and technologies. They also had considerable success in this effort, with nearly 40% of the awardees reporting that they were able to attain the additional funding and with nearly 30% reporting that they plan to obtain it in the future. The funded projects were most frequently backed by public sources (87,7% of 73 funded projects that reported information on the source of additional funding), often involving national public funds, followed by host institution funding and regional public funds (with multiple sources possible). While not as frequent as the public funding, the PoC awardees were able to successfully reach out to private sector sources (i.e. some 36% of 73 funded projects providing information on additional funding), such as private venture funds and foundations. Attracting private funding is significant, given the early-stage of the projects.

The most frequently cited reasons driving the search for additional funding are the need for further development and testing of products, processes, or services (78%) and the need to conduct further research activities (58%). The PIs also report that the search for additional development funding is a complex, time-consuming activity, absorbing significant time between half a year or more for a quarter of them. Their search for funding is complicated in many cases by the early stage of development of their technology or products, which tends to increase the perception of risk for private sector investors.

Enhancing Team Skills

Notwithstanding these challenges, the PoC grantees believe that there is significant improvement in the skills of project members as a result of the valorisation project. Their perceived improvement is strongest in the field of commercial and business development skills, with project members both more aware and more confident in their ability to address valorisation issues. This perceived improvement is significantly higher (68%) than that of the project teams in the control group (35%). Moreover, this improved awareness and confidence is underscored by the PoC grantees' belief that, as a results of the PoC grant, they are definitely more capable of taking on the valorisation process for another idea or technology. This change of culture and increased confidence among the research teams is itself a significant positive outcome of the PoC awards.

Supportive Interviews

The interviews of PoC awardees are closely aligned with the findings of the survey, confirming in personal terms the benefits of the programme and paths for potential improvement. The fact that the results of the interviews, which were conducted by a separate and diverse team of experts, correspond closely with the survey results is a source of confidence in the strength and validity of the study's survey findings. In particular, the interviews reinforced the need for more time and additional funding for the PIs to complete the objectives of the initial PoC award. They also recorded positive assessments regarding the administrative implementation of the programme, again corresponding closely with the survey results. The interviews also resulted in a series of short cases, outlying the accomplishments and challenges of a diverse group of PoC awardees. As noted, these cases are included in the text below.

A Key Finding: Significant Additionality

The Proof of Concept awards appear to have a powerful additionality effect. According to the survey, around 50% of the awardees report that without the PoC grant, the team would probably not have undertaken the valorisation project. Importantly, nearly two-thirds of the respondents affirm that in the absence of the PoC grant, the valorisation project would have been significantly narrower in scope and would have taken substantially more time to complete.

Challenges Identified by Awardees

While the positive assessment of the impact of the awards by the PIs is encouraging, the current PoC process has limitations. For example, nearly half (43%) of the PoC grantees report that the funding provided for the project by the award was actually not enough to fully achieve the project's proposed objectives. This is expecially apparent in the life-sciences and physical and engineering domains. As noted, they also report that a significant amount of their time (in some cases more than 6 months) is devoted to seeking additional funds, drawing them away from research and development activities. Interestingly, half of them also report an administrative limitation, namely that the project duration is too short to fully achieve the project objectives. Still, the financial constraint remains paramount, as over two-thirds reporting they would definitely apply for additional follow-on funding for their ERC PoC projects if it were available from another institution, while nearly a third affirm they would probably apply for additional funding These responses strongly suggest that most of the awardees believe they need the opportunity to apply for more funding and also argue for more flexibility in the duration of the awards.

Another area of improvement identified, although with considerably less frequency, involves the creation of opportunities for interaction with potential investors. Other suggested improvements include the provision of mentoring and training support and the reduction in the administrative burden, such as more flexibility and easier IP transfer arrangements at host institutions. Finally, some also express the need to enhance visibility for the project's outcomes. These suggestions are taken up in the recommendations section below.

An Effective Programme

While recognizing the challenges faced by the awardees and project teams, it is important to emphasize that this survey of the PoC awardees demonstrates conclusively that, in addition to quality research, the ERC awards have considerable potential for commercialisation and societal impact. This commercial potential is reflected in additional private and public investments in companies founded by PoC awardees and in the licensing fees, consulting arrangements, and actual sales achieved by these companies. Importantly, the awards are also changing the expectations and capabilities of the ERC PoC research teams, with regards to their ability to commercialize the results of their research. This can be a very positive cultural change, enabling researchers both to conduct top tier research and to have the confidence and ability to apply it to societal needs.

3. Structure and statistics on the ERC PoC programme

This section first provides a brief description of the structure and objectives of the ERC PoC programme. It then provides an overview of the main features and statistics of the ERC PoC programme, including the analysis of the distribution of applications and grants over time, by ERC scientific domain, by originating country and by gender.

3.1. ERC PoC Programme History and Structure

Background. The European Research Council (ERC) was established in 2007 with the twofold mission of encouraging the highest quality research in Europe through competitive funding and supporting investigator-driven frontier research across all fields on the basis of scientific excellence. Today, it represents one of the main research funders in the European Union. The ERC approach is 'investigator-driven' or 'bottom-up' in nature, allowing researchers to identify new opportunities and directions in any field of research, rather than being driven by externally defined priorities. The ERC provides funding for frontier research through long-term, individual grant schemes for ground-breaking, high-risk/high-gain research.

The Council deploys three main grant schemes representing the core of its activities. These are: Starting Grants, Advanced Grants, and Consolidator Grants[3]. Starting Grants provide support for researchers at an early stage of their careers with the goal of encouraging them to become independent leaders of quality research. A second grant programme, called Consolidated Grants, provides resources for researchers who are at an early stage of their careers but often already working with their own group. A third category includes the Advanced Grants which are designed to support outstanding researchers who are already established leaders in their field by providing them with substantial resources to continue the work of their teams. The selection of projects in such schemes is based on an international high-quality peer-review process, and it is based on the sole selection criterion of scientific excellence. Over the period 2007-2016, the ERC has funded more than 6900 projects in these 3 categories.

[3] We refer to such three main funding schemes as “Frontier Research grants” in the rest of the report.

Objectives of the ERC PoC programme. In 2011 the ERC launched a Proof of Concept programme (PoC), designed to encourage ERC grant winners to explore the innovation potential of the ideas developed under their ERC frontier grants. The aim of the PoC scheme is to maximise the value of the frontier research, by financing further work to verify the commercial or societal innovation potential of ideas and technologies stemming from ERC funded projects. PoC projects can thus aim at verifying the potential for the realization of commercial innovations (such as a new or significantly improved product, process, service or method of production) and/or societal innovations (novel solutions that can reduce or radically solve a relevant social need). Such novel solutions include new products, processess, or services, but also new principles, a new piece of legislation, a new social movement, an intervention or a new form of participation, for instance). Only Principal Investigators of ERC Frontier Research projects can apply and receive ERC PoC funding. The activities to be funded are intended to draw substantially on this ERC-funded research.

Accordingly, PoC funding covers activities at the very early stage of turning research outputs into a commercial or socially valuable proposition, i.e. the initial steps of pre-competitive development. The objective is therefore to bring ERC-funded ideas to a pre-demonstration stage where potential opportunities for commercialisation or generation of new societal benefits have been identified. For instance, PoC funding can be used to cover activites intended to: establish technical viability and solve technical issues; realize prototypes and technical tests; clarifiy intellectual property rights position and strategy; assess market demand and user needs; cover initial expenses for establishing a new company; and/or search for additional sources of follow-on funding.

Evaluation and selection process. Proof of Concept Grants are up to €150 000 for a period of 18 months. More than one Proof of Concept Grant may be awarded per ERC funded frontier research project but only one Proof of Concept project may be in process at any one time for the same ERC frontier research project. The application and selection process is arranged through calls published once per year, with 3 cut-off dates for submission. The proposals are evaluated by an independent evaluation panel, composed of high-level technology transfer experts, based on 3 criteria: 1) Excellence (Innovation potential: ability to move the output of research towards the initial steps of pre-commercialisation); 2) Impact **(**ability to generate economic and/or societal benefits); 3) Quality of the proof of concept plan (credibility and strength of the plan for establishing technical and commercial feasibility of the project). Reviewers evaluate independently each eligible proposal on each of the three evaluation criteria above on a "pass/fail" basis.

3.2. Statistics on the ERC PoC programme

A steady increase in programme participation. A total of 1695 project proposals have been submitted to the ERC PoC programme from its launch in 2011 to the end of 2016, through 6 calls (Figure 1). They originated from around 12% of the ERC Frontier Research grantees (discounting for all re-applications from the same PI). This trend shows a significant increase in the number of ERC PoC applications, rising from around 140 applications in the first year to around 400 applications in the final year. Over the same period, the programme budget increased from 10 million Euro per year (in the first three years of the programme), to 15 million Euro in 2014, to 20 million Euro in 2015 and 2016. Reflecting the increased funding, the number of grants tripled during this period. By the end of 2016, the programme had funded 618 PoC projects, originating from around 5% of all ERC Frontier Research grantees. The average success rate of the ERC PoC programme (computed as the ratio of grants over applications) is thus 36% over the 2011-2016 period.

Figure 1 - Evolution of the number of ERC PoC applications and grants over time

	Budget 10mil	Budget 10mil	Budget 10mil	Budget 15mil	Budget 20mil	Budget 20mil	
	2011	**2012**	**2013**	**2014**	**2015**	**2016**	**Total**
PoC Applications*	139	120	279	426	323	408	**1695**
PoC grants	51	60	67	121	160	159	**618**
Success rate **	37%	50%	24%	28%	49%	39%	**36%**

* Withdrawn and ineligible applications not taken into account
** Number of applications/number of grants (in %)

Key figures on the ERC PoC programme

- Steady growth in the number of applications (from around 140 to around 400 per year)

- Increase in the annual budget for ERC PoC grants (from 10 million to 20 million Euro)

- Over the 2011-2016, 618 ERC PoC grants (out of 1695 applications) have been awarded

- The average success rate for ERC PoC applicants is around 36%

- On average, around 12% of ERC Frontier Research grantees originate an application for a PoC; around 5% of ERC Frontier Research grantees receive a PoC grant

- ERC PoC applications originate from the Life Sciences domain (36,8%), the Physical Sciences and Engineering domain (50,5%) and the Social Sciences and Humanities domain (12,5%)

- 16,6% of ERC PoC grants are held by female researchers.

Distribution by country: UK institutions generate the highest absolute number of applications to the ERC PoC programme, followed by institutions from the Netherlands, France, Spain and Germany. Reflecting the applicant pool, UK institutions lead in terms of total number of PoC grants, followed

by the Netherlands, Spain, Germany and Israel. Figure 2 shows that four countries account for around 50% of all PoC applications and grants. In general, the geographical distribution of PoC applications and awards reflects, although it does not exactly mirror, the underlying distribution of ERC Frontier Research grants. UK institutions are responsible for the highest share of ERC PoC grants, in line with the fact that they also generate a higher number of ERC Frontier Research grants. However, Figure 2 shows that countries such as the Netherlands, Spain, Israel and Ireland generate a higher proportion of ERC PoC grants as compared to their underlying shares of ERC Frontier Research grants. This would suggest that PIs in these countries are more effective in translating ERC awards into PoC awards. On the other hand, countries such as the United Kingdom, Germany and France receive more ERC Research grants awards, yet generate less PoC awards out of them. The difference could reflect different national policies towards research valorisation, availability of national funding sources for valorisation activities, or may be influenced by the scientific domains of the originating ERC research grants[4].

Figure 2 - Share by country of PoC grants and of ERC grants (in % of total grants)

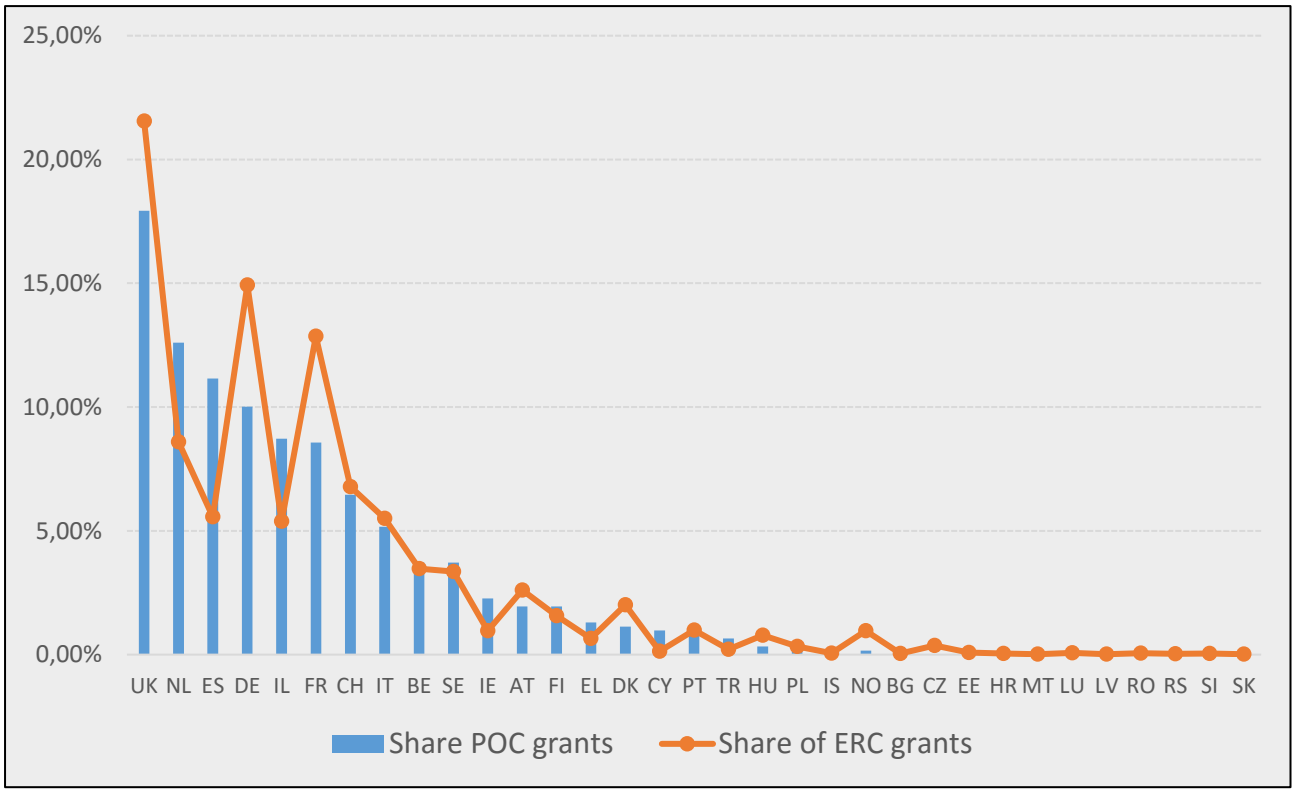
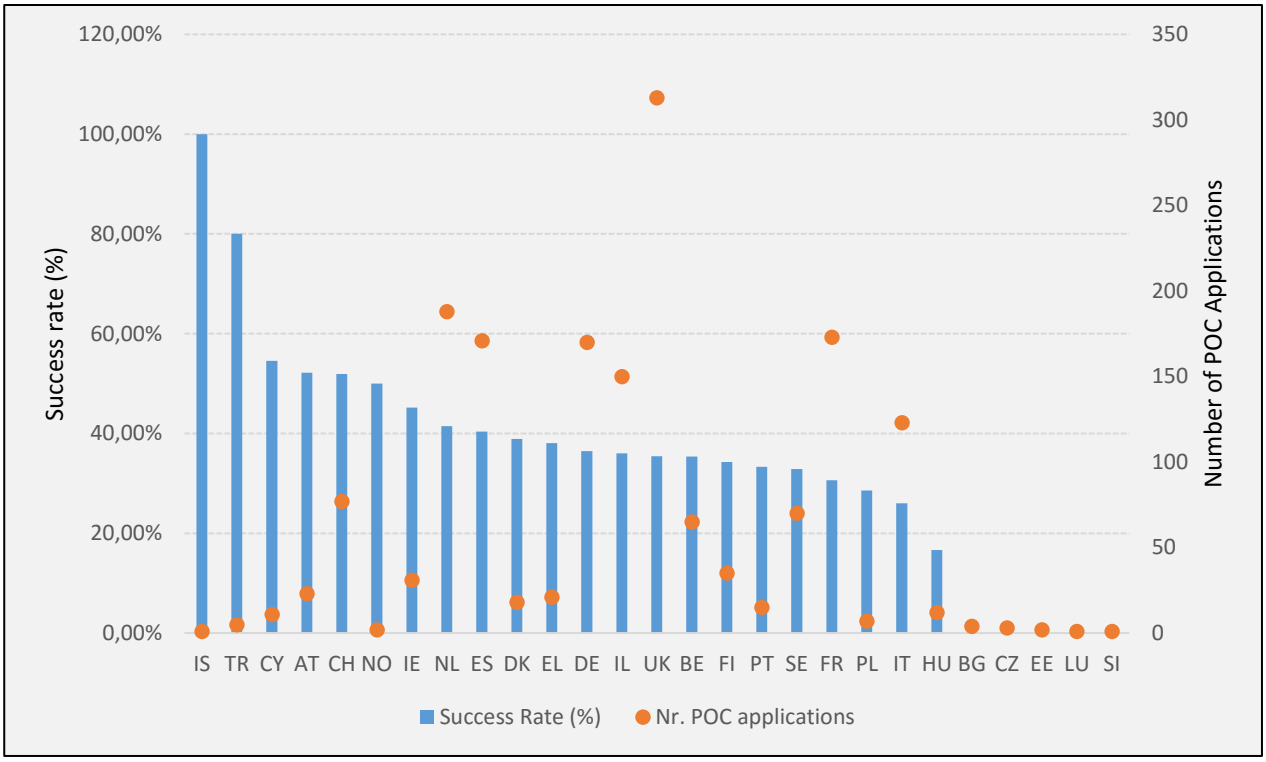


Figure 3 – Success rate (nr.grants/number of applications) of PoC applications, by country (in %)

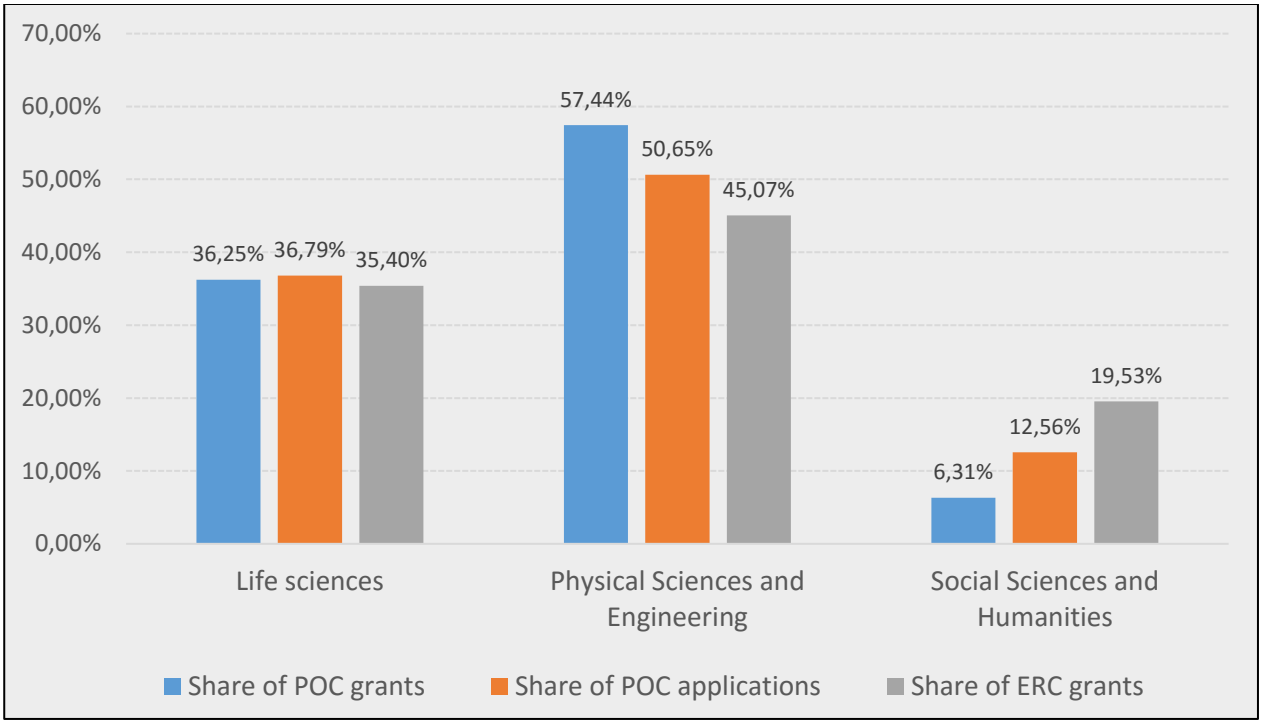
[4] Countries which are the most effective in obtaining ERC PoC funding (Figure 3), having the higher success rate, are Iceland (100%, one successful application), Turkey (80%, 5 applications, 4 grants), Cyprus (54%, 11 applications, 6 grants), Austria (52%, 23 applications, 12 grants), Switzerland (51%, 77 applications, 40 grants), Norway (50%, 2 applications, 1 grant), Ireland (45%, 31 applications, 14 grants).



