European Research Council
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Qualitative Evaluation of completed projects funded by the European Research Council

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Introduction

The European Research Council (ERC) was established in 2007 with the goal of providing funding to investigators to pursue ground-breaking, high-risk/high-gain research in Europe. It is one of the premier research funders in the European Union. Scientists and scholars of any nationality and in any discipline can apply to the ERC for a grant to undertake research at the frontiers of knowledge, free of any thematic constraints, in an EU Member State or an Associated Country. Researchers at a comparable career stage compete for Starting, Consolidator or Advanced Grants — the sole criterion for receiving research funding is scientific quality aiming at excellence of both the project and the principal investigator. The evaluation of proposals is conducted by means of a structure of high-level peer review panels; the ERC currently has 25[1] panels covering all fields across three research domains: Life Sciences (9 panels, LS1–LS9), Physical Sciences and Engineering (10 panels, PE1–PE10), and Social Sciences and Humanities (6 panels, SH1–SH6) (Table 1). Following the publication of a call, researchers can submit their proposals in a 'bottom up' manner. The panel structure serves solely as an organisational tool to gather experts with appropriate collective expertise.

Since 2007, more than 60000 project proposals have been submitted to the ERC, of which, to date, some 6000 have been selected for funding, representing an investment of 9.8 billion euros. At the end of 2014, more than 500 ERC-funded projects had been finalised. The vast majority of ERC-funded projects are still ongoing as they were initiated later.

When public funds are disbursed to support research, especially on this scale, it is important to evaluate whether the goal set for the programme is being met and whether the peer review procedures in place lead to that ground-breaking research projects are funded. Furthermore, as the ERC funds projects in a strictly 'bottom-up' approach, it is also of interest to evaluate the potential for societal impact of the outcome of the projects funded, even though it should be noted that societal impact often only materialises many years after a project is completed.

There are various indicators that can be used to evaluate the outcomes of research projects, including scientific impact and developments, bibliometric analysis of scientific publications, and, depending on the domains, generation of patents and establishment of spin-off companies. In 2014, the ERC conducted a citation analysis of the 30319 publications retrieved from Thomson Reuters' Web of Science database as having acknowledged ERC funding (as of September 2014). Overall, 2005 articles and reviews acknowledging ERC support (corresponding to 7% of these publications) were classified in the top 1% of most highly cited publications in their scientific discipline and year of publication. This analysis showed that research funded by the ERC has a scientific impact far above average.

[1] In 2007, the ERC panel structure consisted of 20 panels, but in 2008 the number of panels was increased to 25 and this structure has remained stable since then.

Qualitative peer review analysis remains the gold standard for in-depth assessment of research outcomes. This is why the ERC Scientific Council requested, as part of the 2015 Work Programme[2], an analysis of the results and outcomes of ERC research funding evaluation, following this approach.

In this evaluation, which serves as a pilot exercise for the future evaluation of completed ERC-funded projects, the qualitative evaluation of 199 completed ERC-funded projects was undertaken by independent high-level scientists who were selected by the ERC Scientific Council. The aim of this document is to report on the overall outcome of this evaluation.

The completed projects evaluated were funded in the framework of the Starting Grant and Advanced Grant funding schemes that the ERC implemented in its first years of existence. The Starting Grant scheme provided funds of up to 1.5 million euros to junior principal investigators (2 to 9 years after PhD) for projects of up to five years in duration, while the Advanced Grant scheme focused on senior principal investigators who received funding of up to 2.5 million euros for projects of up to five years in duration. The Consolidator Grant scheme was only introduced in 2013 and, thus, there are not yet any completed projects for this grant type.

