

SERB merit review process: adapting to emerging challenges

Premila Mohan and Ramasamy Brakaspathy*

Merit review is the most trusted process adopted by funding agencies worldwide for selecting high-quality research proposals. Recently, owing to intense competition, the merit review process has come under pressure necessitating the funding agencies to deliberate on issues associated with it. This article describes the merit review process of the Science and Engineering Research Board, Department of Science and Technology, Government of India, which funds competitive research grants of about 8 billion rupees a year for supporting research in science and engineering. The issues associated with the merit review process and possible suggestions are discussed.

Keywords: Funding agencies, merit review, research proposals, science and engineering.

THE Science and Engineering Research Board (SERB) is a statutory body under the Department of Science and Technology (DST), Government of India (GoI), established through an Act of Parliament. Its primary mandate is supporting high-quality basic and applied research in frontier areas of science and engineering. It carries forward the legacy of the erstwhile Science and Engineering Research Council (SERC) of DST, which promoted and handled extramural research funding for four decades. The individual-centric excellence-based programmes of SERC were brought forward to SERB along with the robust merit review process. Since the inception of SERB, several new programmes have been introduced depending on the needs of the research community and global trends. With total R&D funding of Rs 767 crores, SERB supported about 8500 researchers in the year 2016–17 through its various programmes and schemes. The funding decisions of all these competitive grants are based on the merit review process of SERB, which ensures that research excellence is supported and the most deserving research projects are funded in a fair and transparent manner. This article gives a brief overview of the merit review process of SERB, the impending challenges and suggestions to address them.

SERB merit review process

The SERB merit review process is well established and supported by laid-down policies and guidelines to uphold its mandate and eminence. The core principles underlying this merit review process are: (i) Expert assessment: it is ensured that each research proposal is assigned to reviewers

with appropriate expertise and the committee members have a broad collective knowledge to arrive at a decision. (ii) Transparency: procedures and review criteria are declared and the consolidated comments of the committee are made available to the applicants as applicable. (iii) Impartiality: to ensure that decisions are fair and credible, and also to avoid any conflict of interest between the reviewers and the applicants, a Conflict of Interest Policy has been formulated and implemented by SERB. The reviewers and committee members accept to abide by the policy before initiating the process of evaluation. (iv) Appropriateness: the level and intensity of the review process is customized to align with the programme's mandate and proportionate to the investment. (v) Confidentiality: proposals, data and deliberations are kept in confidence. (vi) Integrity: in order to protect and preserve the integrity of the funding process and confidentiality, a code of conduct document has been drawn which sets out the basic principles and standards that the members are required to adhere to. These merit review principles of SERB are in line with the Global Research Council (GRC) Principles of Scientific Merit Review, which was endorsed at the May 2012 Global Summit on Scientific Merit Review¹.

In general, the merit review process of SERB involves two levels of appraisals: (i) review by external experts, and (ii) review and recommendation by the committee. Each proposal under consideration is normally referred to five external reviewers chosen from SERB reviewer database based on the relevant subject area. In the second level, committee members review the proposals assigned to them and during the meeting, a decision is arrived at based on the external reviewer comments as well as those of the assigned committee member and overall judgment of the committee. The recommendations of the committee are binding and SERB accepts the recommendations as such, making the merit review system robust and reliable.

Premila Mohan and Ramasamy Brakaspathy are in the Science and Engineering Research Board, Vasant Kunj, New Delhi 110 070, India.

*For correspondence. (e-mail: rbpathy@nic.in)

The intensity of review and level of committee vary with each programme. In case of core research grant (CRG; previously called extramural research (EMR)) programme, there are 13 discipline-wise Programme Advisory Committees (PACs) consisting of 6 core and about 20 co-opted members in each committee. All the core members are invited for every meeting and 4 of the 20 co-opted members are chosen based on the expertise required for the review of proposals that are to be considered in the meeting. Depending on the cost of the proposal, the levels of appraisals vary. The PAC can recommend proposals costing up to Rs 80 lakhs. Recommended proposals costing more than Rs 80 lakhs are referred to an Empowered Committee. This committee can approve projects up to Rs 5 crores, whereas for proposals costing more than Rs 5 crores, the same committee will serve as an appraisal body to the Board. In case of Early Career Research Award (ECRA) and National Postdoctoral Fellowship (NPFD) programmes, there are five discipline-wise Expert Committees (ECs) and for other programmes such as Empowerment and Equity Opportunities for Excellence in Science (EMEQUE), J. C. Bose and Ramanujan Fellowships, VAJRA Faculty, etc. there are multi-discipline task force committees. While for NPFD, the external review is predominantly waived-off, for Intensification of Research in High Priority Areas (IRHPA) and for high-cost CRG proposals, evaluation by foreign experts is an integral part of the review system.