Distribution by ERC domain. The distribution by ERC scientific domain of all ERC PoC applications in the 2011-2016 period is the following (considering the domains of originating ERC Frontier Research projects): around 36,8% of ERC PoC applications originated from the Life Sciences domain; 50,5% from the Physical Sciences and Engineering domain; 12,5% from the Social Sciences and Humanities domain, and 0,2% originated from Synergy projects (Figure 4)[5]. Considering the underlying distribution of all ERC Frontier Research grants (in the 2007-2016 period), representing the pool of potential applicants, ERC PoC applications can thus be linked to around 9% of signed ERC Life Sciences grants, to around 11% of Physical and Engineering grants, to around 3% of Social Sciences and Humanities grants and to around 4% of Synergy grants. Looking at ERC PoC grants, 36,2% of them originate from the Life Science domain, 57,3% from the Physical Sciences and Engineering domain, 6,3% from the Social Sciences and Humanities domain and 0,2% from Synergy Projects. The success rate (number PoC grants/number PoC applications) thus varies by ERC scientific domain, with the higher success rate for applications from the Physical Sciences and Engineering domain (41,5%), followed by the Life Science domain (36%) and the Social Sciences and Humanities domain (18,5%).

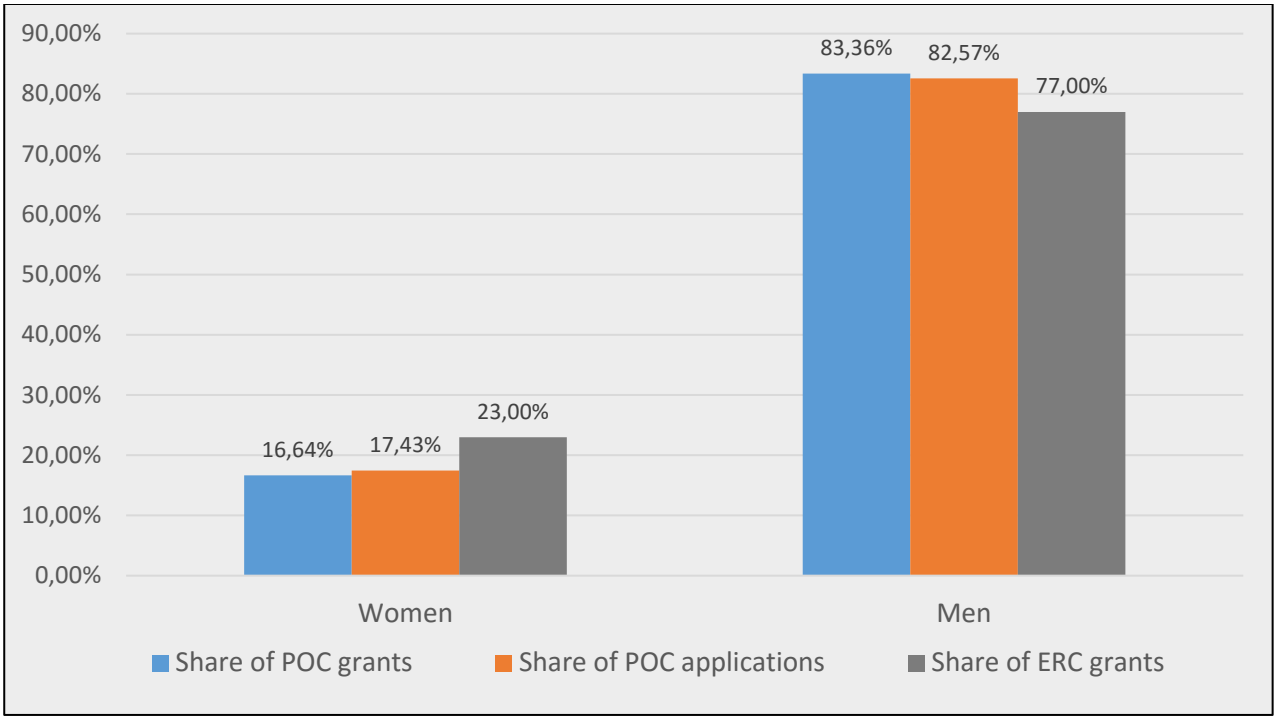
[5] The ERC Synergy Grant scheme ran under two pilot calls in 2012 and 2013, and it will be will be re-launched in the ERC Work Programme 2018. Synergy Grants allow a group of two to maximum four Principal Investigators (PIs) – of which one will be designated as the corresponding PI (cPI) – working together and bringing different skills and resources to tackle ambitious research problems.

Figure 4 – Share by domain of PoC grants, PoC applications and of ERC grants (in % of total grants/total applications)



Distribution by gender. In all ERC PoC calls until the end of 2016, around 17,5% of PI applicants were women (Figure 5). Over the same period, the share of women grantees in the ERC PoC programme was around 16,6%. The data show that the share of ERC PoC applications coming from women have increased in the period, from a share of 12,2% in 2011 to around 19,2% in 2016. The share of ERC PoC grants to women has had a more irregular trend over the period, ranging from 13,2% to around 21%, while the absolute number of grants has steadily increased. The lower share of women PIs vis-à-vis men PIs in the ERC PoC calls mirrors the overall situation in the pool of potential candidates (ERC Frontier Research grants), where the share of women grantees is around 23%. This, in turn, reflects the overall situation in science in Europe. The data show a slightly lower representation (in percentage terms) of women PIs in ERC PoC applications as compared to the women share in the pool of all ERC Frontier Research projects. The data do not show the existence of significant gender issues in the selection process of the ERC PoC programme, as the success rate by women PIs is similar to the rate for male PIs (respectively 34,92% and 36,94%).

Figure 5 – Share by PI gender of PoC grants, Poc applications and of ERC grants (in % of total grants/total applications)



Multiple grant-winners. More than one Proof of Concept Grant may be awarded per ERC funded Frontier Research project. However, only one Proof of Concept project may be running at any one time for the same ERC Frontier Research project. The data show that only a limited number of ERC Frontier Research awardees attracted multiple PoC grants. More precisely, as to the end of 2016, 10 ERC Frontier grantees were able to achieve 3 different ERC PoC grants in different PoC calls; 65 ERC Frontier grants achieved 2 different ERC PoC grants; 458 ERC Frontier grants achieved 1 ERC PoC grant. The existence of these multiple awardees can be seen as a positive development as academic "stars" seek to valorize their research, profiting from their experience with previous awards. These awards may reflect the need (described in the surveys and interviews) for additional funds to complete development and prototyping for related processes or products.

4. Survey Findings

This section first introduces survey objectives and methods. It then presents and discusses the main findings of the survey, following this sequence of topics: Awareness of the ERC PoC programme; Motivations to apply; Valorisation activities and outputs; Valorisation outcomes; Access to additional developmental funding; Skills development and other outcomes; PIs'assessment and recommendations for the ERC PoC funding scheme.

4.1. Survey structure

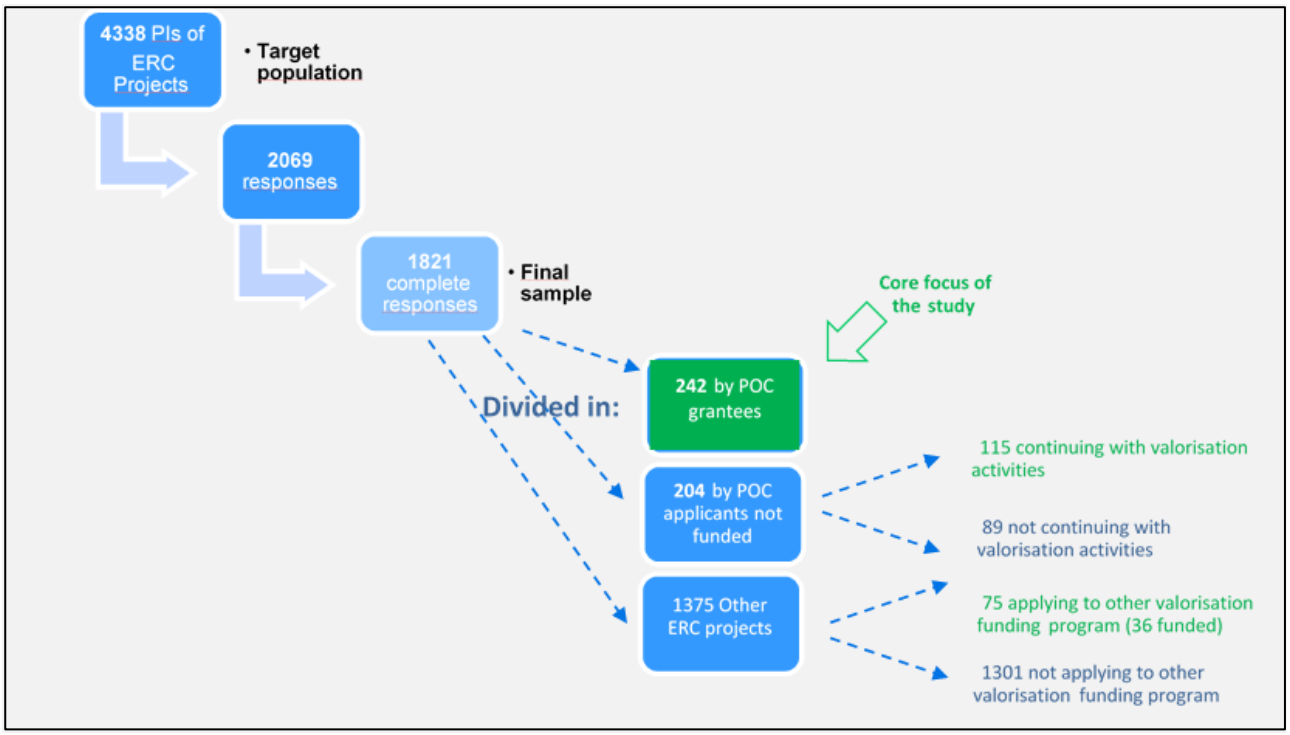
Objectives and structure of the survey. The methodology for the assessment of the ERC PoC programme consisted of a survey to all 7th Framework Programme (FP7) ERC grantees, including PoC awardees, PoC applicants who did not receive an award, and other ERC Frontier Research grant awardees. The survey thus targeted the PIs of all FP7 Frontier Research grants (those awarded over the period 2007-2013), as potential applicants of the ERC PoC funding scheme since its initial foundation. The survey was based on an ad-hoc questionnaire, implemented on the Surveymonkey web-platform. More details on the survey methods are reported in the Annex at the end of this report. The survey was complemented by a series of interviews with a selected group of ERC PoC grant holders, conducted by outside experts (see Section 5 of this report for the main findings from the interviews). The interviews also served to identify a set of success stories of the programme, that are presented in the form of short cases in this Section of the report, so to better illustrate the survey findings with concrete examples of PoC valorisation activities, outputs and outcomes.

A Very Positive Response Rate. The survey was sent to all 4338 PIs of FP7 ERC Frontier Research Projects (corresponding to 4378 ERC projects). The survey thus targeted the PIs of all FP7 main grants, as potential applicants of the ERC PoC funding scheme since its initial foundation. Following three recall rounds, we received 2069 responses to the survey (response rate 47,7%). Given that some PIs did not give consent to use the data and some responses were largely incomplete, the final sample is constituted by 1821 responses, representing a final response rate of 42%. Out of 1821 usable responses, 446 responses are from PIs that applied to the ERC PoC programme, including 242 responses from ERC PoC grant holders and 204 responses from ERC PoC applicants that were not funded. The remaining 1375 responses are thus from other ERC Frontier Research grantees that did not apply to the ERC PoC programme. The responses obtained from ERC PoC grant grantees represent 39,2% of the population of all ERC PoC grantees up to the end of 2016 (242 out of 618). Figure 6 summarizes the survey response rate and the final composition of responses.

High representativeness. The distribution of survey responses (both overall, and from ERC PoC grantees) closely resembles the distribution of the target population, along several analytical dimensions (distribution by ERC domain, by year, by country, by gender). Therefore, the survey achieved a very high level of representativeness of the ERC/PoC population, enabling robust conclusions from the analysis of the responses. The Annex at the end of the report provides more detailed statistics on the distribution of survey responses.

The adoption of a counterfactual logic. As counterfactual for the assessment of ERC PoC beneficiaries, the survey also targeted a control group of other ERC Frontier Research projects, including a set of projects that applied for an ERC PoC grant, but were not funded and continued valorisation activities and a set of projects that did not apply for it but used other valorisation funding sources (non-ERC). This control group is used in the set of analyses concerning valorisation outcomes (reported in Sections 4.5, 4.6 and 4.7 of this report).

Figure 6 – A representation of the survey responses



A comprehensive assessment. The presentation and discussion of the survey findings in this Section follows the sequence of the survey questions and it is articulated into the following areas:

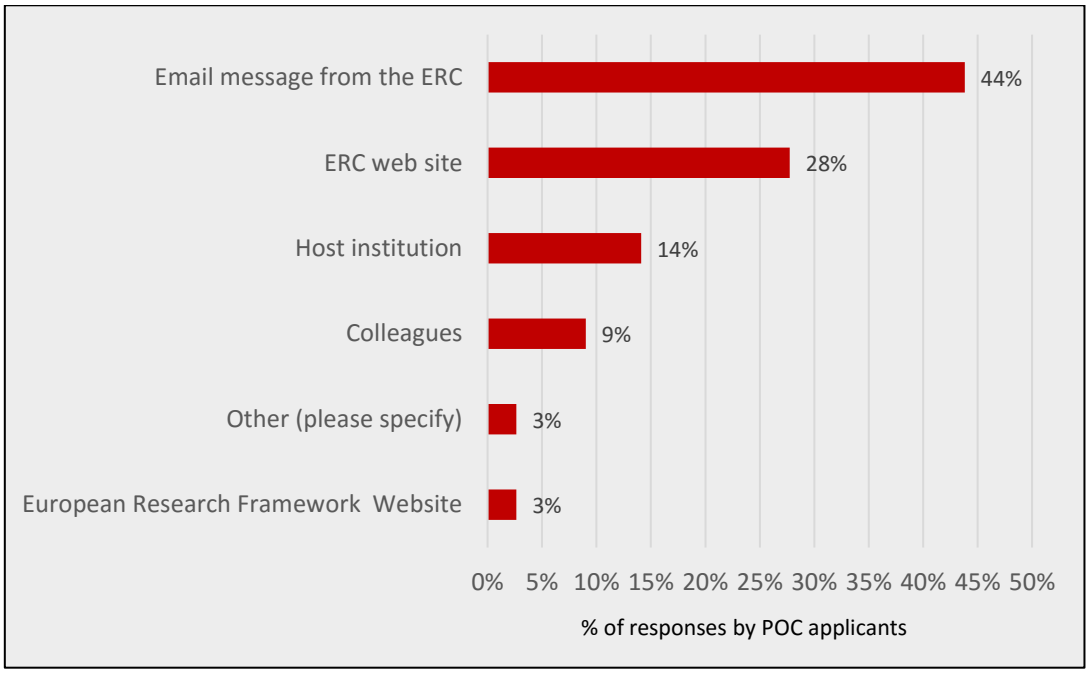
- Awareness
- Motivations
- Valorisation activities and outputs
- Valorisation outcomes
- Access to additional developmental funding
- Skills development and other outcomes
- PIs'assessment and recommendations for the ERC PoC funding scheme

4.2. Awareness of the ERC PoC programme

A high awareness of the programme. The responses to the survey show that there is a high level of awareness of the ERC PoC funding scheme among ERC Frontier Research grantees. Out of 1375 responses by grantees that did not apply to the PoC scheme, only 13% (181 responses) state that they were not aware of the possibility to apply to the ERC PoC programme. Among the respondents that did not apply, the decision not to apply was mainly because the priorities remained focused on research activities (54,6%) or because the Frontier Research project had not yet generated opportunities for commercial/societal valorisation (38.9%). A limited number of cases (6.35%) declared that they applied to another valorisation grant (available in the Host Institution, at national level or at EU level).

The importance of direct communication with PIs. According to the survey responses from 446 ERC PoC applicants, the most frequently cited source of information on the ERC PoC programme is represented by email messages from the ERCEA (Figure 7). This evidence highlights the importance of maintaining a direct communication channel between the Agency and the PIs for the exchange of updated information on upcoming calls and other programme opportunities. Direct communication is also essential for further assessments of awardees' progress over time. Failure to maintain open communication with awardees and applicants will essentially "blind" the programme with regard to its achievements, challenges and opportunities.

