



UNIVERSITY OF TARTU
Centre of IT
Impact Studies

Improving Estonian R&I Framework



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I Introduction

The comparative picture shows Estonian research to be highly impactful. Essential Science Indicators (ESI) show Estonian science to be highly cited, when taking the size of the research community into account it can even be claimed to be among the top 5 of countries whose research is most cited over a fixed time-period (Allik & Lauk 2023). This indicates that Estonian research output is small, but of high impact. The nominal R&D funding and nominal R&D personnel has grown significantly. Total R&D funding from Estonian state grew from €195 million in 2017 to €386 million in 2023, this is excluding fully the funding received from EU and other external sources. However, there are also some risks that suggest that this positive dynamic is not sustainable in the long term, unless changes are made to enable sustainable R&D in Estonia. At the same time, experiences from other European countries can provide inspiration for overcoming barriers (Tausch, 2019).

The following white paper identifies four different challenges and takes a somewhat unorthodox approach to proposing solutions. This paper does not propose major structural policy changes, which may be good but are often difficult to implement because of the large number of actors involved, path dependencies and entrenched institutional structures. Rather, it takes a more pragmatic approach to possible changes, and this White Paper attempts to do the opposite, proposing smaller-scale managerial changes aimed primarily at the management of research groups and R&D organisations, focusing on changing individual motivations, removing specific individual barriers and increasing access to resources for researchers to enable and empower them to overcome these challenges. These recommendations should therefore be easier to implement within existing structures and institutional environments. This is done by looking at four challenges and areas for improvement:

1. recruiting and retaining young talent;
2. outsized dependence on competitive funding;
3. publishing high impact research in volumes;
4. suboptimal knowledge transfer levels.

For each of the above challenges, a brief analysis of the problem is followed by a set of recommendations that can and should address the original problem.