In recent years, SERB adopted changes in its procedures for further enhancing its efficiency and timeliness. Call-based invitation of proposals was introduced in 2016 and it replaced the open-call structure, wherein the investigators could submit their proposals anytime of the year and meetings were conducted when a sizeable number of proposals received comments from external reviewers. The call-based system was devised such that there would be two calls per year with a call-opening period of two months, followed by a period of four months for evaluation and announcement of decision before the opening of the next call. The electronic project proposal management system (ePPMS) to cater to the complete project cycle was developed; it replaced the paper-based system. The number of proposals received increased owing to both these factors – the ease of applying online and the conditional wait period of six months for the next submission. Apart from these reasons, several external factors such as general increase in the number of faculty, more pressure on faculty members, particularly from private institutions to bring in research grants, linking of research grants to promotion, etc. have caused a steady increase in demand.

Issues associated with the merit review process

Internationally, merit review is the most reliable and trusted system for research grant evaluation. In recent years, increased demand is being felt by most of the

research funding agencies worldwide^{2,3}. While the government spending on R&D did not increase significantly over the past few years, the increased demand has caused immense strain on the merit review process. The associated issues such as increased burden and operational cost, limited reviewers and tight binding arise due to increase in demand. Further, as the merit review process operates within defined rules and guidelines, some embedded issues such as bias, conflict of interest, reliability of assessment, inclusiveness, etc. may exist inconspicuously. The current phenomenon of increased demand has not only created its own associated issues, but has amplified the embedded issues and brought them to the forefront. Hence it is highly imperative to reflect upon the issues of the merit review process and find ways to address them.

The critical issues of the merit review process are discussed below.

Increased burden

SERB has been witnessing a significant increase in demand for research grants in the past few years, which has increased the burden on reviewers, committee members, administrators and applicants. The external reviewers are loaded with proposals which are to be evaluated within the stipulated time. The committee members are also burdened with proposals and frequent meetings. This issue of increased demand and associated burden is global and is being felt by most of the research funding agencies worldwide.

Limited number of quality reviewers

While the number of proposals increased drastically, the number of reviewers did not increase in a proportional manner. Hence currently, there is only limited number of quality reviewers who are loaded with a vast number of proposals. The load on reviewers could lead to unavoidable refusal and reviewer fatigue⁴. Many funding agencies are facing shortage of reviewers, particularly high-calibre established reviewers⁵.

Time constraint-induced lapses

According to the time schedule adopted by SERB, decisions need to be declared within four months of call closing. Preliminary scrutiny, external peer review and committee meetings need to be completed within the said period. In such a constrained scenario, there may be possibilities for skipping protocols or procedural lapses in order to adhere to the time schedule.

Tight binding of equally merited proposals

The R&D budget of SERB has shown cumulative annual growth of 12.3% since 2012–13, while the number of

proposals received witnessed an exponential increase (Figure 1). Increase in the number of proposals resulted in marked reduction in the approval rate. The average success rates for research funding falling below 20% have been reported by other agencies as well⁶. In such case of reduced approval rate, a unique scenario emerges. While the meritorious high-quality proposals stand out, lower quality proposals could be easily identified, equally merited proposals bundle up in the mid range causing difficulty in ranking them, particularly so when the investigators are not invited for personal interaction with committee members. This results in a matter of chance for all these proposals, wherein those from less endowed institutions have greater possibility of being left out.

Increased operational cost

With increase in demand, the operational cost of undertaking the merit review process has increased over the years. The number and cost of conducting the meetings to evaluate the proposals received under CRG programme for the year 2015–16 were 42 and Rs 4.1 crores respectively, and the corresponding figures for the year 2016–17 were 81 and Rs 6.5 crores respectively. The amounts mentioned are only the operational costs and do not include cost to applicants, reviewers and committee members.