Table 1: The ERC panel structure

Panel	**Panel title**
Life Sciences	
LS1	Molecular and Structural Biology and Biochemistry
LS2	Genetics, Genomics, Bioinformatics and Systems Biology
LS3	Cellular and Developmental Biology
LS4	Physiology, Pathophysiology and Endocrinology
LS5	Neurosciences and Neural Disorders
LS6	Immunity and Infection
LS7	Diagnostic Tools, Therapies and Public Health
LS8	Evolutionary, Population and Environmental Biology
LS9	Applied Life Sciences and Non-Medical Biotechnology
Physical Sciences and Engineering	
PE1	Mathematics
PE2	Fundamental Constituents of Matter
PE3	Condensed Matter Physics
PE4	Physical and Analytical Chemical Sciences
PE5	Synthetic Chemistry and Materials
PE6	Computer Science and Informatics
PE7	Systems and Communication Engineering
PE8	Products and Processes Engineering
PE9	Universe Sciences
PE10	Earth System Science
Social Sciences and Humanities	

[2] https://erc.europa.eu/sites/default/files/document/file/ERC_Work_Programme_2015.pdf

SH1	Individuals, Institutions and Markets
SH2	Institutions, Values, Beliefs and Behaviour
SH3	Environment, Space and Population
SH4	The Human Mind and Its Complexity
SH5	Cultures and Cultural Production
SH6	The Study of the Human Past

Methodology

The ERC followed a common approach to evaluation based on peer review for all completed projects. 25 evaluation panels, corresponding to the 25 scientific panels of the ERC, were formed, each composed of three experts; two with experience as an ERC panel member or panel chair, and one without any previous participation on an ERC evaluation panel. Members of the selection panels that made the decision to fund the projects to be evaluated were not recruited to these evaluation panels.

Each evaluation panel evaluated 8 projects[3]; 5 Starting Grant projects and 3 Advanced Grant projects, reflecting the ERC distribution of funding between younger and more experienced researchers. Most of the projects were funded in the first two ERC calls (i.e. in 2007 and 2008). The projects to be evaluated were selected based on the project start date, and were allocated to the 25 panels according to the 2013 panel identifiers of the ERC, i.e. the last panel structure used in the Seventh Framework Programme (FP7). Each project was evaluated by 2 members of the evaluation panel and, if necessary, by an additional remote reviewer. These additional reviewers were appointed by the members of the evaluation panel. One panel member was appointed as lead reviewer for each project. A procedure to detect conflicts of interest and protect the confidentiality of the exercise was established, and the evaluators received an honorarium for their work.

The evaluators were provided with the following material:

(i) The Description of Work – a document based on the project proposal that motivated the selection for funding and which was part of the Grant Agreement;

(ii) The Final Scientific Report submitted by the principal investigator at the end of the project that includes a self-assessment describing the project achievements, and information on project outputs such as publications, awards and patents;

(iii) A publication list and bibliometric analysis;

(iv) Where applicable, information on any Proof of Concept Grants (ERC grants that are designed to bridge the gap between research and the earliest stage of marketable innovation) associated with the project.

In addition, the evaluators were encouraged to consider any other information publicly available through online resources. Notably, the evaluators were encouraged to assess any publication by the principal investigators published after the end of the project if ERC funding was acknowledged or if it was deemed to be directly linked to the ERC-

[3] One evaluation panel evaluated 7 projects.

funded project.

The evaluators were asked to use their professional judgement to form an overall view of the scientific quality of the project achievements. Each evaluator delivered one written review of each evaluated project, and the panel as a whole drafted a consensus report for each of the 8 projects evaluated by the panel. The primary focus of the project reviews was to highlight the frontier nature of the results, including any breakthroughs or important scientific advances of knowledge. The project reviews consisted of three parts:

(i) A brief questionnaire addressing the scientific advances made, the level of interdisciplinarity, and impact outside the scientific domain (if applicable);

(ii) A review text describing and assessing the project findings;

(iii) An overall grade based on the scientific results.

The overall grades used for the evaluation panels to categorise the projects were defined as follows:

(A) - scientific breakthrough;
(B) - major scientific advance;
(C) - incremental scientific contribution;
(D) - no appreciable scientific contribution.