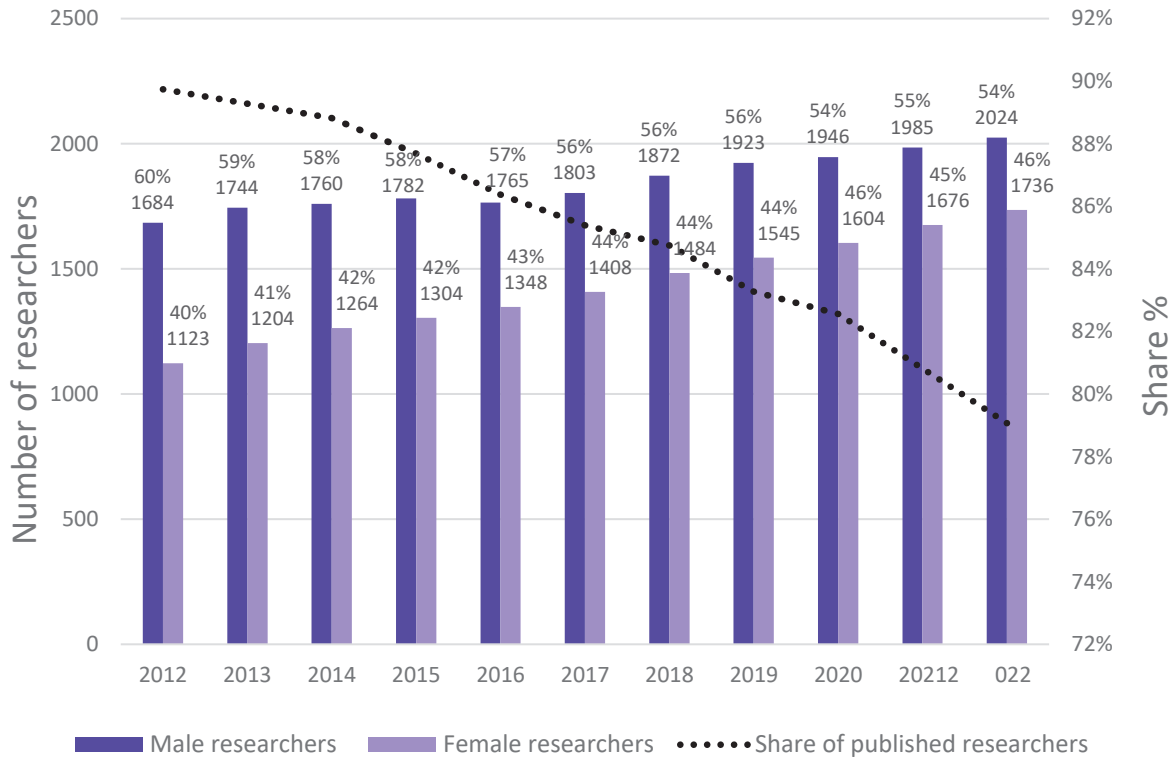
II Challenges and Areas for Improvement

1. Recruiting and retaining young talent

Challenge

The growth in R&D funding has not correlated with a similar growth trend in R&D personnel, nor with the growth in young researchers at R1 and R2 levels.

While the total number of researchers has increased by 33% over a ten-year period between 2012 and 2022 (Hirv & Piirsoo 2023, p. 6, see figure below), the overall share of R&D personnel in the total workforce is 1.5%, well below the EU average of 2% (ibid). In other words, the growth in funding has largely outpaced the growth in the number of people doing the actual research, and the additional funding has largely been used to compensate for previous underinvestment in R&D, exemplified by the not uncompetitive pay levels of R1 to R4 level researchers compared to both private sector and public sector positions. This problem is also reflected in the composition of R&D personnel. Despite the nominal increase in R&D personnel, there has been an overall decrease in the number of younger researchers. The share of first-stage researchers, junior research fellows and doctoral researchers aged 25-29 will fall from 1.4% to 0.5% between 2012 and 2022, and the share of 30-34-year-olds fell from 12.4% to 7.3% (ibid). As the recruitment and retention of young R&D talent is a major challenge for research-intensive organisations worldwide (Dilger, 2009; Donald, 2023), Estonia is arguably more exposed to the challenge of recruiting and retaining young R&D talent.



Number of researchers and share of researchers publishing in the period 2012-2022. Source: Estonian Research Information System, ETAG calculations. From Hirv & Piirsoo 2023, p. 6.

Recommendations

Adding yet more competitive funding schemes (see challenge II) for younger researchers is not a solution. Studies suggest that recruiting and retaining scientific talent requires a more balanced and comprehensive approach (Dilger, 2009; Przytula, Sutkowski & Kulikowski, 2024), focusing on those aspects that contribute to talents' career aspirations and relate to the supportive framework. Recommended practices for the management of R&D institutes and research groups include

- 1. set limitations to teaching load of R2 level researchers** similar to R1 which is currently set at an equivalent of not more than 20% of working hours to open up more time for R&D work;
- 2. favor R2 level researchers in allocating grant writing support services** and establish an academic mentoring scheme to mitigate the highly competitive funding pressure at R2 level;
- 3. involve R1 level PhD researchers and early-career researchers in larger research project conception stages** to familiarize them with standard practices but without the funding pressures faced at R2 and R3 to 4;
- 4. establish clear promotion pathways already at R1 level** for effective career planning and mapping of university support services role along the path for effective progression along set path and assign individual academic mentors for each R1 and R2 level researcher.