Interdisciplinary proposals

The programmes of SERB are organized in discipline-wise verticals. Interdisciplinary proposals are therefore to be submitted in any one of the core disciplines. Such proposals are sent to relevant external reviewers and special invitees related to the interdisciplinary fields are made part of the committee in which these proposals come up. Even then, there is a possibility that interdisciplinary

proposals might not get due attention. The disadvantages faced by interdisciplinary proposals under conservative merit review mechanisms have been widely reported⁷. GRC has also recognized this issue and its Statement of Principles on Interdisciplinarity was endorsed by the research funding agencies⁸.

Bias

SERB's merit review strives for fairness in the evaluation process. The committee members, even though they work as a team drawing upon their experience and expertise, are individuals who bring along with them their own perspectives and preferences. This may cause bias to creep within the merit review process. The bias could be orientation towards discipline, subject area, institution affiliation, etc. Studies carried out worldwide suggest that peer review is subject to biases based on gender, institutional affiliation, discipline or field of study, personal bias, etc.^{9,10}.

Reliability of assessment

Differences in rating of the same proposals by different reviewers have been observed. Even though there are prescribed guidelines to rate a proposal, the difference still persists because the notion of excellence is difficult to describe, and it may vary from individual to individual and across committee to committee. Less correlation in single-rater reliability has also been reported¹¹. In case of inconsistencies in assessments by reviewers, the onus lies on the committee to take the final decision. Variability of assessment by committee members may make funding decisions as a matter of chance for equally merited proposals.

Conflict of interest

In the SERB merit review process, procedures for avoiding conflict of interest are clearly defined. According to the policy, reviewers are supposed to decline conflict of interest proposals and committee members are expected to leave the room when such proposals come up for discussion. However, there may be occasions where conflict of interest protocols are overlooked. Increased demand, time constraint during committee meetings and shortage of experts in some areas negate the members from conforming to the conflict-of-interest policy.

Anti-innovation

There is a general contention that merit review is biased against innovation. Competitive pressure leads to researchers submitting more conservative proposals rather

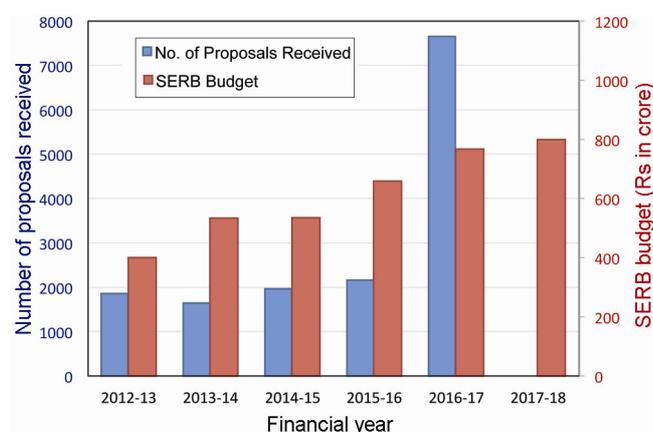


Figure 1. Number of proposals received under the core research grant programme and the Science and Engineering Research Board budget over the years.

than risky ones¹². Low approval rates have exaggerated the situation¹³ and in such a case, innovative proposals from younger researchers and less endowed institutions are prone to be not funded.

Against inclusiveness

Merit review based on the framework of research excellence may hinder inclusiveness. Disparity in research funding could arise between established and new researchers. Mathew effect in merit review process has been widely documented. This originates from the *Bible* which says, 'To those who have, shall be given and will have in abundance, for those who have not shall be taken away even the little that they have'. It corresponds to disproportionate attribution of credit, recognition and grants favouring eminent scientists over comparatively unknown researchers¹⁴. Similar is the case of disparity between high-profile and less-endowed institutions, and that between proven and low priority subject areas.

Suggestions

Increased demand is not an issue but a positive factor, as it indicates the growth of R&D environment in the country. Reducing the number of proposals should not be the aim, but the purpose should be to improve the overall quality of proposals being received. The underlying motive is increasing the competitiveness and vigour of the research community, thereby enhancing the vitality of the research environment and productivity of the nation. Thus, the emerging challenge is to find mechanisms to manage the complex issues of (i) receiving quality research proposals, (ii) improving the efficiency of the system to handle a large quantum of quality proposals, and (iii) mitigating the other related issues.