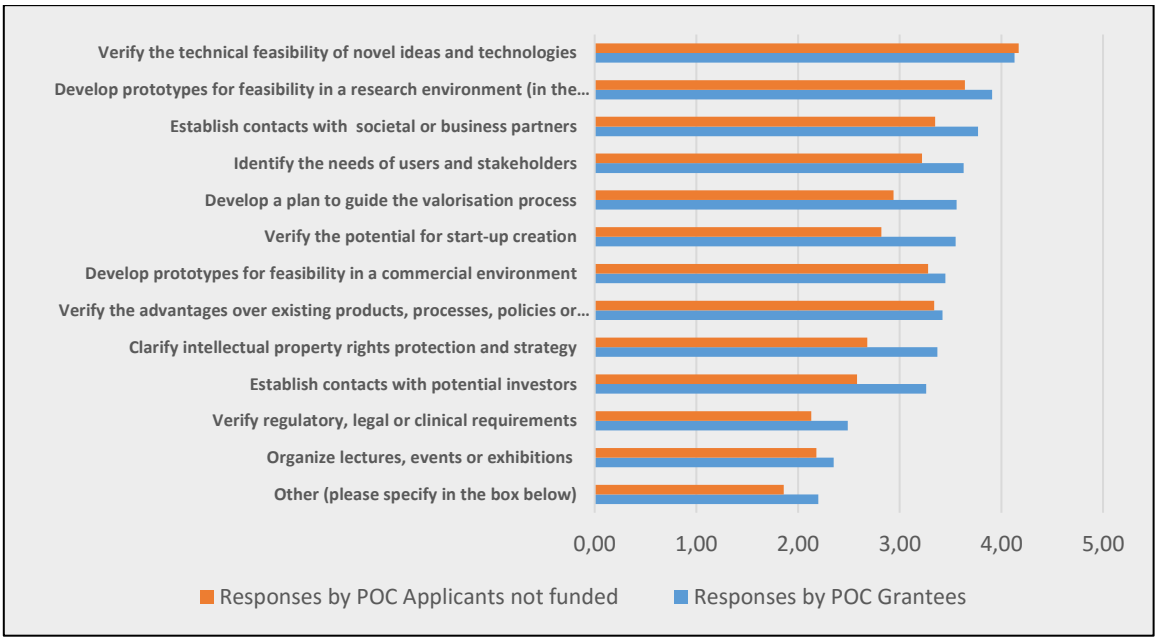
Figure 7 - Sources of information on the ERC PoC programme, according to PoC applicants (% of responses)



4.3. Motivations to apply

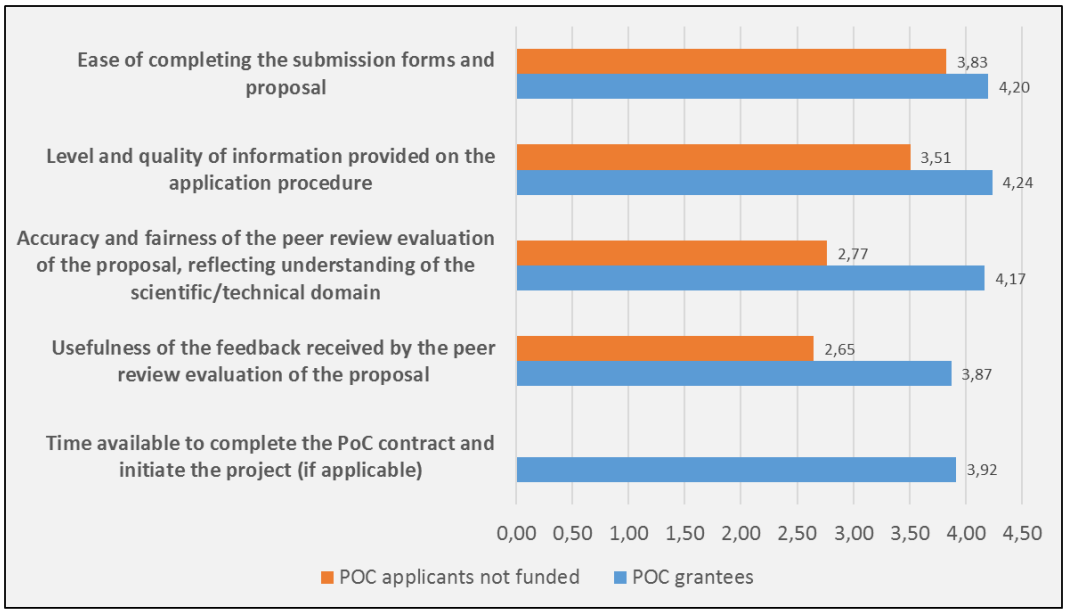
A focus on project objectives, technical validation and demonstration. ERC PoC grants can be exploited to conduct a range of activities enabling ERC funded ideas to be brought to a stage where opportunities for valorisation can emerge. According to the responses by 242 ERC PoC grant holders, the objectives of PoC projects are mainly focused on issues related to technical validation and demonstration (Figure 8). The most important objectives (on a 1-5 Likert scale) for the projects seem to be related to verifying the technical feasibility of novel ideas/technologies (average score 4,13) and to developing prototypes/test data in a research environment, i.e. in the lab (3,93). Close behind are other objectives cited as important such as commercial/societal validation and user need analysis: "Establish contacts with potential societal or business partners"; "Identify the needs of users and stakeholders"; "Develop a plan to guide the valorisation process"; "Verify the potential for start-up creation". This evidence suggests that, in accordance with the Programme objectives, PoC projects tend to be in the very early-stages of the valorisation path, mostly focusing on significant technical challenges and are generally still distant from market and societal applications.

Figure 8 - Main priorities of the ERC PoC project, at the time of the submission (average values, on a 1-5 scale)



Positive feedback from PoC grant holders on the submission and selection process. On average, ERC PoC grant holders provide a positive assessment of the proposal submission procedures (Figure 9), in particular the ease of completing the submission (average score of 4,2 on a 5 scale) and the level and quality of information provided on the application procedure (4,24). There is also a positive feedback by PoC grantees with regard to the peer review evaluation process, in particular concerning the accuracy and fairness of the evaluation. On the other hand, the assessment of the proposal submission and evaluation procedures provided by the group of applicants to the ERC PoC programme who were not funded is less positive, along all dimensions. Of course, this may reflect the different outcomes of the selection process. In particular, in this group there is a low average score assigned to the accuracy and fairness of the peer review evaluation of the proposal (2,77) and to the usefulness of the feedback received by the peer review evaluation (2,63).

Figure 9 - Satisfaction with the different aspects of the submission procedure for the ERC PoC funding scheme (average values, on a 1-5 scale)



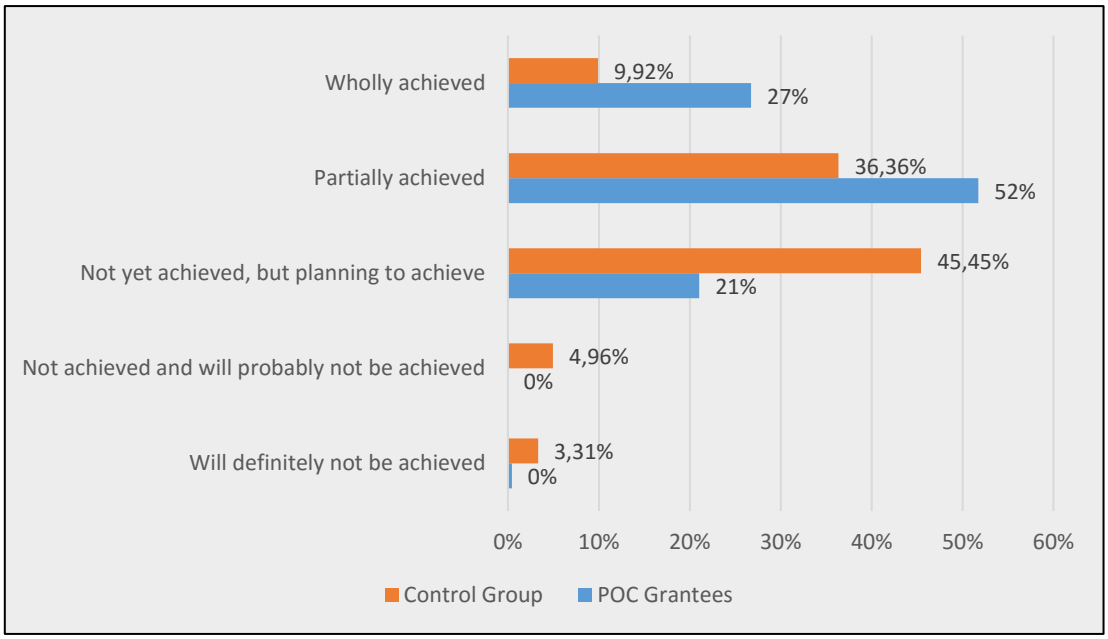
Interactions with Host Institution Technology Transfer Offices (TTOs). A considerable share of respondents in the group of ERC PoC grant holders (63%) declare that they were supported by the TTO of the Host Institution in the preparation of the ERC PoC proposal. In general, the support received by the TTO in the preparation of project proposals is reported in positive terms, with a high share (70%) of ratings of 4 or 5 on a 1-5 scale. 29% of PoC grantees were supported by external organisations (with respect to the Host Institution), such as consulting companies. Respondents in the group of ERC PoC applicants not funded tend to report less frequently the involvement of the TTO (56% of cases) or of other internal or external organisations (16% of cases) in the preparation of the PoC proposal. This joint evidence argues for the importance of adopting a broader perspective (not only scientific/technical), as well as for the value of professional help in the preparation of the PoC proposal.

4.4. Activities and outputs

Meeting the project objectives and enhancing idea and technology maturation. In the majority of cases ERC PoC grant holders declare that the projects' objectives were fully (26,7% of responses) or partially achieved (51,7%) (Figure 10). In 21% of cases, the objectives were not yet achieved, but were expected to be achieved. It is important to understand that partial success can be expected, given the substantial risks involved in this type of projects. Looking at the different types of objectives, the responses by ERC PoC grantees show that objectives related to verification of technical feasibility, the development of prototypes/test data in the research environment (i.e.,in the lab) and the

development of a valorisation plan are those more likely to be fully or partially achieved (in cases where they were rated as relevant for the project). In relative terms, lower percentage levels related to the full or partial achievement of objectives were found in these cases: "Develop prototypes/test data to demonstrate feasibility in societal or commercial environment"; "Establish contacts with potential investors"; "Verify regulatory, legal or clinical requirements"; "Organise lectures and events to involve stakeholders". This evidence further confirms that ERC PoC grants are typically used to pursue different valorisation activities in parallel, but a large majority of projects use the PoC mainly to seek confirmation of their technology/product/process.

Figure 10 - Declared achievement of project objectives (PoC grantees vs control group, as a % of responses)



Evidence of additionality of the ERC PoC programme. It is noteworthy that, out of 205 survey respondents that applied to the ERC PoC programme but were not funded, a little more than half, 56,4% (115 responses) reported that they continued to look for ways to valorise their idea/technology through other funding sources. A significant 43,6% of such respondents indicated that they discontinued valorisation activities for the idea/technology at the basis of the submission to the PoC programme. These responses underscore the triggering role of the ERC PoC grant for the actual undertaking of valorisation activities.

Composition of the PoC team. According to the survey responses, on average 6.8 people were involved in the teams responsible for ERC PoC projects. As suggested by Figure 11, the typical composition of a PoC project team is quite diverse. In addition to faculty members (including the PI), who are essentially involved in all projects, it is interesting to note the very high level of participation by post-doc students, who are present in 88% of cases. Also PhD students and Master students are frequently involved, although to a lesser extent (respectively in 60% and in 44% of cases). PoC projects thus function as a learning environment for young researchers to mature new skills and experiences related to innovation and commercialisation. In addition, PoC teams often involve members that are external to the research context. The participation of staff from TTOs of the Host Institution is cited in 62% of cases, in 54% of cases business/industry partners were involved, and in

53% of cases external consultants were involved. The implementation of a PoC valorisation plan thus typically requires a broad knowledge set and some kind of accompaniment and support for the research team to deal with the various challenges of the innovation path.

Figure 11 – Types of members in PoC project teams. (as a % of responses by PoC grantees, multiple responses possible)

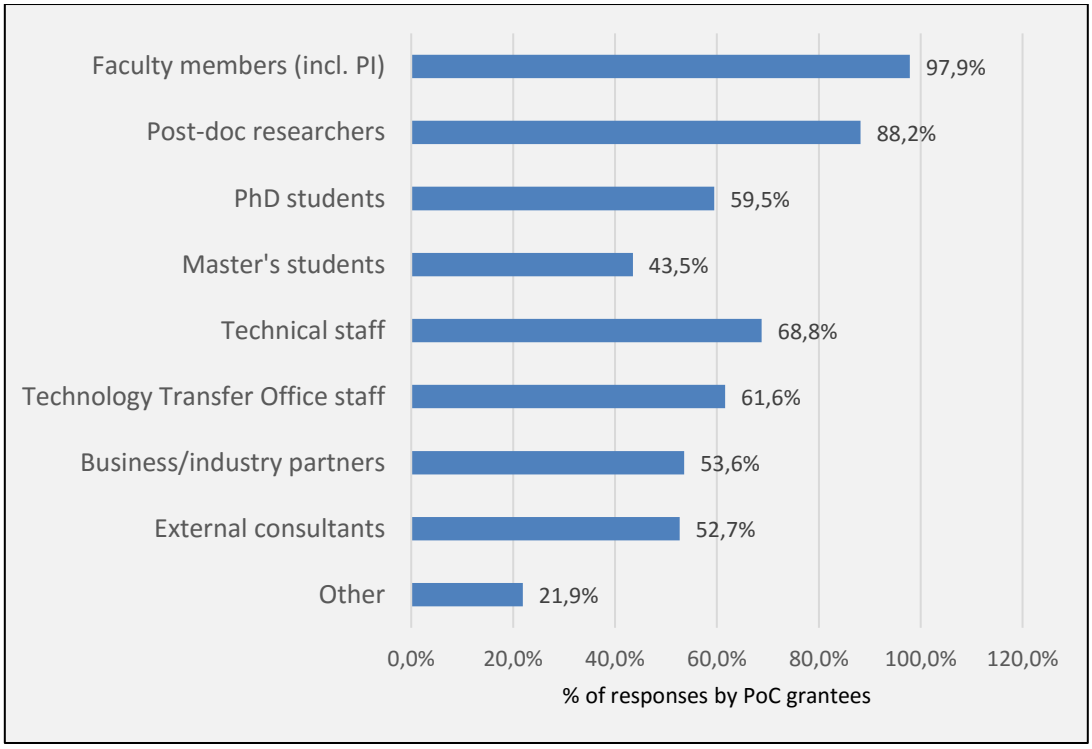
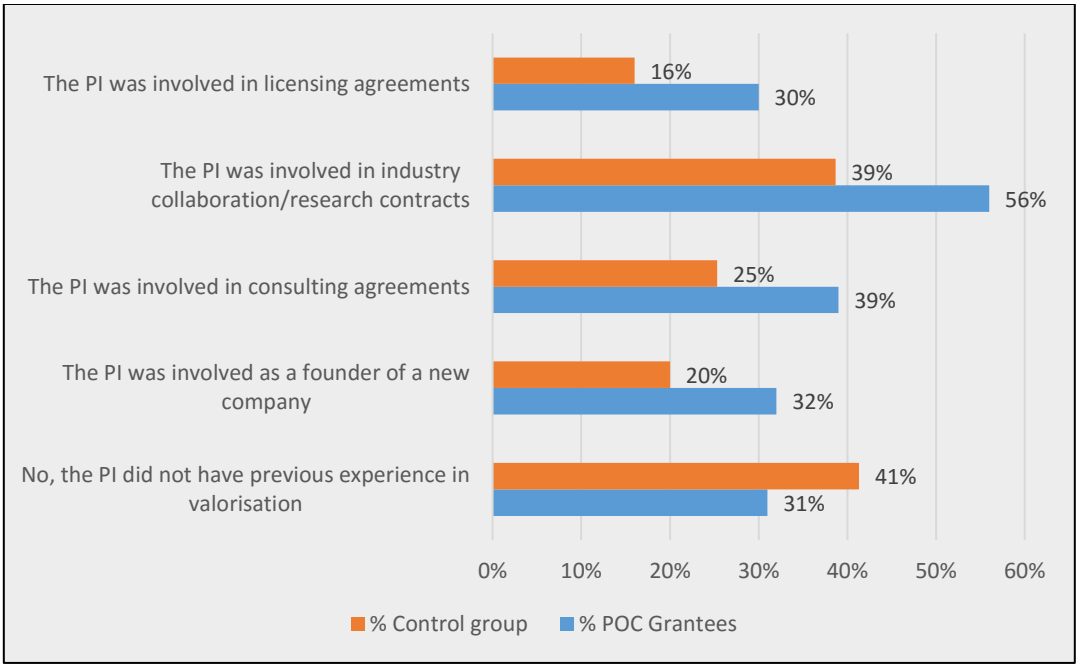


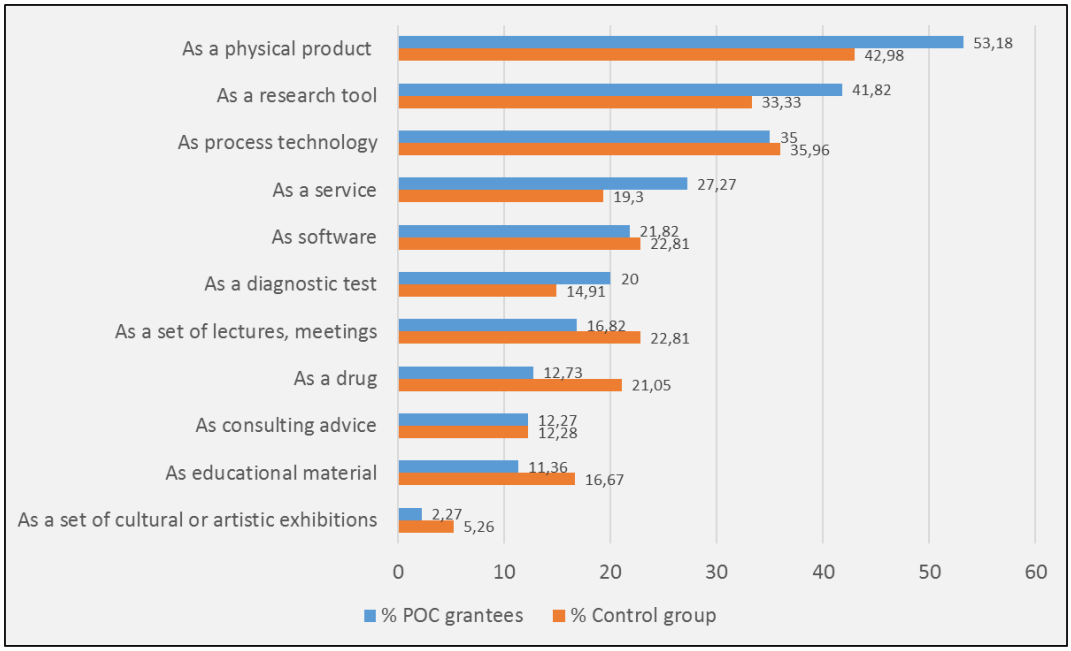
Figure 12 describes the previous experiences, if any, of Principal Investigators in valorisation activities. The PIs were asked to check different types of valorisation activities in which they had been involved before the submission of the PoC proposal. It shows that, on average, PIs responsible for ERC PoC projects more frequently have had previous experience in valorisation activities as compared to those in the control group. Only 31% of PIs of ERC PoC grants declared they had no previous valorisation experience, whereas the percentage is higher in the control group, around 41%. This suggests that for around one third of ERC grantees, the PoC project represented the first important opportunity to engage in a range of valorisation activities such as industry collaborations, consulting, licensing or new company creation. On the other hand, the majority of PIs responsible for ERC PoC grants had previous experience with industry collaborations and research contracts (56%), 39% of them were previously involved in consulting agreements, 32% as founders of new companies, 30% in licensing agreements (multiple responses possible).