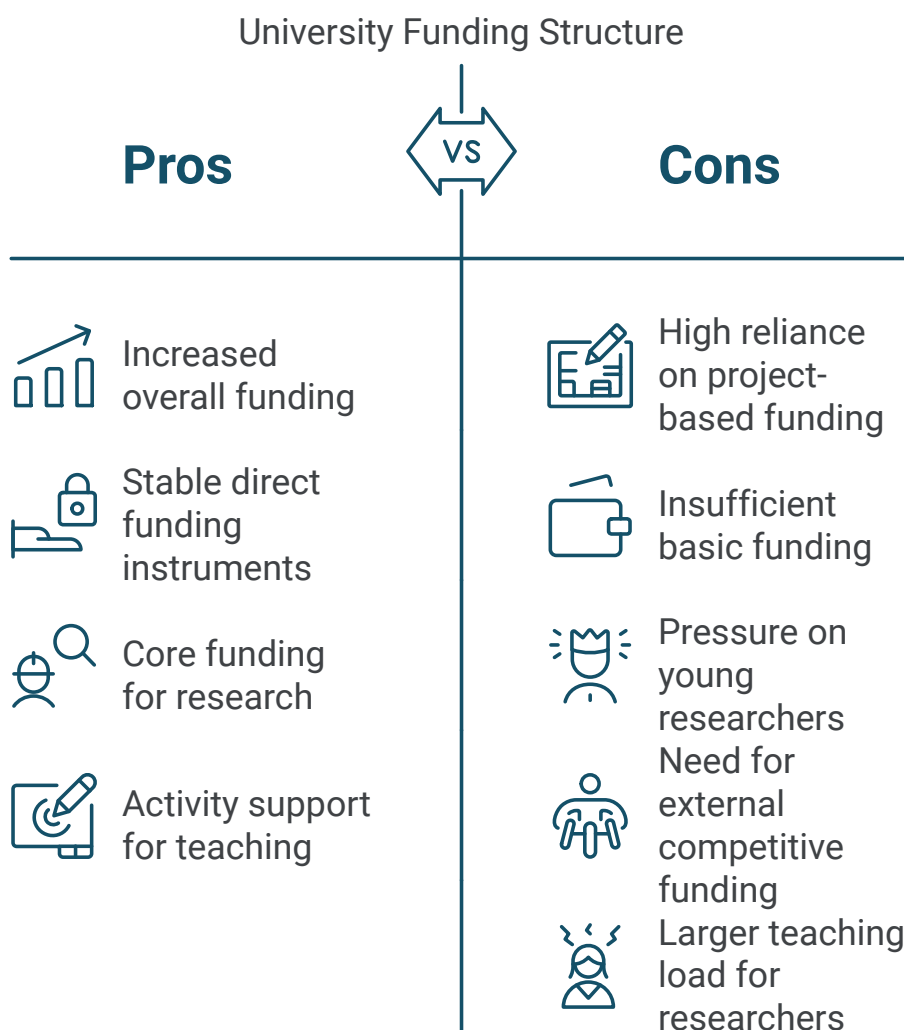
In short, for R1 (doctoral) and R2 (post-doctoral) researchers, financial resources need to be complemented by supportive frameworks and arrangements by the management of R&D institutions to actively support the career paths of young researchers, to remove barriers that might discourage academic talent from pursuing excellence in R&D in general, and to provide guidance for career development.



2. Outsized dependence on competitive funding

Challenge

Paradoxically, the increase in R&D funding has coincided with a greater reliance on project-based funding for universities. While overall funding at the state level has increased and the level of funding channelled through the Estonian Ministry of Education and Research is now less dependent on EU funding sources managed by the ministry, i.e. a larger proportion of funding comes directly from the Estonian public budget, a look at the composition of universities' budgets shows an actual increase in the share of project-based funding between 2012 and 2022. The University of Tartu, for example, receives up to 70-80% of its total R&D income from project-based funding (see UT dashboard: statistika.ut.ee). The state has provided stable direct funding instruments, mainly the so-called core funding for research, and activity support for funding teaching has grown, but not at the same pace as the needs of the universities. Basic funding is not sufficient to cover the costs of basic research, including the promotion of young talent. The result is an environment that is dependent on attracting external competitive funding and the consequent pressure on young researchers to bring in their own grants, unless they are prepared to take on a larger teaching load, which is funded by activity support, but does not provide the necessary research funding to develop their own research and publication portfolio. (see also Zheng, 2009 for a discussion of similar international trends).



Recommendations

Securing long-term funding is a significant challenge in research. The reliance on project-based R&D funding, of which only a small percentage is stable and long-term, creates a precarious situation for research groups. This instability makes it difficult to plan and carry out long-term projects, which are essential for meaningful progress in any field. A range of additional support services is therefore needed to navigate the environment, as changing it is beyond the immediate power of individual researchers. Recommended practices for managing research groups and R&D institutions are as follows:

- 1. match project-based funding partially with baseline funding by research group** to reduce research group 100% reliance on projects to sustain a group and establish standard (guaranteed) bridging funding schemes for groups in between projects;
- 2. invest in expanding grant writing services within universities**, in particular to allocate capable professional grant and proposal writers to promising R2 to R4 researchers at a higher rate that currently possible;
- 3. develop expertise in data management and AI.** Investing in the capacity to handle and analyse large datasets as these are crucial for competing in the global research environment;
- 4. develop means and tools to create so-called “dream team” groups of R2 to R4 level researchers** based on their portfolios and prior research work to match interdisciplinary grant calls and assign professional project managers to said groups for grant proposal development.