To improve the quality of proposals submitted, i.e. to reduce the submission of non-competitive proposals, proper feedback needs to be provided to unsuccessful applicants, as this would facilitate subsequent improvement. Information about rejected proposals and their rating could be sent to the concerned institutions, which could help them to provide better mentoring/training to their faculty. Help of academies or professional services could be solicited to conduct seminars/workshops at different locations to mentor researchers to write fundable proposals. Awareness workshops on the need to follow research integrity principles should be organized regularly. Scientific social responsibility (SSR), an upcoming proactive initiative could also serve as an effective platform for mentoring researchers in this regard. At present, there is only limited time between decision announcement of a previous call and the opening of the next call. Introduction of a cooling period of one call cycle for unsuccessful applicants can help in many ways: (i) the available time

would motivate the applicants to refine their proposals in a better way; and (ii) applicants would attempt to submit better quality proposals as any rejection could lead to a waiting period of a year for the next submission, thereby reducing the overall low-quality proposal submission. A drawback to this method is that borderline applicants whose projects have been rejected due to intense competition may also need to undergo the cooling period. A modified way would be introducing a cooling period for only lower-rated applicants, whereas for those above a certain cut-off immediate submission may be allowed.

For decreasing the burden on existing reviewers, the quantity and quality of reviewers need to be enhanced. The number of external reviewers needs to be increased with the motive of not just populating the reviewer database, but to accommodate quality reviewers who understand the intricacies of reviewing and are willing to spare their time. Apart from enrolling competent young researchers, especially the ECRA grant awardees, young Associates of science academies, etc. foreign referees, in particular those associated with Indian R&D programmes such as VAJRA Faculty may be engaged for reviewing proposals. To enhance the quality and motivation of external reviewers, payment of monetary incentives is an option which should serve as a token of appreciation. Care needs to be taken to avoid any unwarranted side-effects, such as quantity over quality or making the peer review process a commercial venture instead of a scientific endeavour. Non-monetary benefits such as merit card of appreciation or membership, etc. can also be contemplated. Key performance indicators (KPI) based on several parameters and weightage need to be devised for the reviewers. Periodic appraisal of KPI has to be carried out and feedback on the same needs to be communicated to the reviewers. Based on the KPI, the reviewer pool needs to be revamped periodically. Further, application and reviewer formats also need to be revisited for improving the efficiency.

To reduce the burden on the reviewers, a screening process could be adopted. According to this process, the committee could meet initially to shortlist the proposals to be sent for external review and the remaining proposals could be rejected with technical comments. Recently, this process is being followed by some of the committees. However, one needs to keep in mind the associated issues such as: (i) the need to organize multiple meetings, (ii) proposals getting rejected without external peer review, and (iii) committee revisiting the shortlisted proposals after the external review.

Modifications in the merit review system have been experimented by other agencies in a pilot mode. These include: (i) double blind review: Here the identity of reviewers and applicants remains anonymous to each other. This may help overcome bias; however, achieving proper blinding is difficult as the reviewers can identify the authors in most cases¹⁵. (ii) Open review: The identity

of reviewers is individually informed to the applicants, or the names of the reviewers are published after the review is completed, as in case of the European Research Council. This would bring more accountability to the reviewing and enhance the robustness of the peer review process. (iii) Random allocation mechanism: A two-stage lottery method involving peer review for choosing meritorious proposals followed by computer-generated lottery has also been suggested¹⁶. The Health Research Council of New Zealand adopts the random selection method for the Explorer Grants Scheme¹⁷. (iv) Sandpit: In this method, researchers, reviewers and funders are brought together through a workshop to interactively discuss and revise proposals for a predetermined quantum of money. Final decisions are made and projects are recommended at the end of the workshop¹⁸. The Engineering and Physical Sciences Research Council of UK has funded projects by conducting such theme-based workshops.