Figure 12 - Previous experience of PIs (before the submission of the project proposal) in research valorisation activities (as a % of responses, multiple responses possible)



Generating a variety of projects' outputs. The survey shows that a very diverse set of outputs emerged (or are expected to emerge) from ERC PoC projects (Figure 13). In most of the cases (53% of responses, with multiple responses possible) the output is represented by a physical product (final product, intermediate product, component), followed by research tools (42%), a process technology (35%), a service (27%), and/or software (21%) (multiple responses possible). Other outputs, cited with relatively lower frequency, include diagnostic tests, new drugs, consulting advice, educational materials, artistic or cultural exhibitions. The fact that projects within the control group cite with relatively higer frequence (as compared to the group of PoC projects) expected outputs related to educational materials or cultural/artistic exhibitions may be due to the slightly higher presence of projects from the field of Social Science and Humanties domain within the control group. Case-studies 1 and 2, taken from the interviews with selected PIs, illustrate the activities and outputs of two ERC PoC projects, respectively from the Life Science and the Social Science and Humanities domains.

Figure 13 - Expected outputs of the valorisation project (as a % of responses, multiple responses possible)



Clarifying valorisation strategies. The ERC PoC project serves as an important opportunity for the identification and finalization of a valorisation strategy for the idea/technology. Indeed, 31,6% of ERC PoC grant holders responded that they did not a have a valorisation strategy at the beginning of the PoC project, whereas that percentage drops to 11% at the end of the project. The most frequently cited valorisation strategies refer to (in decreasing order of frequency): Licensing agreements; Collaborative R&D agreements; Release of usable knowledge in the public domain; Creation of a new company (multiple responses possible).

Case Studies. To provide some context to the PoC awardees and the rich set of ideas and products being pursued as a result of the Proof of Concept awards, a series of case studies (taken from the interviews described in Section 5) are found below and in the following sections. They are just a small number of the many promising products, processes and services generated in part due the awards.

Case study 1
Developing a revolutionary system to support paraplegics and kinetically challenged persons

ERC PoC project: Robomed
Principal investigator: Prof. Grégoire Courtine
Host Institution: EPFL (Switzerland)

The ERC PoC grant triggered the development and commercialisation of a robotic platform enabling high-precision force control in multi-dimensional application. On the technical side, it led to the creation of a novel prototype to validate the robotic technology and the definition of a roadmap to obtain regulatory approval based on the norms and procedures for robotics. On the commercial side, it allowed the identification and prioritisation of market opportunities for the technology, assessing different application domains (including translational research, medical and industrial applications). The results were assembled in a detailed business plan. Thanks to the grant, a prototype was

constructed to support paraplegics and kinetically challenged persons. The product is revolutionary and has advanced to the commercial stage, thanks to the partnership with the medical company Motek. The project led to the creation of a new start-up company (GTX medical), that was able to attract some 37 million Euro from venture capital investors.

Case study 2
A new software tool to map complex social events as they unfold

ERC PoC project: Mapps
Principal investigator: Prof. Eyal Weizmann
Host Institution: Goldsmiths College, University of London (United Kingdom)

The idea at the basis of the ERC PoC project MAPPS was to develop a software that would work as an aggregator of data in different media formats as well as an advanced data visualisation platform. This was totally achieved by the PoC project, which led the development of "pattrn" (http://pattrn.co), a tool to map complex social events – such as conflicts, protests, or crises – as they unfold. The PoC project was also instrumental in identifying the stakeholders potentially interested in using the platform, such as news agencies, NGOs, policy makers. Pattrn was released as an open-source software. The tool enables its users to build a database of events with space and time coordinates, and to add tags, media, and content to these events. Several NGOS, groups have used the software for their campaigns (for instance, Amnesty International). It has been used to analyze war conflicts, migrations, air strikes, monitor sexual violence, etc.

4.5. Valorisation outcomes

Assessing valorisation outcomes with a counterfactual logic. In this section we report the findings concerning the achievement of valorisation outcomes by ERC PoC projects, in terms of:

- Creation of IPRs
- Licensing agreements
- R&D collaborations/R&D contracts
- Consulting agreements
- New company formation
- Public engagement

In each case, we compared PoC grantees to a control group of other ERC Frontier Research projects that continued valorisation activities. This control group includes applicants to the ERC PoC funding scheme that were not funded but continued to pursue valorisation activities; it also includes grantees of other ERC Frontier Research projects that did not apply to the PoC scheme, but undertook valorisation activities through other funding sources[6].

4.5.1. Creation of Intellectual Property Rights

[6] See the Annex at the end of the report for more information on the construction of the control group

Fostering the creation of new patents. On average, more than 42% of the ERC PoC grant holders report at least one patent application as a result of their PoC project (Figure 14). The distribution is very skewed (only 10% of ERC PoC projects generated two or more patent applications) and there are significant sectorial differences (not surprisingly, patent generation is limited in the Social Sciences and Humanities sector). The likelihood of generating one or more new patent applications is significantly higher in the group of ERC PoC respondents than in the control group (only 17% of projects in the control group generated at least one patent application). There is a low share of projects reporting the generation of other types of IPRs (e.g. trademarks, industrial designs, copyrights, plant variety) in both the PoC grantees group and in the control group.

Evidence of IPR generation based on the originating ERC Frontier Grant. The survey shows that in many cases the ERC PoC grant serves to validate and develop technologies already patented in the originating ERC Frontier Research Grant (Figure 15). A large share of respondents, both in the group of PoC grantees and in the control group, report that they applied for at least one patent during the originating ERC Frontier Research Grant (this share is 59% for ERC PoC projects and 49% in the control group).

Figure 14 – Number of patent applications generated as a result of the valorisation project (PoC grantees vs control group, % of projects in a given class)

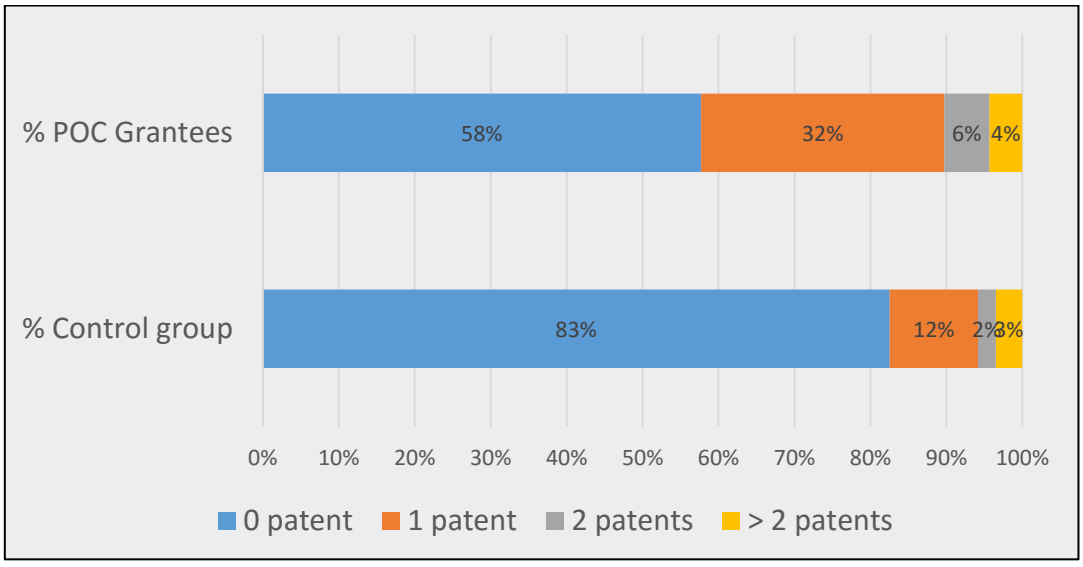
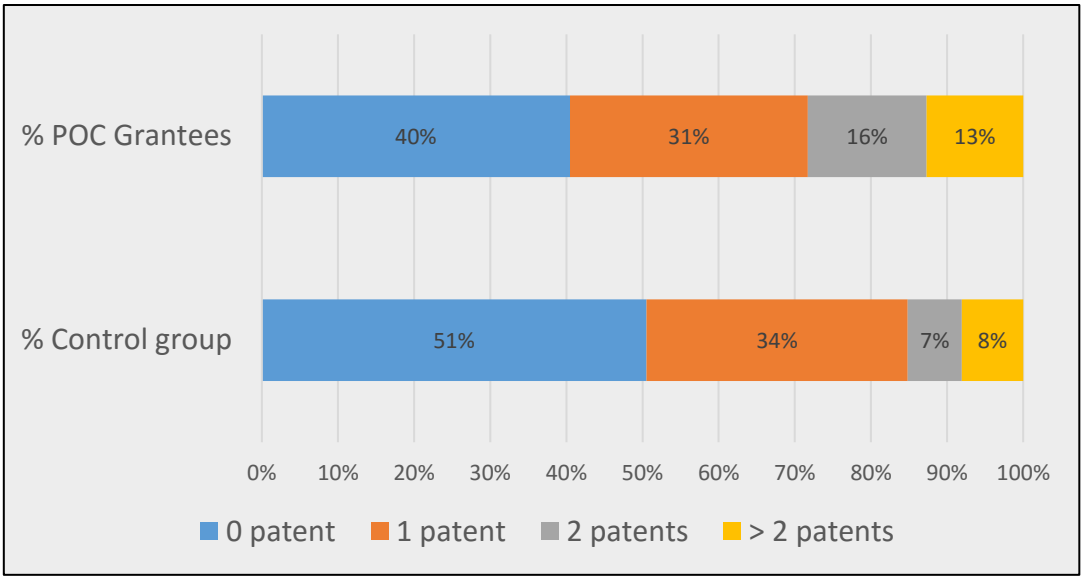


Figure 15 – Number of patent applications generated during the previous originating ERC Frontier Research grant (PoC grantees vs control group, % of projects in a given class)



4.5.2. Licensing agreements

Significant licensing activity. 17,26% of ERC PoC grant holders report the achievement of a licensing agreement for their technologies as a result of the PoC project (Figure 16). In 3,54% of PoC cases, a licensing agreement was obtained during the parent ERC Frontier Research grant. The likelihood of a licensing agreement is significantly higher in the group of PoC grantees as compared to the control group (in the latter group only 9,32% of cases cite an agreement). Licensing activity within the ERC PoC programme is thus significant, and particularly pronounced in the Life Sciences and Physical Sciences and Engineering sectors.

Licensing as commercialisation route. Most frequently, licensing agreements generated from PoC projects involve, as a license, a start-up/spinoff created to exploit the technology (53,33% of cases), followed by SMEs (48,9%) and large enterprises (28,9%, with multiple answers possible). In 51% of cases, such licensing agreements led to the generation of income, in the form of upfront/milestone payments and/or royalties. The vast majority (79%) of licensing agreements generating income report a total income from the agreement inferior to 100.000 Euro. However, reflecting the normal skew in early stage development, two cases report total income from licensing agreements already greater than €1,000,000. Case-studies 3 and 4 reported below illustrate two successful licensing agreements established as a result of ERC PoC grants.

Case-study 3
Commercializing a new class of reagents through a licensing agreement

ERC PoC project: Snap
Principal investigator: Prof. Jeffrey Bode
Host Institution: ETH (Switzerland)

A new class of reagents for directly accessing more drug-like molecules at the early stages of drug development were developed thanks to the ERC PoC grant. The PoC team developed modular

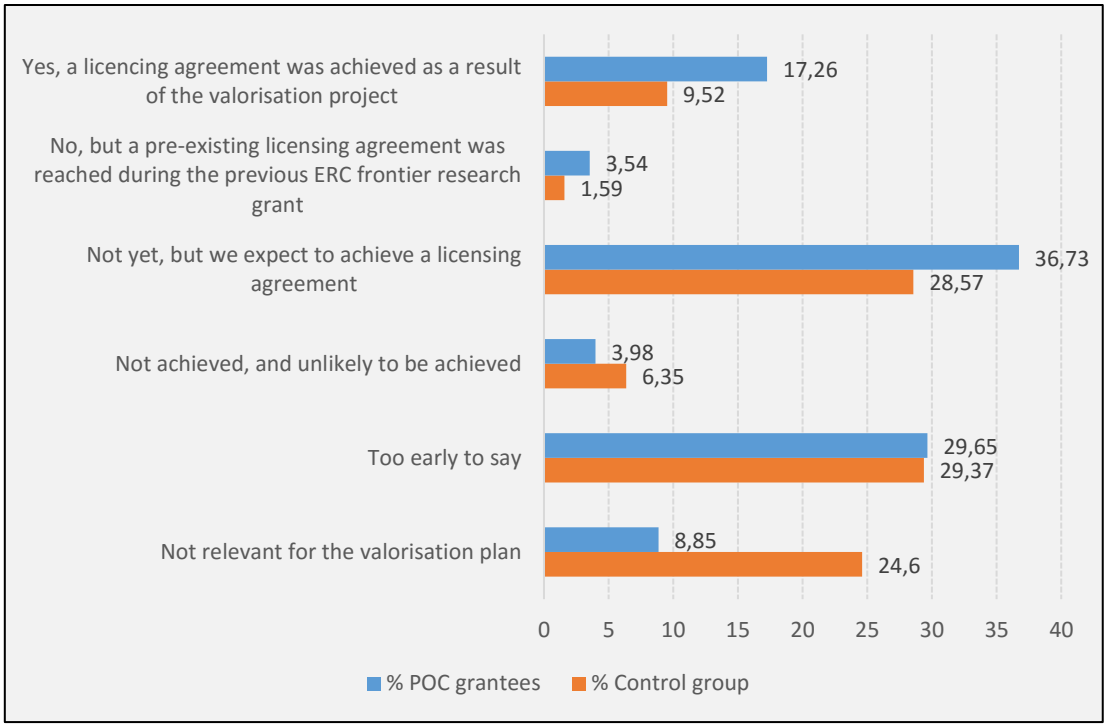
chemistry synthesis blocks - the SnAP platform. They can be used by pharmaceutical or chemical companies to prepare intermediate building blocks as a faster means to obtain candidate molecules for pharmaceuticals and agricultural chemicals. The ERC PoC grant supported a first delivery of the reagents and the development of new reagent classes in consultation with key industry leaders. The technology has been out-licensed to Merck Millipore, a major chemical and life-science company. The company has already commecialised SnAP-based solutions to more than 60 of its clients, generating an income stream for the Host Institution in the form of royalties.

Case-study 4
Co-developing a new generation of laser technology

ERC PoC project: NLS
Principal investigator: Dr. Eleftherios Goulielmakis
Host Institution: Max Planck (Germany)

The goal of the ERC PoC grant "A Novel Light Synthetizer" (NLS) was to develop a scientific instrument in the area of laser technology. The grant allowed the achievement of the full technical validation of a new generation laser pulse shaper, the light synthesizer. The device will permit for the first time applications in science and technology that require shaping of light waves over the entire range of the visible light spectrum and beyond, the ultraviolet and the infrared. A licensing agreement has been established with the small company Ultrafast Innovations, under a 5 year exclusive commercialisation agreement. A manufacturing line has been established with money and support by the licensee. The company will start to market the product from summer 2018.

Figure 16 - Has the valorisation project resulted so far in a licensing agreement with private or public parties, concerning the idea/technology (at least in part)? (as a % of responses)

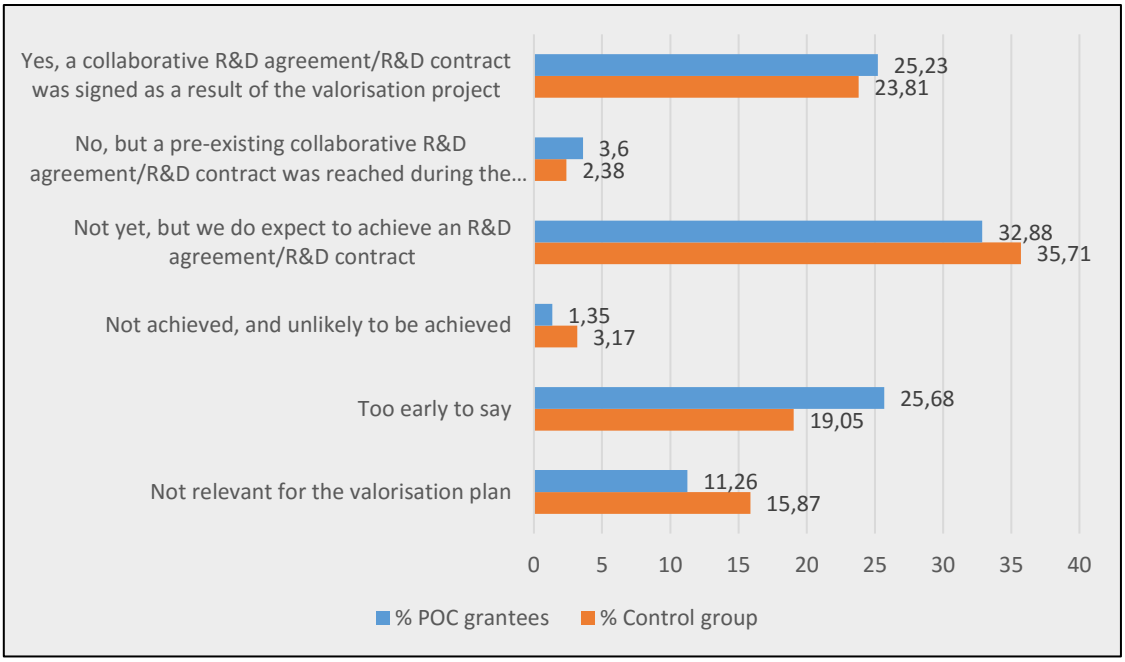


4.5.3. R&D collaborations/R&D contracts

R&D agreements are a frequent valorisation path. R&D agreements/R&D contracts represent the most frequently cited valorisation path (as compared to the other options) for both PoC projects and projects in the control group (Figure 17). Among ERC PoC grantees, 25,23% cite the achievement of a R&D agreement/contract as a result of the valorisation project. In 3,6% of PoC cases, a previous agreement was achieved during the ERC grant. The propensity to engage in such collaborative agreements is similar to the one found in the control group (23,81% of respondents in the control group cite such achievement).

SMEs and research facilities are important targets of R&D agreements. The partners most frequently involved in R&D agreements/R&D contracts emerging from PoC valorisation projects are SMEs and research facilities of universities/public research centres, followed by large enterprises. Other partners include startups/spinoffs created to exploit the technology and hospitals. 34,4% of ERC PoC grantees involved in R&D agreement/R&D contracts report that they have already generated income streams, in the majority of cases in the range of €100,000 to €500,000.