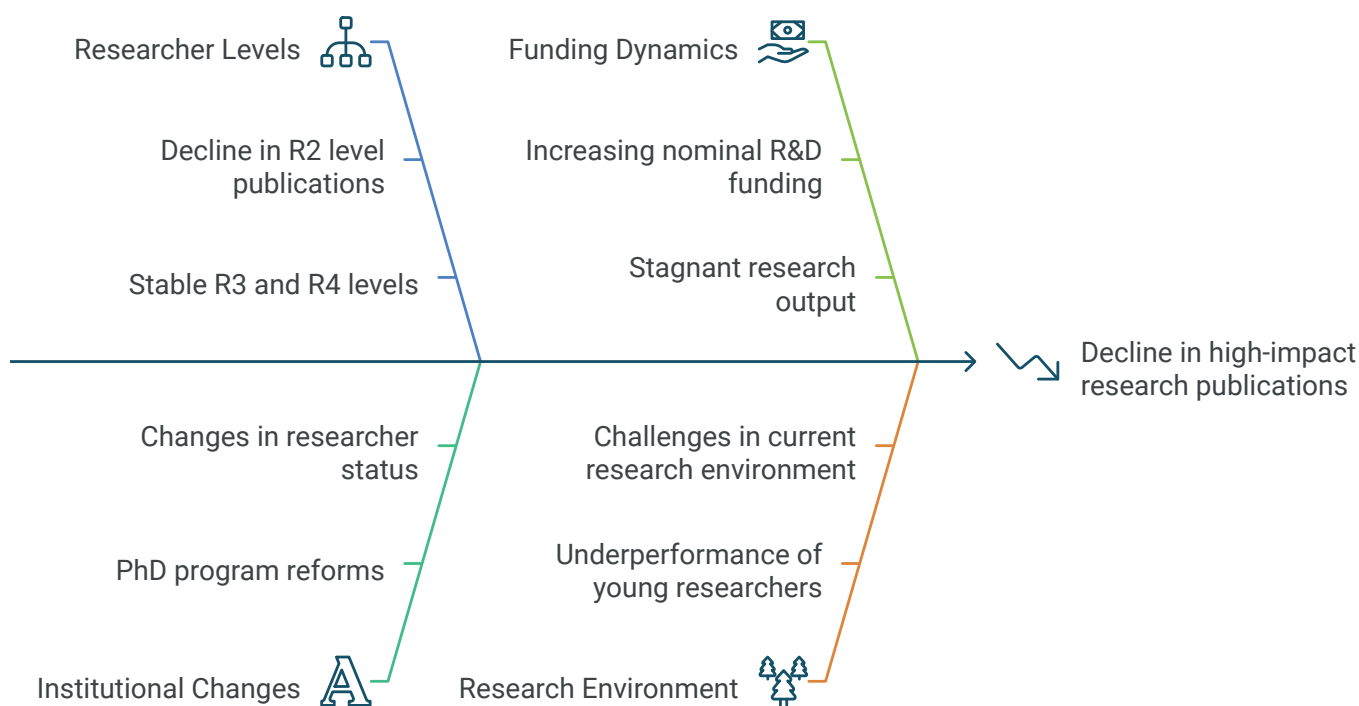


3. Publishing high impact research in volumes

Challenge

A third trend is the stagnation in the publication of high-impact research. As mentioned above, the Estonian research community certainly punches above its weight in international comparison. However, it is not certain that this will continue if current trends continue. An in-depth look at the activities of R&D personnel reveals a slow decline in research output. For example, in 2012, 89% of R&D personnel published at least one paper per year, but in 2022, 79% did so (Hirv & Piirsoo 2023, p. 10). In fact, the main decline in publication frequency came from R&D staff at R2 level, not R3 or R4 (ibid). Data from universities further supports this. The University of Tartu, for example, has an average of 1.03 high-impact publications per academic staff member in 2024, compared to 1.25 ten years earlier. Even when taking into account the reform of the PhD programme in 2022, which resulted in a change of status to R1 level researchers and a nominal increase in the number of researchers and a decrease in the number of publications per academic employee, there is still a reduction in publication effectiveness. The total volume of research outputs produced is stagnating and somewhat decoupled from the increasing nominal R&D funding.