In the first phase of the evaluation, the panels were given access to the evaluation documents. Subsequently, the panels met for a one-day meeting in Brussels in June 2015. The meeting consisted of an introduction to the exercise and a discussion in a plenary session, followed by individual break-out sessions for each panel to prepare and initiate the evaluation and nominate remote reviewers where additional expertise was needed. In the second phase, the evaluators remotely prepared individual reviews. Following this, virtual panel meetings were held by videoconference in which the panels discussed the reviews and agreed on the main points for the panel's consensus assessment. Finally, the panels prepared one consolidated review report for each project, and a panel report summarising a general view on the advances and impact of the research funded in the field of the panel.

Findings

Overall outcome

The evaluation panels identified 43 projects (ca. 21%) as having led to a scientific breakthrough (grade A) and 99 projects (ca. 50%) as having led to a major scientific advance (grade B). Taken together, ca. 71% of the evaluated projects were assessed as having led to a major scientific advance or a scientific breakthrough (*Figure 1*), i.e. highly successful projects. The exercise also showed that 50 projects – that is 25% - delivered an incremental scientific contribution, and in a few cases - ca. 4% - had no appreciable scientific output. It should be noted though that these latter categories contain projects which may not have led to the intended outcomes due to the high risk nature of the projects, as well as projects which delivered rather poor outputs. It is important to keep in mind that the small sample size limits the conclusions that can be drawn. These results cannot necessarily be extrapolated to the full set of ERC-funded projects.

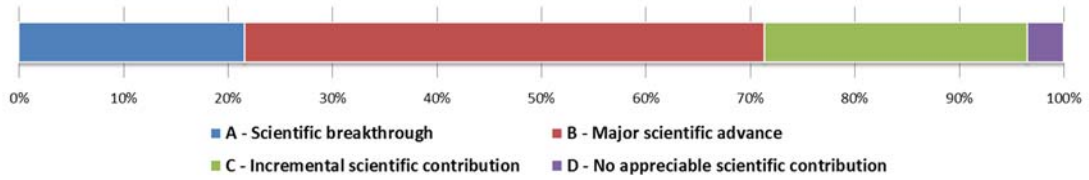

Figure 1: Overall grade attributed to projects.

Outcome by grant type

A higher proportion of the Advanced Grants evaluated in this exercise were awarded a grade A than Starting Grants (*Figure 2* and *Table 2*). When grades A and B are combined, however, a rather similar picture emerges for Starting Grants and Advanced Grants. There are no clear indications of differences between the two grant types in terms of the quality of the results obtained.

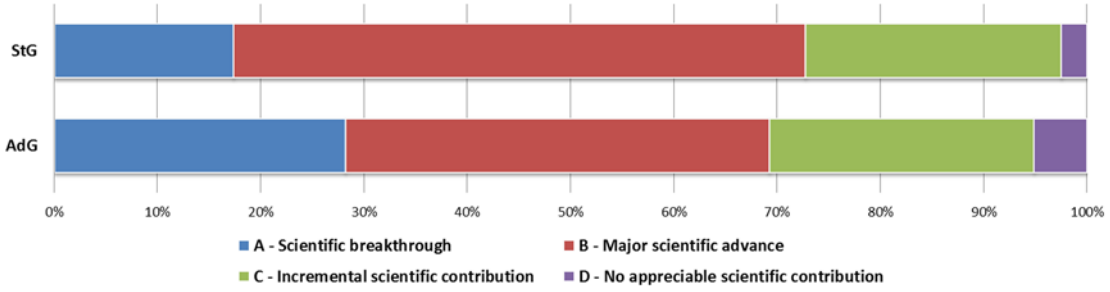

Figure 2: Overall grade attributed to projects by grant type. StG: Starting Grant; AdG: Advanced Grant.

Table 2: Overall grade attributed to projects by grant type.

	A - Scientific breakthrough	**B - Major scientific advance**	**C - Incremental scientific contribution**	**D - No appreciable scientific contribution**	**Total**
Starting Grant	21	67	30	3	121
Advanced Grant	22	32	20	4	78
Total	43	**99**	**50**	**7**	**199**

Scientific impact and risk

The overall scientific impact of these 199 research projects funded by the ERC is very high. Even projects categorised as incremental in the overall assessment could result in significant scientific advances or open up new research avenues. The reviews of the projects show that, in general, funded projects were ambitious and have led to new important results being published in key journals. For many projects, these outputs were considered to have had a major impact, as indicated by the high numbers of citations collected.