Figure 17 - Has the valorisation project resulted so far in a R&D agreement/R&D contract with private or public parties, concerning the idea/technology (at least in part)? (as a % of responses)



Case Study 5
Using nanotechnology to transform photo-epilation techniques

ERC PoC project: Pelo
Principal investigator: Prof. Romain Roger Quidant
Host Institution: Fundacio Institut de Ciencies Fotoniques (Spain)

The ERC Proof-of-Concept Project "Plasmon Enhance Photoepilation (Pelo)" exploited the latest advances in nanotechnology to develop a novel photo-epilation technique with reduced invasiveness, higher efficiency and wider applicability over state of the art approaches for laser hair removal. As a result of the ERC PoC grant, 2 PCT patent applications were filed. A R&D collaboration agreement was established with a multinational company that is assisting, also financially, the further validation of both technical and marketability aspects of the existing results. Currently validation trials are ongoing with volunteers, showing promising results for applications not only in the cosmetic sector, but also in the medical sector (for instance, for the treatment of hyperpilosity or hidradenitis). The technology is foreseen to be spun-off during 2018.

4.5.4. Consulting

Consulting is relatively more common in the SH domain as a valorisation channel. Consulting agreements represent another market manifestation of the value of the ERC PoC projects. Compared to other valorisation paths, consulting is generally cited with less frequency by respondents in the group of ERC PoC grantees (14,5% of them declare the achievement of a consulting agreement as a result of the ERC PoC project, a value not too distant from the one found in the control group). However, consulting represents the valorisation option most frequently cited by ERC PoC

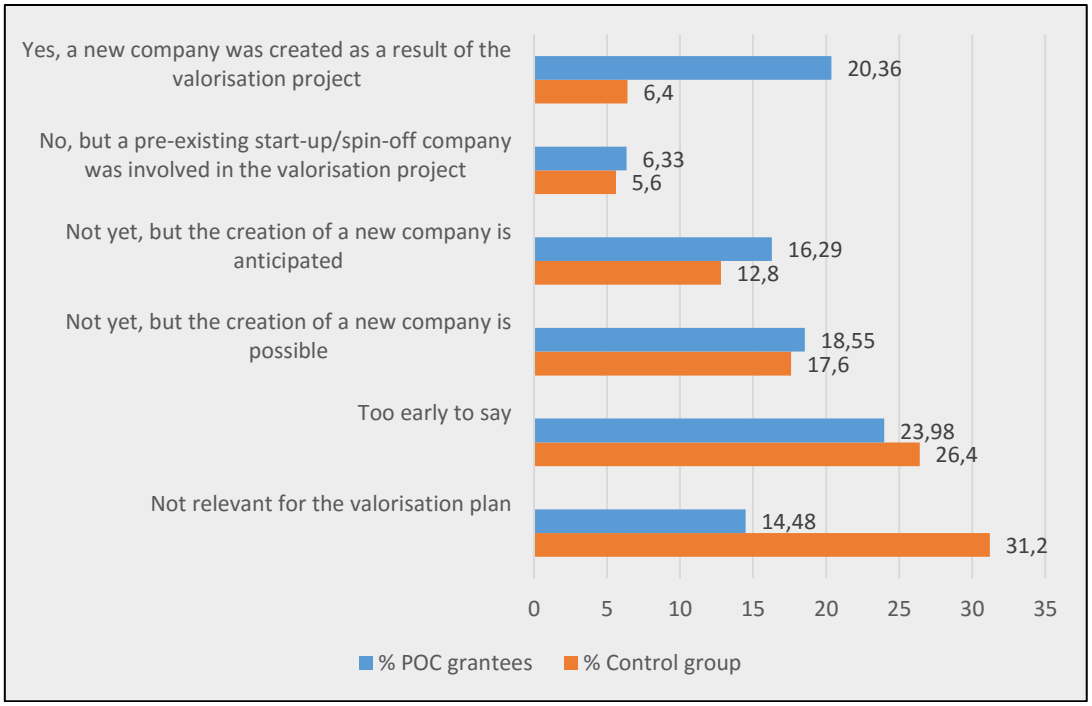
respondents from the Social Sciences and Humanities domain (in this domain, 15,38% of cases cite the achievement of a consulting agreement).

SMEs as the most frequent partners in consulting agreements. SMEs represent the most frequently cited partner for consulting agreements undertaken as a result of PoC projects (77,8% of cases), followed by research facilities of universities and public research centres (27,8%) and large corporations (22,3%, multiple answers possible). 27,8% of PoC projects involved in consulting agreements state that they were able to generate actual income from them (36% expect to generate income from them in the future). 65% of PoC grantees involved in this type of income-generating agreements declare total income achieved from consulting inferior to 50,000 euro.

4.5.5. New company creation

New company creation is higher in the PoC group than the control group. 45 ERC PoC grant holders (representing 20% of all responses by PoC grantees) report in the survey that the valorisation project led to a creation of a new company (Figure 18). Another 14 ERC PoC grantees (6,33% of PoC cases) state that a pre-existing start-up/spin-off company was involved in the project. The new company creation outcome is thus significantly higher in the group of PoC grantees as compared to the control group. In this latter group, indeed, only 8 respondents (6,4% of cases) report such achievement (5,6% of them indicate the involvement of a previous start-up/spin-off in the valorisation project). There are important sectorial differences in the likelihood of new company creation among PoC respondents. The likelihood is higher in the Physical Sciences and Engineering sector, followed by the Life Sciences sector. None of the ERC PoC projects from the Social Sciences and Humanities domain included in the survey have led to the creation of a new company (although in 15% of responses from the SH domain this outcome is anticipated).

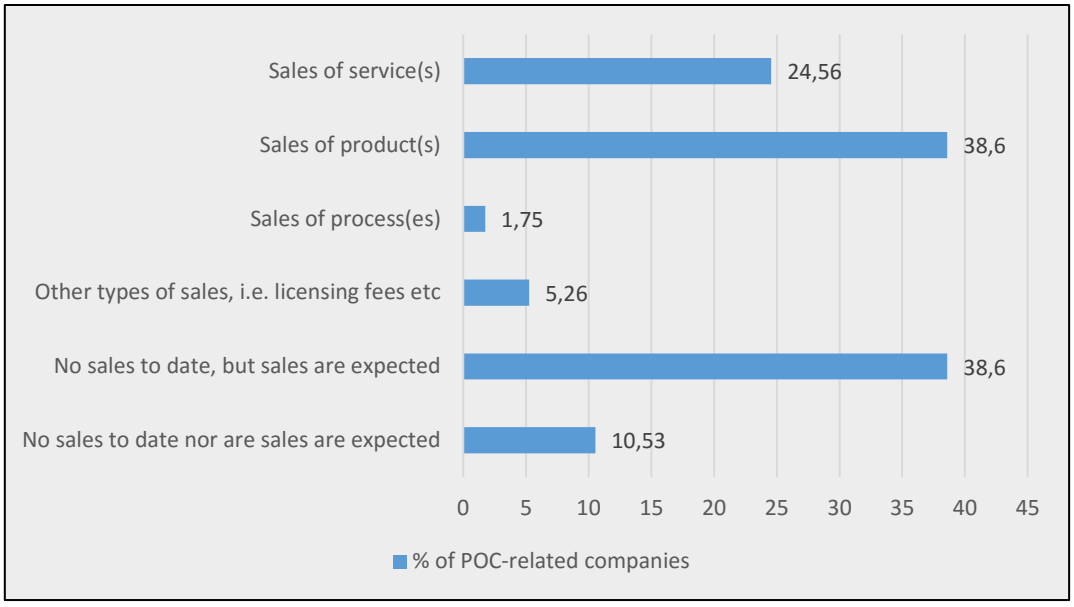
Figure 18 - Has the valorisation project so far led to the creation of a new company focused (at least in part) on valorising your idea/technology? (as a % of responses)



Diversifed founding teams, with a strong presence of post-docs/PhDs. According to survey responses, the date of creation of new companies linked to ERC PoC projects is recent: in 70% of cases, the new company was created after 2014. On average, in the case of ERC PoC projects, 4,63 founders were inolved as initial shareholders in new companies' ownership; 2,46 of them were members of the PoC project. Concerning the founding team composition, in 75% of new companies linked to PoC projects, the project PI is inolved as initial shareholder and in 48% of them post-doc researchers/PhD students/master students are involved as shareholders (multiple responses possible). The relatively high levels of participation by post doc researchers and students in the new companies signal the Programme contribution to a culture of valorisation. In 32% of PoC-related new companies, financial investors (seed funds, business angels) are involved as initial shareholders, whereas industrial corporations are involved in 17,8% of cases.

Early indicators of commercial activity. According to the survey responses, new companies generated through PoC projects have a median number of 3 employees. Thus, the size of such companies is very small, consistent with their early-stage of development. Importantly, around half of the new companies linked to ERC PoC projects report that they were able to generate actual sales, mostly through the sale of new products and/or new services (see Figure 19, multiple responses possible). Total sales levels for this group of companies is still of limited size (around 52% of such income-generating new companies declare total sales below 100,000 Euro). The majority of them achieved their first sale very recently, in year 2016 or 2017. In any case, the presence of new companies actually reaching the market is an important signal of the ability to create measureable value for new users and consumers.

Figure 19 - Has the new company had any actual sales (to date)? (as a % of responses, multiple responses possible)



An early focus on international markets. The customers targeted by new companies linked to PoC projects and generating actual sales mainly refer to large enterprises (75% of cases) and SMEs (65%). Research facilities of universities/public research centres also represent a frequent customer of such companies (51% of cases), followed by hospitals (20%). In only 10% of cases do these new firms target individual customers. It thus appears that PoC-related new companies mainly target the business or the research sector, and do not have a strong focus on the consumer sector. This is consistent with the fact that these small companies typically rely on a larger partner for retail distribution of the products. Moreover, the majority of income-generating companies sell their products/processes/services at the international level with 71% of them in Europe and 60% of them outside Europe (multiple responses possible). This signals an interest in global markets from their very inception, typical of "born global" companies.

Case study 6
Evaderis: Innovating chip design

ERC PoC project: Deshymag
Principal investigator: Prof. Bernard Dieny
Host Institution: CEA (France)

In the context of the ERC Proof-of-Concept Project Deshymag, a new start-up company was launched in September 2014. The start-up is named eVaderis (http://www.evaderis.com/), and its main objective is to offer energy efficient control processors that will drastically reduce the overall systems power consumption while keeping high performances and intelligence levels. The technology has applications in a wide variety of markets segments (including wearables, mobiles and Internet of Things devices) and can overcome limitations of current memory technologies and techniques (speed, power, leakage, flexibility, unification, cost, area…). The company won an innovation prize from a French institution. It obtained additional 1.5 M€ seed funding from the French VC fund Starquest capital.

Case study 7
CMS gmbh: Redefining laser-based precision measurement

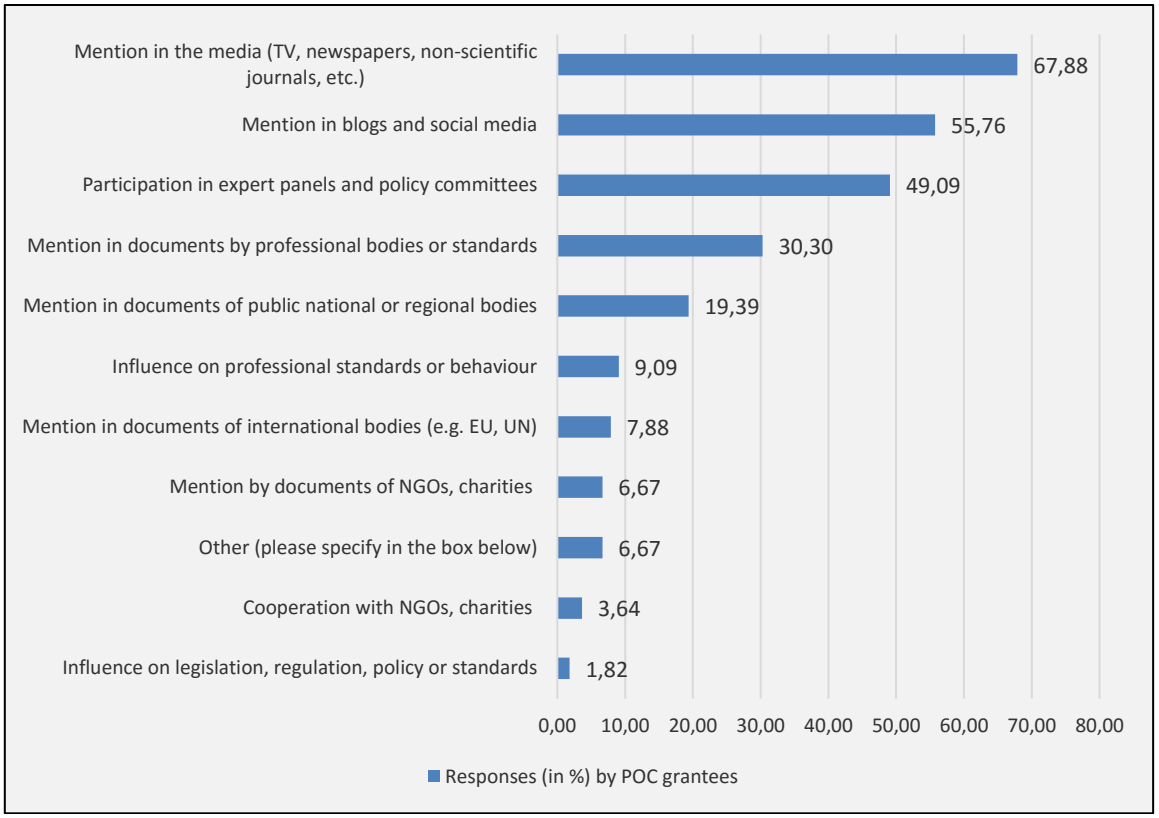
ERC PoC project: CMS
Host Institution: University of Vienna
Principal investigator: Prof. Markus Aspelmeyer

Together with Dr Garret Cole, an expert in semiconductor optics and microfabrication, in 2012 Prof Markus Aspelmeyer founded the start-up company Crystalline Mirror Solutions (CMS), a result of the ERC PoC project CMS. The company developed a game-changing mirror technology that is redefining laser-based precision measurement. The PoC grant helped to cover the initial prototyping costs for the development of high-performance mirrors for optical precision measurement, including the creation of the new company for their manufacture. At the end of the PoC project the company was able to acquire a seed-financing round of 1 M€ to push forward the CMS prototype and commercialisation activities. Today the company CMS gmbh has grown to 14 employees and widened its market spectrum beyond the originally sighted-out academic niche markets (atomic clocks, gravitation waves) to industrial application markets (laser machining, advanced navigation systems, trace gas sensing).

4.5.6. Public engagement

Rich and varied ways to engage with society. Public engagement describes the myriad of ways in which the activity and benefits of research can be shared with the public, in addition to the commercialisation paths previously described. Survey responses highlight rich and varied ways that were used to engage with wider society and have a societal impact. According to the survey, a broad set of communication and dissemination channels, beyond scientific publications, was used in order to exchange PoC-generated knowledge with wider audiences (Figure 20). For 68% of respondents, the results of PoC projects were mentioned in the media (e.g. TV, newspapers, non-scientific publications) and in 56% of cases they were mentioned in blogs or social media (multiple responses possible). Concerning the impact domain related to public policy and services, in 49% of cases, PIs or project members were involved in expert panels or policy committees, in relation (at least in part) to the PoC projects' results. In 20% of responses from ERC PoC grant holders, the project results were mentioned in documents or reports by governments, ministries, national or regional agencies, thus serving as a source of inspiration in the policy decision-making. There is also evidence of impact in the domain related to practitioners and professional services, given that in 30% of responses, the ERC PoC project results were mentioned in documents or reports of professional bodies or standards.

Figure 20 - Has the valorisation project led to any of the following public engagement outcomes focused (at least in part) on the valorisation of the idea/technology?(as a % of responses by POC grantees, multiple responses possible)



4.6. Access to additional funding

Ability to attract follow-on funding. The ability to attract additional funding for the further development of an idea/technology related to the ERC PoC award is a key market based indication of the value of the project. Around 70% of ERC PoC grant holders responding to the survey indicated that they sought to obtain additional developmental funding from public or private sources to sustain the development process. 38,7% of respondents in the group of ERC PoC grant holders (84 out of 217) reported they were successful in obtaining additional (non-ERC) funding. While this share is higher than the one reported in the control group (where 35,6% of respondents (42 projects out of 119) reported they were able to obtain additional funding) the difference is not large, underscoring the overall quality of the ERC funded research.

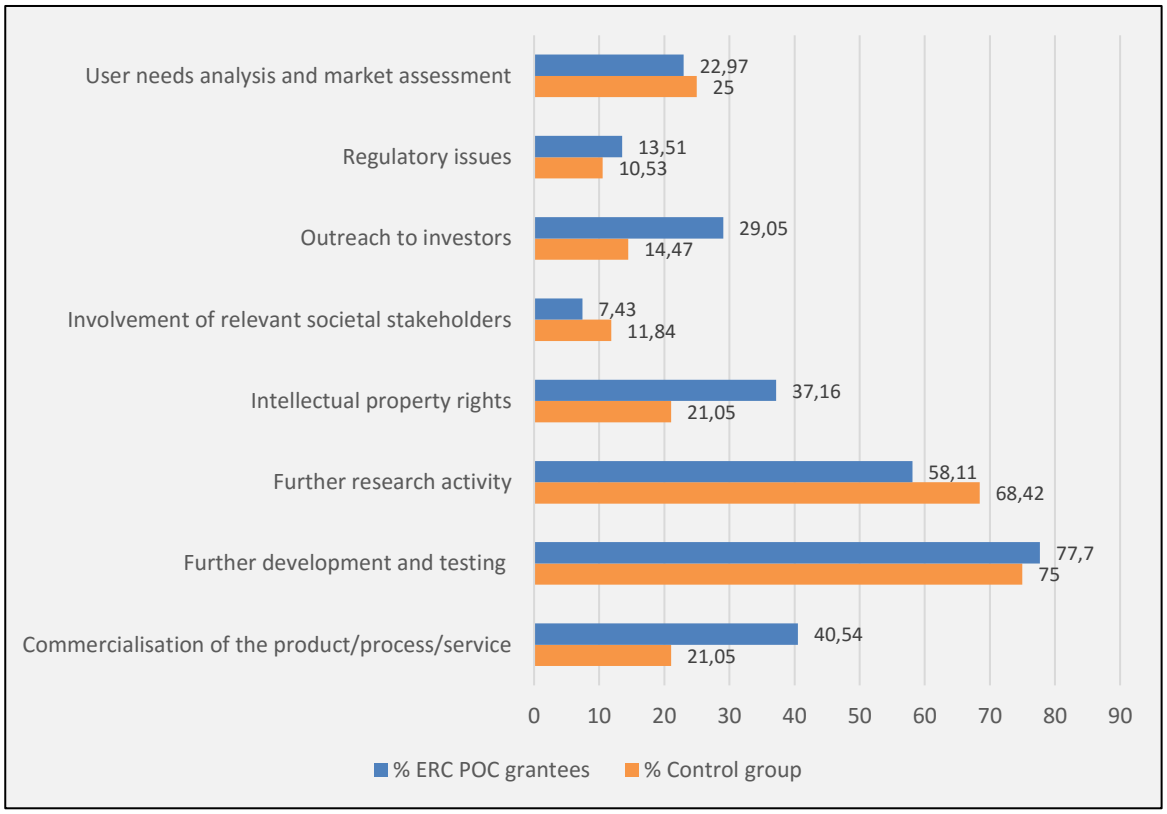
A mix of public and private sources for follow-on funding. Focusing on the 73 projects in the group of ERC PoC grantees that reported the amount and source of additional funding, 87,7% of them obtained it from public sources and 43,84% from private sources. Some projects, therefore, were jointly funded by both private and public sources. Among public sources, the most frequently cited one is national public funds, followed by host institution funding and regional public funds (multiple answers were possible). Among private sources, the most frequently cited one is industrial or business private corporations, followed by private VC funds and foundations. The survey findings thus highlight that public sources still represent by far the most frequent source of follow-on funding for PoC projects, whereas obtaining follow-on funding from private sources is less frequent. This confirms the early-stage nature of ERC PoC projects, and their need to further de-risk the technologies before they are likely to receive additional, expecially private funding.