Analyzing Decline in High-Impact Research Publications



It therefore appears that the publication problems are quite nuanced, and are largely due to the wider issue of young and developing researchers underperforming somewhat in the current environment.

Recommendations

Part of the solution is to free up the time of researchers to engage in what they love to do, i.e. do research. This means addressing factors that currently take up a lot of their time as well as factors that would incentivize them to aim for higher impact of their research. At the same time, mentoring, developing the skills needed to publish in high-impact journals, and establishing collaborative arrangements with reputable academics who can provide access to promising publication opportunities require attention from the perspective of the management of research groups and R&D institutes. Specific recommended practices include:

- 1. Professionalize the project management and managers** by assigning full time project managers to R&D projects and relieve researchers from project management duties;
- 2. Encourage high-quality publications**, especially publishing in Q1 journals: Incentivizing researchers to publish in leading international journals will increase the global visibility of the departments. Specific measures that can help to achieve this include organising writing retreats for junior and senior researchers, awarding prizes for high-impact publications, and providing grant writing support, all of which will encourage higher standards of research output.
- 3. Establish seed grants to support interdisciplinary projects.** Interdisciplinary research, done on top of disciplinary research has been shown to increase total research output and leading to a more effective division of labour within research groups:
- 4. Increase international collaboration of R2 and R3 researchers.** Promoting co-authorships with international researchers can enhance the quality of research and increase citation rates. Additionally, fostering interdisciplinary research will lead to more innovative and widely applicable research outcomes.



4. Suboptimal knowledge transfer levels

Challenge

A recurring and persistent problem is the limited level of knowledge transfer between Estonian enterprises and the research community and universities. No one doubts that it is crucial for fostering innovation in both business and research, for driving R&D-intensive economic growth, and for addressing societal challenges (Cazón-Martin, 2023). Conversely, businesses provide universities with real-world problems and challenges that can inspire academic research and lead to more relevant and impactful studies (Tolin, & Piccaluga, 2025). Increasing this is also set as a key task for Estonian universities, including the establishment of various progress indicators to measure this. For example, core funding is strongly linked to the success in providing R&D services to private companies and public institutions; the higher the volume of such contracts, the higher the core funding of a university.

There are also a number of supporting structures that should increase the volume of such contracts: 1) technology transfer offices in universities; 2) industrial placements and cross-industry mobility schemes for researchers and especially PhD students, including separate industrial PhDs; 3) formalised knowledge exchange networks and business accelerators designed to spin-off ideas from universities and find investors for promising early-stage R&D results; 4) semi-formalised seminar and workshop support schemes for idea exchange; 5) joint R&D grant schemes for industry and university research (Ribeiro, Jorge, Plonski & Gibson, 2025). Nevertheless, Estonia is lagging significantly behind in its ability to attract private R&D funding for university researchers. Please see Jaanson&Noormaa (2022) for a more detailed discussion of the options and choices for funding R&D in Estonia. This comes at a time when direct business R&D expenditure is reaching record levels (ERR 2024).

The main problem, therefore, is not necessarily a lack of willingness from companies to invest in R&D, a deficiency in structured cooperation mechanisms, or a lack of institutional motivation from universities. Instead, it is the failure to transfer this motivation to individual researchers, leading to a mismatch between what companies want to spend on R&D and what researchers are able and willing to do to meet this demand.