Although this is not directly related to the scientific quality of the project's achievements, another feature common to many of the funded projects is the consolidation of the research groups of the principal investigators. ERC funding enables principal investigators to create or consolidate their research group; this was pointed out by reviewers as a very positive aspect due to the high impact on the career of early-stage researchers within the funded research team. Many principal investigators also received a significant career boost during the implementation of their ERC grant. This is highlighted by many reviewers as a major impact of ERC funding.

Projects that were graded as incremental or not providing appreciable scientific contributions could be an indication of the risk taken by the evaluation panels when deciding on the proposals to be funded. The identification of research proposals with the potential to lead to breakthrough results is a very challenging endeavour: at the selection stage, evaluation panels are asked to identify the most promising amongst the many brilliant ideas put forward by applicants and this has a high intrinsic risk. Panels are guided to take these risks while aiming for high-gain research projects. The results obtained in this exercise provide some indications that this guidance was followed to a large extent.

The reviewers pointed out that many of the projects given the two lowest grades did achieve some of their goals, or partially delivered on their main aim. For example, several such projects succeeded in developing novel methodology or an instrument, but have not (yet) succeeded in answering the planned scientific questions by using this methodology/instrument. In contrast, for some of the projects in these categories, the evaluation highlighted their modest publication outputs, limited impact on the field or criticised the project design. It is important to highlight that the snapshot of the scientific impact of the projects evaluated is from a short time after their completion. In many areas, scientific impact takes longer to become apparent and it would be interesting to compare the current findings to those that would emerge by redoing this evaluation in a few years from now.

The distribution of the level of scientific impact found fits well with the expected pattern for a frontier research funding scheme. The distribution peaked around projects leading to major scientific advances with a moderate tail of projects with no appreciable scientific contributions, thus reflecting the balance between high risk and high gain that guided the decision of the ERC selection panels that evaluated the proposals.

Interdisciplinarity

The reviewers also indicated that many of the projects evaluated have an important interdisciplinary component. This was linked to the fact that the research performed found recognition or applicability outside its main field, or because the research brought together areas that previously did not have many interactions (*Figure 3* and *Figure 4*).

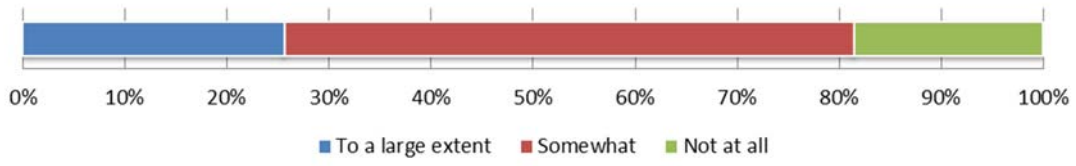

Figure 3: Recognition or applicability of the research performed outside its main field.

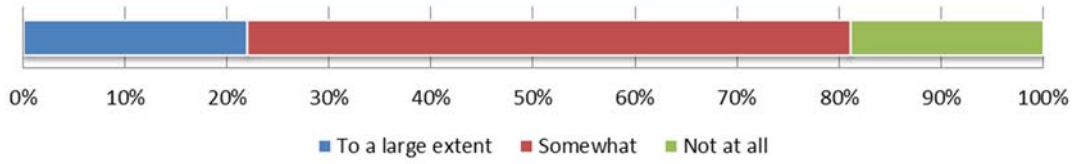

Figure 4: Research bringing together areas that previously did not have much interaction.

Impact (e.g. on economy, on society, on policy-making) in addition to scientific impact

Although it is still very early to consider the long-term impact of the projects, the evaluators were asked to assess the impact (e.g. on the economy, society and policy-making) of the funded projects in addition to their scientific impact. The evaluators were asked two questions: (i) concerning impact that is already apparent, and (ii) the potential for impact in the future:

(i) In addition to its scientific impact, to what extent has the project had other types of impact (e.g., on the economy, society and policy-making)?