A very skewed distribution. With respect to the 73 ERC PoC projects that provided information on their follow-on funding, the average value of additional funding obtained from non-ERC sources is equal to 1,79 MEuro. These results should be viewed with caution because the value distribution of this variable is very skewed and largely influenced by a limited number of extreme values in the upper tail (there are 3 projects declaring additional funding higher than 14 MEuro). The average value of additional funding obtained per project in the control group (for the 31 cases reporting such value) is lower (925,000 Euro), and the value distribution is equally skewed.

Certification effect. The previous results show that in general PoC projects are more likely to receive follow-on funding as compared to the control group. The PoC awardees are also more likely to be funded by private investors, and to receive a higher amount of additional funding. These differences, while relevant, are nonetheless not strong. Such evidence should be interpreted keeping in mind the conservative construction of the control group in this set of analyses, composed of the ERC Frontier Research projects that continued the valorisation path. These projects were not funded by the ERC PoC programme but relied on other funding sources. Still, the survey findings indicate a modest "certification effect" from the ERC PoC grants, with respect to both the reputational effect of the awards and as a form of validation for external investors. The case study interviews with selected ERC PoC grant holders (summarized in Section 5) also provide positive views on this certification role, with a significant share of interviewees supporting the view that ERC PoC awards help to attract follow-on investments. It is worth noting that this small difference could be related to the fact that the "certification" of quality, for an external investor, mostly resides in the originating ERC grant (reflecting the excellence of the frontier research), rather than in the PoC grant. If that would be the case, in order to disentangle the two effects, it would be necessary to compare the access to follow-on funding for similar projects from non-ERC grantees, although this poses significant comparability challenges.

Intended use of additional funding. The two most frequently cited reasons by ERC PoC respondents to search for additional funding are represented by the necessity to conduct "Further development and testing" of the product/process/service (77,7% of responses) and the necessity to conduct "Further research activities" (58,1%, multiple responses possible) (Figure 21). This evidence suggests that at the end of PoC projects there are often still significant technical risks and challenges that require to be addressed and solved through additional funding rounds. It is noteworthy, however, that ERC PoC respondents cite with significantly stronger frequency, as compared to the control group, objectives related to "Commercialisation of the idea/technology", "Intellectual Property Rights", "Outreach to investors". "The idea/technology was at an early stage of development" is reported by ERC PoC respondents to be the most relevant perceived barrier for the acquisition of external additional funding (average value 3,27, on a 1-5 scale).

Figure 21 – Intended use of additional developmental funding (% of responses, multiple responses possible)



Case-study 8
Attracting follow-on funding to realize a new test for Zika and Dengue viruses

ERC PoC project: Romans
Principal investigator: Prof. Anja Boisen
Host Institution: Technical University of Denmark (Denmark)

The ERC PoC project Rotating Opto-Magnetic Analysis System (ROMANS) aimed at developing a prototype of portable, highly sensitive and low cost devices for point-of-care detection of inflammatory diseases biomarkers and at identifying the best approach to commercialise the invention. The grant led to the creation of the spin-off company Blusense-Diagnostics (http://www.blusense-diagnostics.com), that is currently developing a rapid and easy test of viruses like Zika and Dengue, using a single drop of blood. The company was able to attract subsequent awards, grants and seed-funding, including a Horizon 2020 SME Instrument Phase I grant and seed funding from Novo Nordisk Fonden. In 2017 BluSense Diagnostics established a partnership with SystemOne, a company leader in global health disease surveillance and response, for their upcoming clinical trials in Brazil and Malaysia. SystemOne will provide the connectivity solution to securely move critical healthcare data from BluSense's diagnostic test instruments to local clinicians and health information systems.

Case study 9
The next generation in molecular imaging

ERC PoC project: EMSOT
Principal investigator: Prof. Dr. V. Ntziachristos
Host Institution: Technical University of Munich (Germany), in collaboration with Helmholtz Zentrum Munich (Germany)

The goal of the ERC PoC project EMSOT was to evaluate business opportunities and to explore promising markets for a new endoscopic device, termed Endoscopic Multi-Spectral Opto-acoustic Tomography (EMSOT). MSOT breaks through the penetration limit of optical microscopy and can image at tissue depths of several millimeters in-vivo at high resolution. This performance potentially brings new abilities in several medical applications, in particular for the clinical translation of the technology to address limitations of current endoscopic methods of the gastrointestinal tract. The PoC grant helped to clarify the commercialisation plan and the needs of the endoscopists, although it was not enough to develop a prototype. The PI applied successfully for a 4 M€ Horizon 2020 project (ESOTRAC), that should lead to the finalization of the prototype. Due to its high level of innovation, the MSOT technology and its commercialization in the pre-clinical space have so far received several awards, including the "German Innovation Prize 2014", awarded by Accenture, EnBW, Evonik and WirtschaftsWoche in recognition of outstanding, future-oriented innovations.

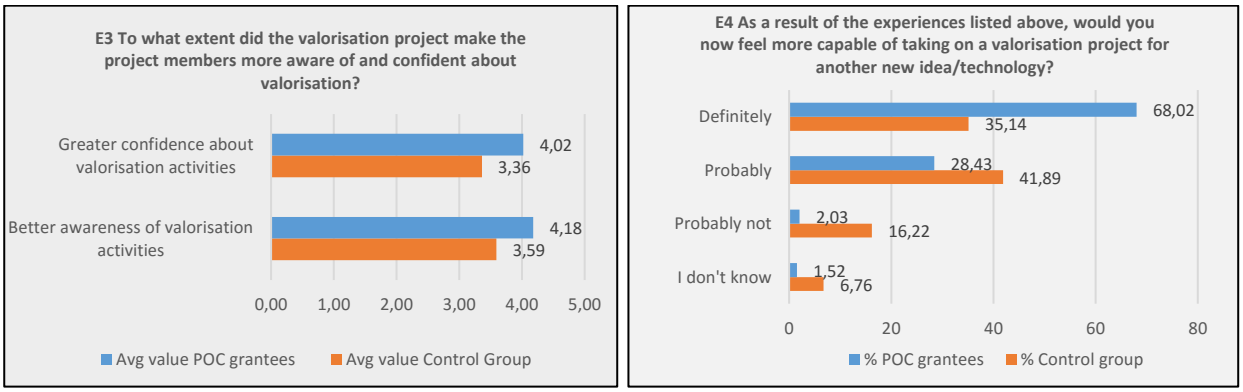
4.7. Skills development

Improvement in valorisation skills. Additional intangible benefits, related to learning, awareness and confidence, were generated as a result of ERC PoC grants. On average, ERC PoC respondents report high levels of perceived improvement in the skills of project members, as a result of the valorisation project. The perceived improvement is strongest in the field of commercial and business development skills. In this field, the average value is significantly higher than the control group (average value of 3,93/5 in the group of ERC PoC grantees, vs 3,20/5 in the control group).

More aware, more capable and more confident about valorisation. According to the survey responses, the PoC project made the project members significantly more aware of (4,02/5) and confident (4,18/5) about valorisation issues (Figure 22). The perceived improvement on such dimensions is again significantly higher in the PoC group as compared to the control group. As a result of the experiences of the valorisation project, 68% of PoC grantees declare that they would now feel definitively more capable of taking on a valorisation project for another new idea/technology (vs. 35% in the control group). This positive impact in terms of mindset and confidence among the award reciepients is potentially one of the more enduring impacts of the awards, contributing to a cultural change among the research teams.

Figure 22 – Awareness and confidence in valorisation activites (average values, on a 1-5 scale)

Figure 23 - Capacity in valorisation activites (as a % of responses)



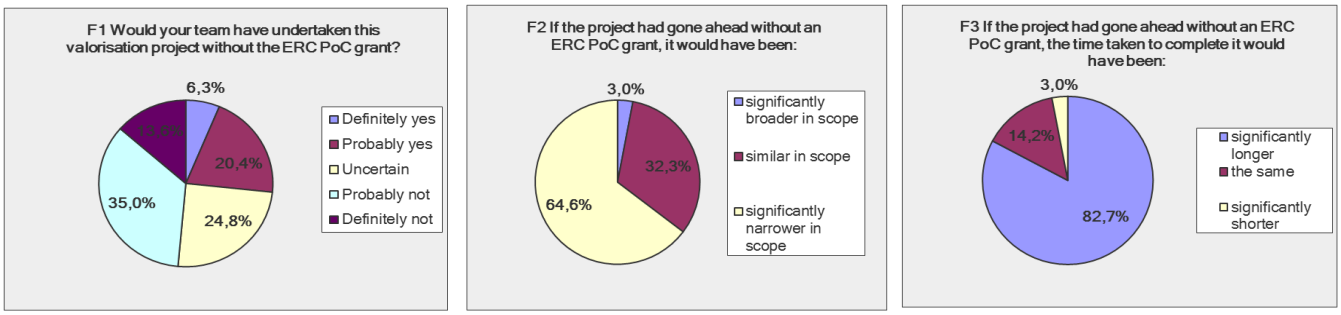
4.8. Programme Assessment and Recommendations from PIs

Strong Additionality. The final sections of the survey contained a set of questions asking ERC PoC grant holders to provide a general assessment of the ERC PoC programme, feedback on its administrative implementation, and suggestions for its possible improvement. As to the first issue, the responses of PoC grantees confirm the additionality effect of the PoC funding scheme. Around 50% of them declare that, without the PoC grant, the team would probably not have undertaken the valorisation project (Figure 24).

Faster, Broader Valorisation. The majority of respondents state that, without the PoC grant, the valorisation project would have been significantly narrower in scope (64,6%) and a very large percentage reports that it would have taken significantly more time to complete (82,7%) (Figure 24).

A Positive Assessment of the Administrative Implementation of the Programme. In general, PoC grantees provided positive assessments of the ERCEA administrative implementation of the programme. The respondents gave a strong endorsement of the way the programme is managed. In general, they provided a high rating for all the various administrative dimensions: support and information provided by ERC during the execution of the PoC project (average rating of 4,02 out of 5), cost claim requirements (3,88/5), monitoring and control process by the ERC (3,90/5), and final reporting requirements (3,96).

Figure 24 - PI assessment of the additionality of ERC PoC grants



Potential Improvements. Notwithstanding the general positive assessment of their experience with the PoC process, there were a number of suggestions for improvement to the Programme, notably with respect to the time allowed to complete the project and the availability of the additional funding needed to fully realize the project's potential and hence the Programme as a whole.

More Funding & Time Needed. A large share (43%) of ERC PoC grantees notes that the project funding amount was not enough to fully achieve the project objectives. Around 50% of them would prefer a longer project duration. There are differences by domains in this respect. The share of projects highlighting that the funding amount was not enough to fully achieve the project objectives is higher in the Life Sciences domain (around 48%), followed by Physical Sciences and Engineerng (41%). In contrast, 20% of projects from Social Sciences and Humanities (SH) report that the funding amount was not sufficient. In a similar vein, around 50% of projects from the LS and 52% from the PE domain report that the project duration was not enough, whereas such percentage is 36% in the case of SH projects. These responses suggest that funding and time requirements tend to be higher in the Life Science and Physical Sciences and Engineering.

Seeking the Next Step. Almost all PoC grantees report that, if an additional source of follow-on funding for ERC PoC projects was provided from another institutional source, they would apply by significant margins (67,5% definitively yes; 29,1% probably yes).

Suggestions for improvement. ERC PoC respondents were asked to rate in terms of importance, on a 1-5 scale, a set of possible areas of improvement for the programme. Concerning the suggested areas for improvement of the funding scheme, the availability of follow-on funding through additional stages is perceived as the most important need (score 4,2/5), followed by opportunities to network with investors (3,89/5) and with potential customers or stakeholders (3,76) (Figure 25). Looking at differences acress domains, in general projects from the Life Sciences and from the Physical Sciences and Engineering domains tend to share similar priorities in terms of suggestions for improvement (in particular, availability of follow-on funding and opportunities to network with investors). Projects from Social Sciences and Humanities domain share the emphasis on the need for follow-on funding, but also put more emphasis on provision of training on valorisation issues and on opportunities to network with potential customers/stakeholders.

Additional qualitative recommendations. At the end of the questionnaire, ERC PoC respondents were also requested to provide brief additional recommendations, if any, on how to improve the ERC PoC funding scheme, as open-ended text responses. 81 PIs responded to this final qualitative question, and their responses were categorized in a way to systematically analyze their feedback (Figure 26).

The analyses of the qualitative recommendations show that the areas of improvement most frequently cited refer to: the provision of longer (more flexible) project duration (mentioned in 41% of the 81 qualitative responses, multiple answers possible) and of additional funding (41%), which they see as needed due to the complexity and uncertainty of project activities and the long and resource-intensive path to reach the market or fully respond to societal challenges. Other areas of improvement that were suggested, although less frequently, refer to the creation of opportunities of interaction with potential investors (14%), reduction of administrative burden/provision or more flexibility (12%), simplification of the relationship with the host institution, in particular for IP transfer issues (12%).

Figure 25 – PIs' assessment of potential areas for improving the ERC PoC Funding Scheme (average values, on a 1-5 scale)

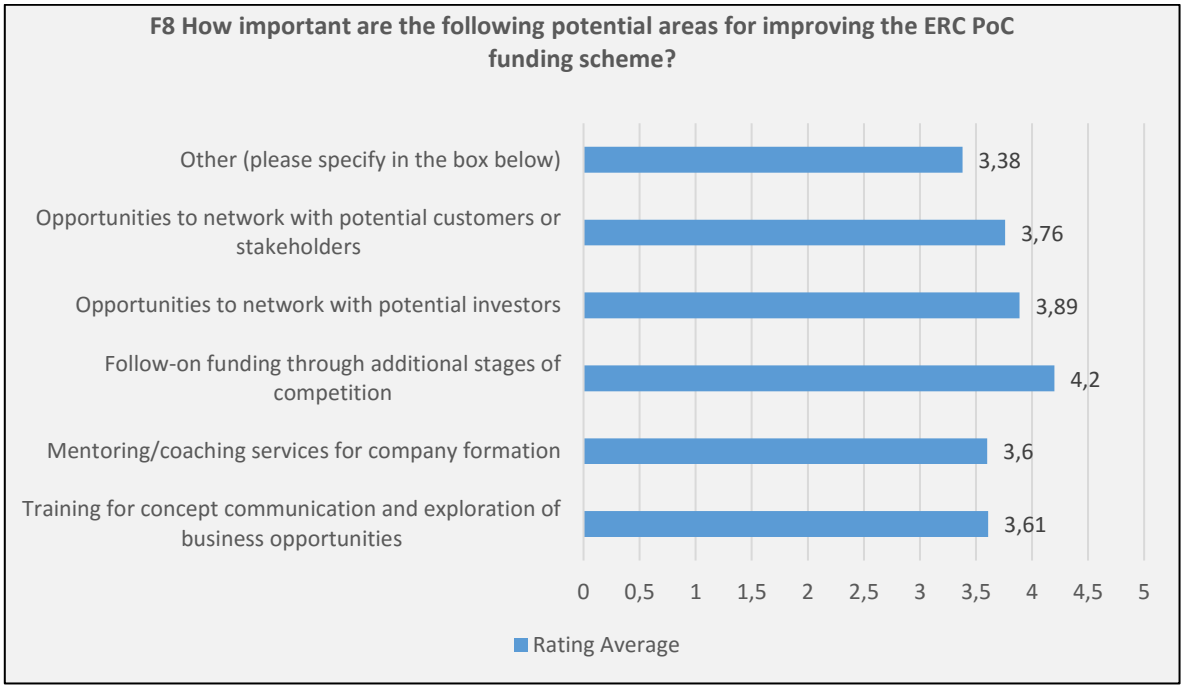
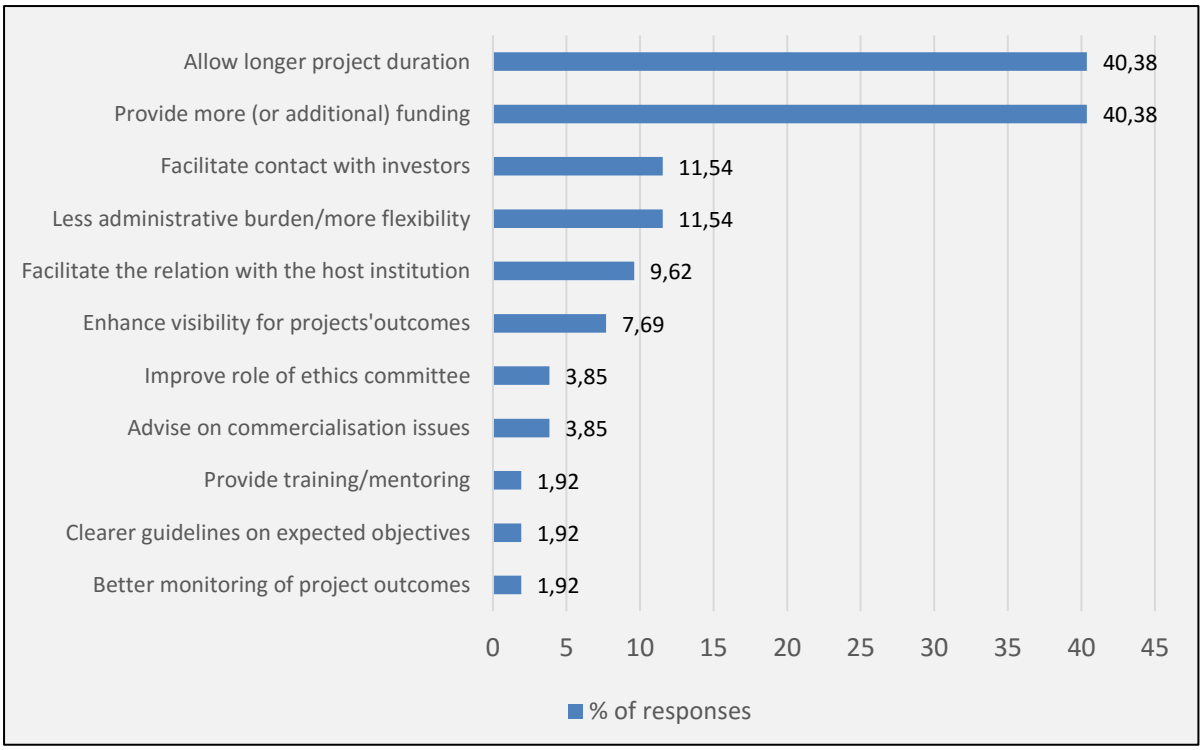


Figure 26 – Suggestions for improvements by ERC PoC grant holders (as a % of responses providing qualitative recommendations, multiple responses possible)



5. Additional evidence from the interviews

Integrating quantitative and qualitative evidence. A set of 33 interviews with PIs of selected ERC PoC projects were conducted in order to provide qualitative evidence to complement the quantitative evidence collected through the survey. The interviews provided the opportunity to go into depth in some of the projects in order to better understand the process that takes ERC PoC grantees towards valorisation of their ideas. The questionnaire was intended to help understand how the research team spent the 18 months and budget of the grant, and to determine the progress made since the conclusion of the grant. More specifically, the interviews served to:

- learn directly about the developments in the projects, their outcomes and impact, the challenges, and future strategies;
- provide opportunities for recommendations for potential improvements of the ERC PoC programme by the PIs;
- identify success stories to be included in the final report in the forms of short cases or sentences.