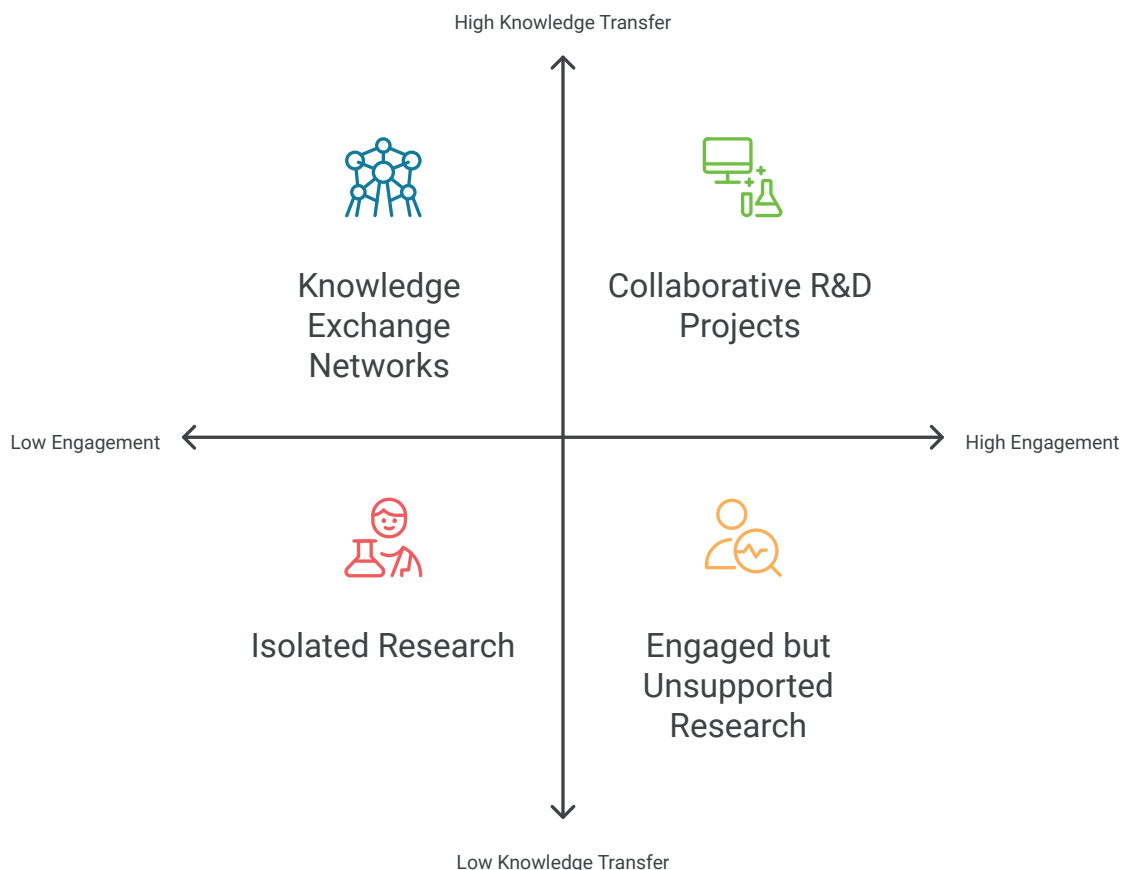
The work of individual researchers is measured in four dimensions: 1) research output, measured primarily (if not exclusively) by publications and secondarily by R&D funding attracted; 2) teaching output, measured by courses taught and supervision; 3) management tasks performed, measured by involvement in internal university management; 4) societal impact, measured by various engagement roles and activities in consultancy and outreach.

Engaging in applied research for an R&D service contract primarily falls under the first dimension, but is often not seen as attractive by researchers. This is because such contracts do not fund the production of papers and are often not a substitute for an R&D grant, but come on top of all research and teaching obligations. In addition, these contracts are often at odds with the academic calendar, which does not accommodate rapid, intensive R&D sprints for companies that demand 100% commitment for shorter or longer periods.

When this is combined with a lack of financial incentives for researchers, as the contract is signed with the university and is often used to support rather than supplement salary levels, researchers may be effectively discouraged from seeking such contracts. This is true even where knowledge transfer structures are in place, private R&D funding is available and institutional interest is clearly articulated and measurable.