(ii) In addition to its scientific impact, in your opinion, could the project have other types of impact (e.g., on economy, on society, on policy-making) in the future?

The results are shown in *Figure 5* and *Figure 6*, respectively. It was judged that, overall, just under 10% of projects have already had impact to a large extent and that nearly 50% of projects have had at least some impact. These proportions increased to ca. 25% and just under 80% respectively, with regard to the potential impact that the projects' outcomes may have in the future. These results indicate that bottom-up research schemes can lead to substantial impact on the economy, society or policy-making. It will, however, be some years before the impact of ERC-funded projects can be fully assessed.

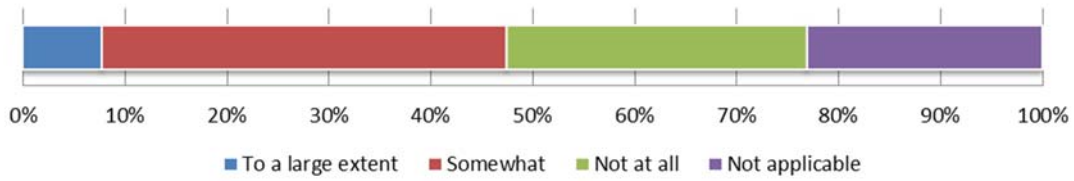

Figure 5: Impact outside the scientific domain (e.g. on economy, on society, on policy-making) that is already apparent.

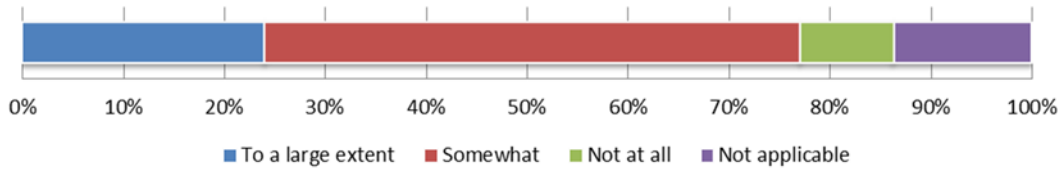

Figure 6: Impact outside the scientific domain (e.g. on economy, on society, on policy-making) that could manifest itself in the future.

The pattern that emerges is consistent with the nature of the type of research funded. One would expect the impact of frontier research on the economy or on society, in most cases, to occur in the medium to long term, and this is precisely what is shown in *Figure 5* and *Figure 6*. When considering impact in the future much higher figures are to be expected.

Conclusions

The overall picture that unfolds from this qualitative evaluation of ERC completed projects seems to be consistent with the ambition set by the ERC Scientific Council in line with its remit to support high-risk/high-gain projects. The main findings that emerged from this evaluation are:

- More than 70% of the projects evaluated have made scientific breakthroughs of major advances;
- About 30% of the projects evaluated have made contributions that can be regarded as incremental or not significant;
- In general, the projects have had a very positive impact on the career of the principal investigators;
- The projects have strongly contributed to the consolidation of research teams;
- A large fraction of the projects evaluated involved interdisciplinary research;
- Close to 50% of projects already had some apparent impact on the economy and society, and nearly 10% had a major impact to date, which underlines the importance of the ERC approach of giving researchers the freedom to undertake curiosity-driven frontier research. Without having societal impact in mind initially, this bottom-up approach delivers in this respect.
- It is the experts' estimate that at least three quarters of the research output are expected to have an impact on the economy or on society in the medium and long term.

These findings give, however, only an indication of the first projects funded by ERC shortly after their completion and therefore cannot be extrapolated to the whole pool of ERC-funded projects, since most projects are yet to be completed.

Future exercises are planned to continue to follow later completed projects through a random sample as there will be too many to evaluate all of them. The next rounds will incorporate improvements based on the lessons learned from this first pilot exercise.