The interviews were conducted during on-site meetings with PIs of selected ERC PoC grantees by technical experts with extensive experience in technology transfer, innovation development and entrepreneurship issues. The interviews were based on an ad-hoc semi-structured questionnaire and followed a common approach (see Annex for methodological details). Projects were selected, in principle, to provide heterogeneity in terms of ERC domains, type of PoC activities undertaken and expected outcomes, institutional settings and country settings. The interviews are thus not intended to be representative of the entire population of PoC beneficiaries. The goal was to attempt to identify core themes and provide personal input on a number of issues of interest for the project. Nonetheless, the process entailed a degree of selection bias at multiple levels, including the choice of project, project "age", the sectors selected, and location.

Achieving the project objectives. Overall, the interviews highlight that the selected ERC PoC projects were effective in meeting the initial goals set in the PoC proposal. According to the interviews, in 27 cases (out of 33) the initial projects' objectives were fully achieved at the end of the project. In 6 cases, they were only partially achieved. The responses provided by the PIs to the rating scale questions report a very high assessment of the projects' progress in terms of technical validation and, to a lesser extent, progress in commercial or societal validation. According to the interviews, in 8 cases (out of 33) a product/service based on the technology developed in the PoC project was already on the market.

Leveraging external collaborations. According to the interviews, in the vast majority of cases the project team had the skills required for the effective implementation of the valorisation plan. In several cases, inter-disciplinary teams were formed, or experts were hired with commercial or business skills. The teams involved in the PoC projects collaborated very frequently with the TTOs of the Host Institution. The support from the TTO is cited by 21 interviewed PIs (64%), often in positive terms. More precisely, the external support received in the course of the valorisation process came from a variety of sources, as shown below (multiple in the course answers possible):

- 21 teams declare that they were supported by TTOs
- 3 by Incubators
- 2 by external consulting companies
- 2 by University Central Offices

- 1 from University Seed Funds
- 8 state that they did not receive external support

Ability to achieve significant valorisation outcomes. The interviews illustrate a very positive capacity of the selected projects to achieve intermediate valorisation outcomes related to the idea/technology developed as a result of ERC PoC projects. Out of 33 interviewed cases (multiple responses possible):

- 4 established licensing-out agreements with external partners
- 12 created a new company to pursue valorisation activities
- 9 established R&D collaboration agreements with external companies
- 10 have not yet achieved these types of intermediate valorisation outcomes

According to the interviews, the selected projects as a group achieved very positive results in terms of attraction of follow-on funding from other public and private sources, in order to support the further development of the idea/technology developed as a result of PoC projects. Out of 33 interviewed cases (multiple responses possible):

- 2 were funded by charities/foundations
- 2 by other subsequent H2020 projects
- 4 by national public funding programmes
- 9 from business corporations
- 8 from VC investors
- 8 did not attract further external funding
- 3 did not provide information in this regards

Importantly, over half received follow on funding from the private sector, with nearly half of those receiving venture investments. Some of the successful cases emerging from the interviews have been presented as case-studies in Section 4 of this document, as a way to better illustrate the survey results.

Not necessarily a linear process. Some interviews also highlight that the process towards valorisation is not necessarily straightforward and linear, but can follow complex and initially unexpected paths. Some PoC projects that initially seemed unsuccessful nonetheless persisted, learned to adapt their project, and ultimately succeeded in opening-up new opportunities. These cases emphasize the importance of maintaining a long term orientation in the ex post assessment of the programme. Ad seriatum assessments are essential to capture on-going growth, new applications, acquisitions, and in some cases, instructive failure. Two relevant examples of such processes are reported in the boxes below.

Case study 10
Fighting cancer with a novel class of small molecules

ERC PoC project: TUTCHEM
Principal investigator: Prof. Eric Alexander Miska
Host Institution: Cambridge University (UK)

MicroRNAs (miRNAs) are a novel class of human disease genes that are key to a number of therapeutic areas in particular cancer, and also heart disease, infectious disease and ageing. Specifically, some miRNAs are known to regulate cancer therapeutic targets acting as tumour

suppressors and some are prognostic and diagnostic markers of human disease. The TUTCHEM PoC project focused in this scientific area aimed to develop an assay for small molecule screening, with an aim to develop small molecule potential drugs for cancer. The Poc finished at the end of 2013 and the final report outlined the PI's failed attempts to generate interest in these very early stage compounds. The Host University filed two patents, but they were abandoned when the PI failed to progress the technology. Since that time, however, the PI has continued to work on such technologies and teamed up with a colleague working on other novel miRNA related new drug targets to create a new company, able to raise 15 million of VC funding for the original idea of novel compounds against a first in class target.

Case study 11
Developing a new platform for treating respiratory system

ERC PoC project: Mico PlUng
Principal investigator: Prof. Luis Serrano
Host Institution: Fundacio Privada Centre de Regulacio Genomic (Spain)

The Mico PlUng project looked to develop new possibilities in the treatment of respiratory and genital tract illnesses based on the use of bacteria to act as vectors which, instead of causing illnesses, could cure them. The main achievement of this project was the successful expression of active proteins with M. pneumonia a delivery vector for the treatment of lung and eventually other diseases. However, tests in mouse models were unsuccessful or impossible to perform due to the exit of the business partner Sanofi, that cancelled their exploratory unit due to internal restructuring. The experience and know-how developed during the project in secretion signals was however essential for completing a new and successful application to a H2020 project. The new project will help to develop vaccines against mycoplasma infections in animals, an application not explored during the ERC PoC, but of great potential.

Problems limiting the progression of valorisation activities. The PIs cited a diversified set of hurdles and problems that emerged during the project and limited the progression of valorisation activities. The most frequently cited issues refer to problems related to technical failure (obstacles to the development of the product appeared early on), problems in commercial validation and market outreach, human resource constraints in light of resource and project timeline. Other problems that were cited, although with a low frequency, include issues with the Host Institution, lack of follow-on funding in the region/country, market competitors who were more advanced or better funded, IP issues, regulatory issues, different career choice (time and commitment required for a viable product are too high in light of other career aspirations and accomplishments). Comments by the PIs reported below illustrate some of the hurdles and challenges that were cited in the interviews. Such evidence confirms that a simple and direct line between research results and valorisation outcomes rarely exists in practice, as the process is characterized by uncertainties and challenges.

Failure in technical development and validation
"The project faced intense data problems to run the forecasting models, since available empirical data were structured in a different matter"

"However, tests in mouse models were unsuccessful or impossible to perform due to the industrial partner"

Length and complexity of regulatory process
"The idea is not at the stage of getting to clinical testing. There are discussions with the industry but it is very difficult to go further if the clinical testing is not done. Right now the idea needs more support"
"One has to consider that the time to market for these types of medical devices is very long […]. Consider 12 years to get to market. At least 4 years of research and then tests with healthy people, then tests with patients and hospitals to prove that it actually works"

Intensity of competition
"The main value of this project/product is the potential brain-training software, but we realized that there are in fact many companies in this market, which is very competitive and probably few of them really make money out of it"

Limited market traction
"The valorisation needs more traction. The chemical processing market is conservative and works with long term plans and investments"

Finding the right competences
"*One major problem during the PoC referred to the fact that it was not possible to attract experienced experts and/or entrepreneurs that could push the project to the next level"*
"It is quite expensive to hire a scientist working for 18 months, the salary for this type of highly-qualifed human resources is very high in our country"

IP issues and lack of freedom-to-operate
"A patentability study was carried out, and the current patent was considered too weak and too specific, finding it preferable to license know-how to existing biotech company"

Change of priorities
"The PI decided not to go further with the marketing and commercialisation activities of the new software application. She decided not to continue on this path because she realised that this was not aligned with her interests as a scientist"

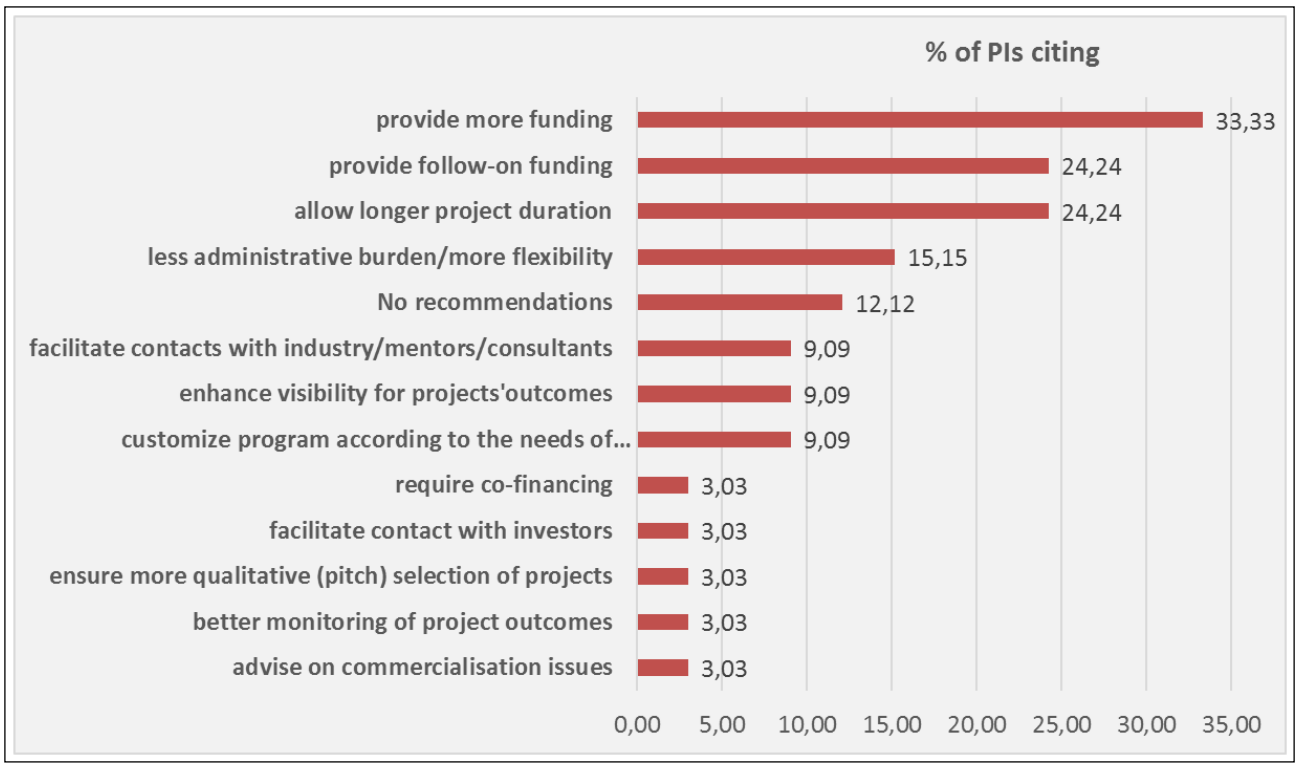
Issues with regulations in the Host Institution or in the country
"The only severe problem was that the University stopped providing the premises once the company was formally established"
"The regulations in our country do not easily allow the PI to set up a start-up, so a lot of time thinking about the solution."

Very positive feedack on the design and implementation of the ERC PoC programme. In general, the interviewed PIs provide a very positive feedback on the design and implementation of the ERC PoC funding scheme. Most of the interviews (69%) identify no major administrative or management problems, but rather highlight elements of programme strength, such as the unique valorisation orientation of the programme, or the simple and efficient application procedures.

The PIs were also asked to provide suggestions, if any, for the future improvement of the ERC PoC programme (Figure 27). The suggestions received in the interviews largely confirm the

recommendations of the survey. In the interviews, the most frequently cited recommendation refer to: 1) the provision of larger funding amounts (33,3% of responses); 2) of longer project duration (24,2%); 3) of follow-on funding (24,2%), due to tecnical complexity, investment uncertainty and long-term commitment needed for project activities. Other areas of improvement suggested, albeit with lower frequency, refer to the reduction of administrative burden/provision and the need for more flexibility (15%); others suggest the creation of opportunities of interaction with industry/mentors/consultants (9%), the enhancement of the visibility of projects' outcomes (9%) or the customization of the programmes according to the needs of the scientific/technological sector (9%). Other suggestions cited with relatively lower frequency are reported in the Figure below.

Figure 27 – Suggestions of interviewed PIs for the future improvement of the ERC PoC programme (as a % of total responses, multiple answers possible)



Key Messages. The evidence collected from the interviews reinforces and complements (with detailed and qualitative information) the findings of the survey. The ERC PoC programme works—it is achieving its objectives of valorisation and commercialisation with remarkably high frequency. The projects funded under PoC show sufficient promise to attract private sector funding as well as follow on support from other sources of public funding. This is a powerful external validation of the Programme's accomplishments. Significant numbers of awardees indicated, in both the survey and the interviews, that there is room for improvement in the programme in three main areas: more time, more (follow-on) funding and more flexibility in programme management.

6. Recommendations

When seeking to understand and improve a public programme, it is important to remember that, "one does not need to be doing badly in order to improve." The ERC Proof of Concept programme is sound in concept and effective in practice. At the same time, the programme could benefit from additional steps that would enable it to realize its full potential. In particular, the limitations identified by the awardees themselves concerning the need for additional funding and additional time should be addressed.

The most powerful finding of the survey is the expressed need of the programme awardees for additional funding, not only to achieve the initial PoC objectives, but also to further develop their products and technologies and facilitate their entry into the market. The single funding phase for the PoC programme has proved effective in helping to advance research towards the market. Nonetheless, the bulk of the PoC projects are not sufficiently de-risked as a result of the initial award to be able to attract substantial private sector funding. Additional rounds of funding, first from the ERC itself, and then from other sources of public and private finance are needed. Other sources of early-stage capital can add significant value by further developing technologies, products, and processes. Moreover, by adding value and lowering risk they also support the interests of the PI and the research team as they interact with potential investors. The reputational benefits of the ERC awards and further development of the projects enhance the ability of the team to capture a greater share of the value of their work.

Given that PoC awardees could significantly benefit from follow-on investment, there are a number of policy changes to be considered. The recommendations below are not mutually exclusive, rather they represent a menu of options to consider[7]:

1. **An Overarching Goal should be to Provide Additional Investment by the ERC in the Most Promising Projects.** Providing follow-on funding to reinforce and enable success is key and indeed represents best practice in programmes such as the US SBIR Programme or the EU SME Instrument. Recognizing the importance of maintaining the ERC's focus on high-quality basic research, there are nonetheless a number of complementary steps which might be considered, as indicated in the menu of options below.

    1.1. **Follow-On Awards.** One innovation that might be considered would be to have the PoC programme make funds available for a second round of funding in a subsequent round of PoC awards. This might be considered as a sort of continuation award, similar to the process used in the National Institutes of Health's SBIR Programme. These awards would of course be made competitively within a limited pool of PoC funding. In the event that the ERC budget is significantly increased, this would be an opportunity to reinforce the progress of the most successful projects and thereby expand the broader societal impact of ERC investments.

[7] The findings and recommendations below are based on the results of the survey, and statements made by the experts as a result of the interviews, and the analysis of the report's authors. The recommendations are put forward for consideration, they do not necessarily reflect the views of the ERC Executive Agency, or the Scientific Council.

1.2. **Matching Funds.** A similar approach would be to challenge promising firms to seek private sector funds which could then be matched by the ERC (again assuming enhanced ERC funding overall) or from a related institution. The match could be a one-to-one or differentiated depending on the amount of the private investment.

1.3. **More Cooperation with Other European Institutions.** There are a variety of EU programmes that provide funding for start-ups and SMEs. Steps should be taken to facilitate a clear path for PoC awardees to other EU programmes. Ideally these arrangements would be on the basis of a formal agreement, one that would institutionalize cooperation and provide an opportunity for significant additional resources, again awarded competitively, for promising recipients of PoC awards. For example, it might be possible to establish a collaborative arrangement with the European SME Instrument, Fast Track for Innovation or with an arm of the European Investment Bank. The new European Innovation Council appears as a natural potential partner for this type of agreement, as it aims to support breakthrough innovations that have the potential to create new markets, by grouping together a set of already existing innovation instruments. High potential PoC projects and companies would represent attractive targets for the EIC in this domain. The EIC could play a valuable role as a facilitator and potential funder to help firms make further progress towards the market and obtain the resources necessary to begin to scale up. The possibility of collaboration should therefore be explored in more depth by the two institutions.

1.4. **Programmes in Member States.** The European level programmes are often innovative and benefit from substantial funding, but almost by definition the existing programmes cannot make funds available to the full range of promising European companies. The private sector can of course provide very substantial funds with the right policy framework. However, very early stage firms can often benefit significantly from relatively modest infusions of capital through competitive public awards. Accordingly, another approach to enhance the success of PoC awardees would be to develop pathways for PoC awardees to national and regional investment programmes. The reputational benefits of having received an award from the ERC with follow-on funding from the PoC programme are significant. This can serve as a certificate of quality for national and regional early stage investment programmes. The initial awards are in effect a mechanism to de-risk investment in a technology or product. In this way, consideration should be given to a collaborative arrangement where the PoC programme might make available limited additional funds on the condition that they are matched, perhaps on a two-to-one or greater basis by Member State institutions and programmes, or ideally in cooperation the private sector.

2. **Additional Time.** As noted, there was much support in the survey from PIs for additional time to complete their projects. There is certainly much to be said for administrative rigor, but flexibility is also a virtue. The fact that the time allocated to complete research projects was already extended suggests that there is recognition of the need to achieve the objectives of the proposal rather than simply complete the project on time. Time constraints can often foreshorten valuable research and development in order to meet administrative goals. Having a process which could allow a nearly automatic extension for a properly justified request could prove valuable in more fully

achieving the goals of the awards. Reflecting the recommendations above, there could be both an opportunity for "no-cost extensions" (a frequent occurrence in U.S. research programmes) and also an opportunity to apply for additional time and resources, again with adequate justification. Adding additional time when reasonably requested would be a strength of the PoC programme, even if it would add an element of administrative complexity. As a general proposition, adding flexibility in managing the development of new products, processes, and companies should be fully considered.