SERB, with a wide portfolio of programmes with different mandates, scope, reach and demand, necessitates the need to find varied options to address the issues associated with individual programmes and also to enable easing of procedures. In case of NPDF which has a huge demand, screening could be done first for finding meritorious applications and then random allocation could be done among the screened-in applications for selecting the awardee. In case of CRG and ECRA programmes where the tight binding issue is more pronounced, top- and bottom-rated proposals need to be identified. While the top deserving meritorious proposals should be supported and the bottom-rated proposals eliminated, the mid-range proposals could be decided on random allocation procedure. This would discard the aspect of bias, unreliability of rating and issue of less-endowed institutions being left out. The other option to bring in inclusiveness with respect to less-endowed institutions is to fix a predetermined lower cut-off for state universities and colleges with a capped budget. It is not akin to reservation, as a fixed percentage is not allocated but meritorious applicants who lose out on the edge are provided an opportunity.

Conclusion

The merit review process involves many stakeholders, their time, efforts and aspirations. Any change in the process might impact them and the overall research environment. Hence, it is essential to analyse the issues in-depth, have wider discussions with the research community and study the proposed changes in a pilot mode before implementing them in the merit review process. Development of data metrics and generation of baseline values need to be established to study the effect of

changes being attempted. Periodic review of the process should also be a regular feature of SERB, to assess and adapt to the critical issues that may emerge with time.

1. Global Research Council, Statement of principles for scientific merit review. https://www.globalresearchcouncil.org/fileadmin/documents/GRC_Publications/gc_principles-English.pdf (accessed on 22 December 2017).
2. Research Councils UK, Managing demand for research funding; <http://www.rcuk.ac.uk/research/efficiency/demand/> (accessed on 22 December 2017).
3. NIH, What are the chances for getting funded, National Institutes of Health; <https://nexus.od.nih.gov/all/2015/06/29/what-are-the-chances-of-getting-funded/> (accessed on 22 December 2017).
4. Breuning, M., Backstrom, J., Brannon, J. and Gross, B. I., Reviewer fatigue? Why scholars decline to review their peer's work. *PS: Polit. Sci. Polit.*, 2015, **48**, 595–600.
5. Rethinking grant review. *Nature Neurosci.*, 2008, **11**, 119.
6. Powell, K., Research funding: making the cut. *Nature*, 2010, **467**, 383–385.
7. Porter, A. L. and Rossini, F. A., Peer review of interdisciplinary research proposals. *Sci. Technol. Hum. Values*, 1985, **10**, 33–38.
8. Global Research Council, Statement of principles on interdisciplinarity; https://www.globalresearchcouncil.org/fileadmin/documents/GRC_Publications/Statement_of_Principles_on_Interdisciplinarity.pdf (accessed on 22 December 2017).
9. Wenneras, C. and Wold, A., Nepotism and sexism in peer-review. *Nature*, 1997, **387**, 341–343.
10. Bornmann, L. and Daniel, H., Potential sources of bias in research fellowship assessments: effects of university prestige and field of study. *Res. Eval.*, 2006, **15**, 209–219.
11. Jayasinghe, U. W., Marsh, H. W. and Bond, N., A multilevel cross-classified modeling approach to peer review of grant proposals: the effects of assessor and researcher attributes on assessor ratings. *J. R. Stat. Soc.*, 2003, **166**, 279–300.
12. Spier, R. E., Peer review and innovation. *Sci. Eng. Ethics*, 2002, **8**, 109–112.
13. Alberts, B., Kirschner, M. W., Tighman, S. and Varmus, H., Rescuing US biomedical research from its systemic flaws. *Proc. Natl. Acad. Sci. USA*, 2014, **111**, 5773–5777.
14. Merton, R. K., The Matthew effect in science. *Science*, 1968, **159**, 56–63.
15. van Rooyen, S., Godlee, F., Evans, S., Smith, R. and Black, N., Effect of blinding and unmasking on the quality of peer review: a randomized trial. *J. Am. Med. Assoc.*, 1998, **280**, 234–237.
16. Fang, F. C. and Casadevall, A., Research funding: the case for a modified lottery. *mBio*, 2016, **7**, 1–7.
17. Health Research Council of New Zealand: Explorer grants <https://gateway.hrc.govt.nz/funding/researcher-initiated-proposals/explorer-grants> (accessed on 22 December 2017).
18. Engineering and Physical Sciences Research Councils, Sandpits <https://www.epsrc.ac.uk/funding/applicationprocess/routes/network/ideas/whatisasandpit/> (accessed on 22 December 2017).

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