Balancing Researcher Engagement and Knowledge Transfer



Recommendations

This is arguably the most difficult problem to solve, as it involves both the researcher and the private R&D funder, but there are possible avenues to consider:

- 1. Add cooperation with businesses as one work performance measure of individual researchers.** It is clear that not everyone will nor have to do R&D service contract work, but then at least take that as one possible core measure of job performance;
- 2. Introduce financial motivation packages for individual researchers as part of R&D service contracts.** The ability to top off pay might incentivize more researchers to engage in R&D service contract work;
- 3. Use part of R&D service contract overhead funds to fund paper writing on the same project.** As private R&D funders or businesses do not commission research output in terms of papers, but actual outcomes they are as rule not really interested in funding paper writing.

We propose smaller-scale managerial changes aimed primarily at the management of research groups and R&D organisations, focusing on changing individual motivations, removing specific individual barriers and increasing access to resources for researchers to enable and empower them to overcome these challenges.

These recommendations should therefore be easier to implement within existing structures and institutional environments.



III Recommendations for Future Development and Conclusion

Estonian research is highly impactful, as shown by the Essential Science Indicators (ESI). When considering the size of the research community, Estonian science is among the top 5 countries with the most cited research over a given period (Allik & Lauk 2023). This suggests that the research output is small but of high impact. However, many challenges remain. This white paper focused on four of them:

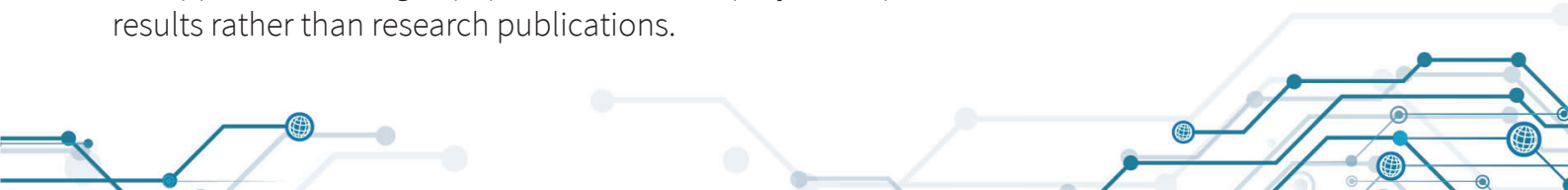
1. recruiting and retaining young talent;
2. outsized dependence on competitive funding;
3. publishing high impact research in volumes;
4. suboptimal knowledge transfer levels.

The proposed solutions are small and practical. For the first challenge, we propose to limit the teaching load of R2 researchers to no more than 20% of working hours, similar to R1, to free up more time for R&D work. Second, prioritise R2 researchers in grant writing support and establish an academic mentoring scheme to alleviate funding pressures. Third, involve R1 PhD students and early career researchers in the conceptual stages of larger research projects to familiarise them with standard practices without funding pressure. Finally, establish clear promotion pathways for R1 researchers for effective career planning, map university support services, and assign individual academic mentors to each R1 and R2 researcher.

In response to the second challenge, we recommend, first, that project-based funding be partially matched with core funding to reduce reliance on projects and to establish bridging funding schemes for groups between projects. Second, invest in developing grant writing services within universities, in particular by providing professional grant and proposal writers to promising R2 to R4 researchers. Third, develop expertise in data management and AI by investing in the capacity to handle and analyse large datasets. Finally, create ‘dream team’ groups of R2 to R4 level researchers based on their portfolios and previous research to match interdisciplinary grant calls, and assign professional project managers to these groups to develop grant proposals.

The third challenge is to professionalise project management by assigning full-time project managers to R&D projects, freeing researchers from these tasks. Second, encourage high-quality publications in leading international journals by incentivising researchers through writing retreats, awards and grant writing support. Third, establish seed grants to support interdisciplinary projects, which can increase overall research output and lead to a more effective division of labour within research groups. Finally, increase international collaboration among R2 and R3 researchers by encouraging co-authorship with international peers and fostering interdisciplinary research for more innovative and broadly applicable results.

For the fourth challenge, first, include collaboration with industry as a performance measure for individual researchers, recognising it as a core aspect of job performance. Second, introduce financial motivation packages within R&D service contracts to incentivise researchers by allowing them to top up their salaries. Finally, allocate part of the overhead costs of R&D service contracts to support the writing of papers on the same project, as private R&D funders tend to focus on results rather than research publications.



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