3. **Programme Replication.** the ERC should adopt an advocacy role to encourage the replication of POC type programs among member states. Given the success of the Proof of Concept awards, albeit on the basis of a rigorous ERC selection process, consideration should be given to encouraging national authorities to create similar competitive awards for leading researchers within their national or regional frontiers. As an example, Poland seems to have taken this type of initiative with its Tango program. National programs with an orientation similar to the PoC would be a way of illustrating the potential benefits of awards designed to valorise research, while perhaps also encouraging a research culture focused on societal needs, as well as basic research. The self-selection element of the Proof of Concept programme would enable both proven and aspiring researchers to exploit the results of their research, while perhaps also encouraging national investments in facilities and human capital.
   The PoC might also consider deploying a Seal of Excellence. This would draw on the successful experience of the SME Instrument which awards a Seal of Excellence to highly qualified companies that nonetheless did not receive an award due to budget limitations. Branding promising projects with a Seal of Excellence would facilitate the selection process for awards at the national or regional level while perhaps also encouraging a culture of awards for the commercialization of promising nationally funded research.

4. **Outreach to the Private Investors.** It is well-established that information asymmetries with respect to promising but unproven technologies and products are a major impediment to private sector investment, both by angel investors, and of course, venture capitalists. It is therefore important to provide more information to potential investors as means of enhancing the opeeration of the financial market. Face-to-face meetings are essential to this process. Investors can be attracted to promising technologies, but they also need to be confident about the ambitions and capabilities of the company's leadership. There are at least two ways to address these information gaps. One proven method is to organise workshops and forums to present promising PoCs to potential private sector investors. The ERC/PoC staff have demonstrated that this is possible and generates positive feedback. More resources, both human and financial, would be required to take a more systematic approach to these outreach efforts. These forums could provide an opportunity for presentations on the potential of PoC awards, and if organised by sector and by region, they could help enlarge the awareness of the quality of PoC awardees and of the potential investment opportunity. Business angels and venture investors often specialize by sector and might well find focused matching events more attractive.

5. **Connect to highly-qualified mentors and coaches**. The survey responses noted the need for mentoring and coaching services to support PoC teams as they seek to move their ideas towards

commercialization. Harnessing the knowledge and experience of highly-qualified mentors and coaches could significantly help PoC researchers. The program management should consider reaching out more to the private sector in order to promote a network of mentors who could assist in company creation and product generation. It would also be possible to envisage "Summer schools" or networking events to highlight project potential and applications while also learning the basics of customer and market identification. This could be combined with the investor forums mentioned above. These activities could supplement the normal support of the TTOs at the university level.

Given the mandate of the ERC, it would probably not make sense to activate a new and dedicated mentoring/coaching scheme. It would be more appriopriate exploring the possibility of leveraging on existing successful communities of qualified mentors/coaches, at the EU level (e.g. network of business innovation coaches of the EIC SME Instrument) or at the national level (e.g. the network of High-Tech Grunderfonds Coaches in Germany). Such networks could be signalled to PoC awardees as opportunities, leaving them the choice to select, if of interest, the most appropriate partner for collaboration.

6. **Entrepreneurship Training**. In the same spirit, the ERC could consider organising one or more annual valorisation "bootcamps", that is intensive training programs focused on helping PoC reserchers understand how they might bring their ideas and technologies from the lab into the marketplace and more broadly to society. At the end of the bootcamp program, participants ideally will have developed a solid awareness of what it takes to build a valorisation plan and have a clearer perspective on the feasibility and requirements of their ideas. The programs could be organised by specific scientific domain and should involve external actors (mentors, investors, related businesses and societal stakeholders). Their presence would provide valuable input and while also generating opportunities to establish linkages with potential partners. Relevant examples could be found in the Horizon 2020 Progress TT Commercialisation Bootcamps or in the NIH I-Corps program. These programs do not need to be replicated exactly but the ability to identify the market, that is, the customer, and understand the steps necessary to reach it, are key elements of success.

7. **Maintaining Communication**. As noted above, it is important that a communication channel be maintained between the management team and the ERC/ PoC grantees. Maintaining a direct communication channel between the Agency and the PIs for the exchange of updated information on upcoming calls and other programme opportunities is valuable in its own right. Direct communication is also essential for further assessments of awardees progress over time. Failure to maintain open communication with awardees and applicants will essentially "blind" the programme with regard to its achievements, challenges and opportunities.

8. **Continuosly Improve the Selection Process**. The survey responses from PoC grantees suggest that the selection and evaluation process has worked efficiently in the past. The survey evidence on the valorisation outcomes of PoC grantees vis-à-vis PoC applicants not funded also speaks in favour of the efficacy of the selection process although the assessment of the usefuleness of the feedback from the selection process from non-winners is less positive. Two steps to improve the selection process might include:

8.1. **Enlarge the pool of experts evaluators.** An emerging challenge is to maintain a high-quality, and therefore a fair selection process. Given the increasing number of applications and the challenge related to commercialization, the selection process should include experts with a background in early-stage finance for small companies and startups as a means of strengthening the valorisation perspective in the selection process (this would of course necessitate appropriate non-disclousure agreements). In the event that the ERC program receives additional funds and is thus able to add a second phase to the POC program, it would be particularly important to include evaluators with experience in early stage company development and the identification of potential markets.

8.2. **Improve evaluators' remuneration.** In addition, it may be useful to explore increasing the remuneration for the evaluators. The current allocation of time for evaluation and corresponding remeuneration seem to insufficiently reflect the effort required for the assessment of what are often complex proposals, nor do they seem sufficient to motivate the continued involvement of evaluators.

9. **The Need for Ongoing Evaluation**. The PoC awardees represent a rich and diverse array of projects across multiple sectors. The gestation period is equally diverse for the related research, valorisation and commercialisation efforts. Some take more time than others, and almost all will develop further over time. As noted, a major constraint of this analysis is the relatively short period between the granting of the award and the assessment. Subsequent assessments should therefore be undertaken on a regular basis to ascertain further progress initiated by the programme's awards and develop a better understanding of likely trajectories and needs of the PoC awardees, their teams and the companies they have created. As with a family, repeated snapshots over time are an effective means to measure growth and change.

7. Conclusions

This initial evaluation of the Proof of Concept programme of the European Research Council finds that the programme is sound in concept and effective in practice. By most measures, from awareness, to IP creation, to firm formation, to additional funding, it is performing very well indeed. This reflects in no small part the underlying quality of the ERC funded research. Importantly, the program's positive impact in terms of mindset and confidence among the researchers is potentially one of the more enduring impacts of the awards, contributing to a cultural change among the research teams.

As noted above, however, even successful programmes can be improved. In the survey and interviews, the PIs identified a number of potential improvements. One straightforward recommendation from the PIs is to have more flexibility and in particular, more flexibility with regard to the time allotted for the project. This seems reasonable if one accepts that the overall goal of the programme is to help the PIs and their companies achieve their project goals rather than focus on completing the project in the allotted time.

The main challenge for the programme is the need for additional funding to fully achieve project goals and advance down the path to the market and the realization of the societal benefits of the research. There are inherent limits to what can be accomplished with 150,000 euros and 18 months. The challenge therefore is to find a means to provide a mechanism for, or at least a path to, additional funding - funding that should be both competitive and phased. Adopting measures to address these challenges of time, funding and ultimately flexibility, could substantially enhance the long-term return on the programme.

Lastly, in order to meaningfully measure the progress of the programme's awardees overtime, it will be important to conduct additional evaluations of awardee’s progress with direct outreach to the PI's themselves. This represents global best practice and will provide valuable information to the ERC management to further improve an already impressive programme.

8. Appendix: methods and data

The first section of this Appendix describes the methodology used to design and implement the survey to ERC grant holders in order to collect the primary data used for the assessment. The second part presents the rationale and methodology used in the set of interviews with selected ERC PoC grant holders.

8.1. Survey

Objectives of the survey. The survey aimed to understand how well the ERC Proof-of-Concept (PoC) programme achieves the goal of maximising the value of ERC-funded research by facilitating the development of its commercial and social innovation potential. The survey collected information from ERC PoC grantees and from other ERC Frontier Research grantees on the following themes: awareness of the PoC existence by ERC grantees; activity, with a focus on key objectives of PoC projects and their achievement; outcomes and early impact of PoC grants; recommendations for improvement of the PoC programme.

Survey approach. The design of the survey followed a counterfactual approach in order to assess the additional impact of the ERC PoC programme. As counterfactual for the assessment, in addition to the group of ERC PoC grant holders, the survey also targeted a control group of other ERC Frontier Research projects (including projects which applied for a PoC grant but were not funded and projects which did not apply for a PoC grant but used other valorisation funding sources), to verify whether they were more or less successful in valorising the results of their research. In addition to that, the survey was also sent to other ERC Frontier Research projects which could have been potential candidates for a PoC grant, but did not apply for it, to verify their awareness of the programme.

The questionnaire. A structured questionnaire was designed in order to undertake the survey data collection process. The survey questions were grouped into the following sections:

- General information
- A. Motivations
- B. Valorisation activities
- C. Valorisation outcomes
- D. Access to additional developmental funding
- E. Skills development and other outcomes
- F. Recommendations for the ERC PoC funding scheme

A web-based version of the questionnaire was implemented on the Surveymonkey platform. A pilot test of the questionnaire was conducted in January 2017, with a selected group of PIs of ERC PoC projects. The feedback received was taken into consideration to finalize the questionnaire.

Survey administration and coverage. The survey was administered online, through the Surveymonkey platform, over the period February 2017- March 2017. The survey was sent to all 4338 PIs of FP7 ERC Frontier Research Projects, corresponding to 4378 ERC projects. We targeted

the PIs of all FP7 main grants (assigned over the 2007-2013 period) since they represent the pool of potential applicants of the ERC PoC programme since its very initial foundation in 2011. Three different rounds of recall were implemented via email, in order to solicit responses to the survey.

Survey responses. Following three recall rounds, we received 2069 responses to the survey (response rate 47,7%). 58 of them did not give consent to use the data and 190 responses were not usable due to several missing data. The final sample is thus constituted by 1821 responses. Out of 1821 usable responses, 446 responses are from PoC applicants, including 242 responses from PoC grantees and 204 responses from PoC applicants not funded. The responses from PoC grantees represent 39,2% of the population of all ERC PoC grantees (242 out of 618). 1375 survey responses are thus from other ERC Frontier Research grantees that did not apply to the ERC PoC programme. They include 75 projects that applied to a different valorisation funding programme (36 of them were funded). Out of 204 responses from PoC applicants not funded, 115 continued the valorisation activities, 89 did not pursue them further. The control group used as a benchmark in the analyses on valorisation outputs, valorisation outcomes, follow-on funding and skills development (sections 4.3, 4.4, 4.5 and 4.6 of this document) thus includes projects that applied for a PoC grant, were not funded but continued the valorisation activities and projects stemming from ERC Frontier Research grants which used other valorisation funding sources to continue their valorisation path. Such control group thus includes 126 valorisation projects that answered to the questions included in the sections on valorisation outputs and outcomes (and to the following ones). It should be noted that the choice to include in the control group only projects that continued to pursue valorisation activities, although with funding sources different from the ERC PoC scheme, is highly conservative. Indeed, the control group includes projects showing some degree of success, given their continuation of valorisation activities. The interpretation of the analyses should take into consideration this prudent analytical choice.

Distribution of survey responses and analysis of representativeness. The tables reported below illustrate the distribution of 1821 survey responses by year, by ERC domain, by country of the host institution, by gender of the project PI. The tables show the distribution of all 1821 survey responses, of responses by 446 ERC PoC applicants and of 242 responses by ERC PoC grantees. Such distributions were compared with the corresponding distributions in the target populations (respectively, population of all FP7 ERC Frontier Research projects; population of all PoC applicants; population of all PoC grantees), in order to assess the representativeness of survey responses and the presence/absence of systematic biases in the responses. The distribution of survey responses by call year closely resembles the one in the population. The same holds for the distribution by call year of survey responses by PoC grantees and PoC applicants. Out of 242 responses received from PoC grantees, 74 are from the cohorts 2011-2012-2013, representing 41% of the PoC projects from such cohorts. Similarly, the distribution of survey responses by ERC domain, by country and by gender is close to the ones characterizing the respective populations. The survey had thus a very respectable response rate and high representativeness, enabling fairly robust conclusions from the analysis of the responses.

Distribution of survey responses by PoC call year

Distribution of survey **responses by PoC applicants**, by PoC call year

Distribution of survey **responses by PoC grantees**, by PoC call year

PoC Call Year	Freq.	%	Cum %
2011	36	8.28	8.28
2012	30	6.90	15.17
2013	47	10.80	25.98
2014	99	22.76	48.74
2015	102	23.45	72.18
2016	121	27.82	100.00
Total	**446**	**100.00**	**100.00**

PoC Call Year	Freq.	%	Cum %
2011	24	10.00	10.00
2012	22	9.17	19.17
2013	28	11.67	30.83
2014	48	20.00	50.83
2015	67	27.92	78.75
2016	51	21.25	100.00
Total	**242**	**100.00**	**100.00**

Distribution of survey responses by country of the Host Institution

Distribution of **total survey responses**, by country

Country	Freq.	%	Cum %
AT	45	2.47	2.47
BE	72	3.95	6.43
BG	2	0.11	6.53
CH	109	5.99	12.52
CY	5	0.27	12.80
CZ	3	0.16	12.96
DE	249	13.67	26.63
DK	39	2.14	28.78
EE	1	0.05	28.83
EL	20	1.10	29.93
ES	129	7.08	37.01
FI	30	1.65	38.66
FR	236	12.96	51.62
HR	1	0.05	51.67
HU	10	0.55	52.22
IE	16	0.88	53.10
IL	90	4.94	58.05
IT	135	7.41	65.46
LU	1	0.05	65.51
NL	134	7.36	72.87
NO	21	1.15	74.03
PL	9	0.49	74.52
PT	18	0.99	75.51
SE	60	3.29	78.80
SI	2	0.11	78.91
SK	1	0.05	78.97
TR	4	0.22	79.19
UK	379	20.81	100.00
Total	**1,821**	**100.00**	**100.00**

Distribution of survey **responses by PoC applicants**, by country

Country	Freq.	%	Cum %
AT	1	0.22	0.22
BE	21	4.71	4.93
BG	1	0.22	5.16
CH	23	5.16	10.31
CY	4	0.90	11.21
CZ	0	0	11.21
DE	52	11.66	22.87
DK	6	1.35	24.22
EE	0	0	24.22
EL	10	2.24	26.46
ES	49	10.99	37.44
FI	8	1.79	39.24
FR	49	10.99	50.22
HR	0	0	50.22
HU	1	0.22	50.45
IE	7	1.57	52.02
IL	25	5.61	57.62
IT	36	8.07	65.70
LU	0	0	65.70
NL	43	9.64	75.34
NO	0	0	75.34
PL	1	0.22	75.56
PT	6	1.35	76.91
SE	14	3.14	80.04
SI	1	0.22	80.27
SK	0	0	80.27
TR	2	0.45	80.72
UK	86	19.28	100.00
Total	**446**	**100.00**	**100.00**

Distribution of survey **responses by PoC grantees**, by country

Country	Freq.	%	Cum %
AT	1	0.41	0.41
BE	12	4.96	5.37
BG	0	0	5.37
CH	17	7.02	12.40
CY	3	1.24	13.64
CZ	0	0	13.64
DE	29	11.98	25.62
DK	4	1.65	27.27
EE	0	0	27.27
EL	7	2.89	30.17
ES	32	13.22	43.39
FI	4	1.65	45.04
FR	28	11.57	56.61
HR	0	0	56.61
HU	0	0	56.61
IE	5	2.07	58.68
IL	14	5.79	64.46
IT	13	5.37	69.83
LU	0	0	65.70
NL	22	9.09	78.93
NO	0	0	78.93
PL	0	0	78.93
PT	3	1.24	80.17
SE	8	3.31	83.47
SI	0	0	83.47
SK	0	0	83.47
TR	2	0.83	84.30
UK	38	15.70	100.00
Total	**242**	**100.00**	**100.00**

Distribution of survey responses by ERC domain

Distribution of **total survey responses**, by ERC domain

ERC Domain	Freq.	%	Cum %
LS	594	32.62	32.62
PE	828	45.47	78.09
SH	363	19.93	98.02
SYG	36	1.98	100.00
Total	**1821**	**100.00**	**100.00**

Distribution of survey **responses by PoC applicants**, by ERC domain

ERC Domain	Freq.	%	Cum %
LS	151	33.86	33.86
PE	230	51.57	85.43
SH	61	13.68	99.10
SYG	4	0.90	100.00
Total	**446**	**100.00**	**100.00**

Distribution of survey **responses by PoC grantees**, by ERC domain

ERC Domain	Freq.	%	Cum %
LS	82	33.88	33.88
PE	145	59.92	93.80
SH	14	5.79	99.59
SYG	1	0.41	100.00
Total	**242**	**100.00**	**100.00**

Distribution of survey responses by Principal Investigator's gender

Distribution of **total survey responses**, by PI gender

PI gender	Freq.	%	Cum %
Women	412	22.62	22.62
Men	1409	77.38	100.00
Total	**1821**	**100.00**	**100.00**

Distribution of survey **responses by PoC applicants**, by PI gender

PI gender	Freq.	%	Cum %
Women	86	19.28	19.28
Men	360	80.72	100.00
Total	**446**	**100.00**	**100.00**

Distribution of survey **responses by PoC grantees**, by PI gender

PI gender	Freq.	%	Cum %
Women	40	16.53	16.53
Men	202	83.47	100.00
Total	**242**	**100.00**	**100.00**

8.2. Interviews

Objectives of the interviews. The aim of the interviews with selected PIs of ERC PoC projects was to provide qualitative and complementary evidence to integrate and better understand the quantitative evidence collected through the survey. More specifically, the interviews served to:

- learn directly about the developments in the projects, their outcomes and impact, the challenges, and future strategies.
- Provide opportunities for recommendations for potential improvements of the ERC PoC programme.
- Identify success stories to be included in the final report in the forms of short cases or sentences.

Approach. As a general rule, the interviews were conducted with the PI of the project, but other PoC team members could also be involved. They took place at the premises of the PIs. Around 1,5 hours were set aside for each meeting. An ad-hoc semi-structured questionnaire was developed to guide the interviews, including a set of open-end questions, organised into 5 sections:

- General information on the visit
- Brief description of the project
- Activities and main results of the project
- Valorisation outcomes and attraction of follow-on funding
- Recommendations for ERC PoC Programme

A final section of the questionnaire contained rating scale questions, to be directly answered by the PI, in order to provide a summary assessment of the PoC project.

Selected projects. 33 interviews were conducted with PIs of selected PoC projects. Projects were selected, in principle, to provide heterogeneity in terms of ERC domains, type of PoC activities undertaken and expected outcomes, institutional settings and country settings. Nonetheless, the process entailed a significant degree of selection bias at multiple levels, from choosing successful projects and country focus. The interviews are thus not intended to be representative of the entire population of PoC beneficiaries. The goal was to attempt to identify core themes and provide personal input on a number of issues of interest for the project. The distribution of the interviews among ERC scientific domains is the following:

- 17 interviews from Physical and Engineering Domain,
- 12 interviews from Life Science Domain,
- 4 interviews from Social Sciences and Humanities.

Analyses. Following the meeting, the technical experts transcribed the results of the interviews on the Surveymonkey platform, to facilitate analyses. The responses were then organised and analyzed by question to look across all respondents and their answers in order to identify common themes, consistencies and differences. Information was then categorized and interpreted in order to identify key points and main findings.