

Periodic Assessment of Research, Development, Artistic and Other Creative Activities VER 2026

Final Report of the Mechanical Engineering Sub-panel

Overview of the Evaluation Approach

The sub-panel Mechanical Engineering conducted a comprehensive qualitative assessment of submissions, guided by the core criteria of originality, significance, and rigour. The evaluation process emphasized expert judgement and deliberative consensus rather than reliance on quantitative indicators.

While scoring frameworks were used internally to support consistency, the final categorisation reflects a holistic assessment of each submission's intellectual contribution and scholarly quality.

The sub-panel endeavoured to ensure that evaluations were anchored in qualitative distinctions and disciplinary expectations.

Particular care was taken to calibrate assessments across sub-panel members through discussion, ensuring a shared understanding of standards.

Description of Assessment Categories

The sub-panel applied a set of qualitative categories to distinguish levels of research quality.

These categories reflect differences in originality, significance, and rigour rather than quantitative thresholds.

At the highest level, outputs are characterised by a high degree of originality, introducing novel concepts or approaches with the potential to shape the direction of the field, combined with strong methodological rigour and clear significance beyond the immediate research context.

The next level includes work of excellent quality that makes substantial and well-executed contributions, though typically building on established frameworks rather than transforming them.

Lower categories correspond to work that is methodologically sound but more incremental in nature, with more limited originality or broader impact.

The distinctions between categories are therefore primarily based on the extent to which research advances the field, the robustness of its approach, and the significance of its contribution.

1. SCIENTIFIC OUTPUTS

1.1. Scientific outputs – strengths

The sub-panel considers the overall body of scientific outputs to be of a high standard, demonstrating a strong and sustained contribution to the international research landscape. The publication record reflects well-established engagement with the global scientific community and a consistent ability to produce research of recognised relevance within the discipline.

The outputs show a clear predominance of work that can be characterised as internationally excellent or internationally recognised in quality. This is reflected not only in the choice of publication venues but, more importantly, in the intellectual contribution of the research,

which addresses relevant challenges in mechanical engineering, manufacturing technology, materials science, and related areas of production engineering.

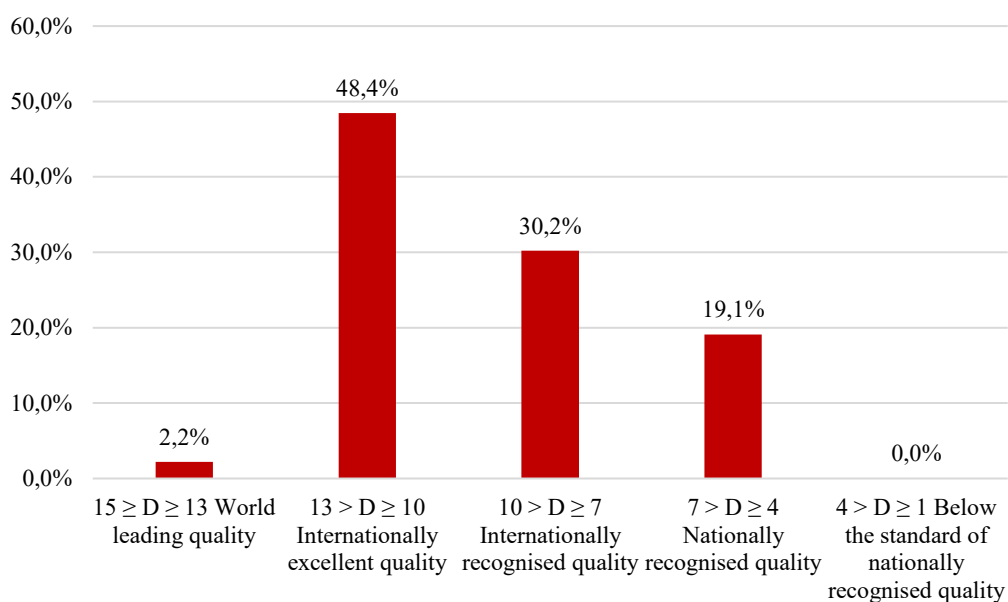


Figure 1. Percentage of publications in categories

From a qualitative perspective, the sub-panel notes that many publications demonstrate solid methodological rigour and are grounded in well-defined research questions. The work is generally coherent and technically sound, with clear links between research design, analysis, and conclusions. In several cases, the outputs show meaningful engagement with applied and industrial contexts, enhancing their broader significance.

A subset of the outputs can be considered to reach a world-leading level, particularly where research demonstrates a higher degree of originality or introduces novel approaches with the potential to shape future developments in the field. However, such contributions remain relatively limited in number.

The publication profile indicates a consistent alignment between the quality of the research and the standing of the journals in which the work appears. The sub-panel emphasises that a key strength lies in the ability of the research teams to position their work within internationally visible and relevant scholarly venues. The continuity of publication activity over the assessed period further reflects a stable and productive research environment, with well-functioning teams capable of sustaining scientific activity over time.

Overall, the sub-panel finds that the scientific outputs are characterised by strong thematic coherence, consistent methodological quality, and clear international relevance. The research demonstrates the capacity to contribute meaningfully to the advancement of the field, particularly through applied and collaborative work with industrial and external partners.

1.2. Scientific outputs – limitations

Despite the overall high quality of the outputs, the sub-panel identifies several areas where further development would strengthen the research profile. In particular, while a number of contributions reach a very high standard, the proportion of outputs demonstrating clearly world-leading characteristics remains limited. Further progress in this area will depend on fostering research with a stronger degree of originality and transformative potential, capable of advancing the discipline in more fundamental ways.

The publication profile also suggests scope for a more strategic positioning of outputs within the most visible and influential international venues. While the current publication practices ensure solid international presence, a more selective approach - prioritising the most impactful and innovative results - could enhance the overall visibility and scientific influence of the work.

Some variability in the quality and ambition of outputs is also evident. This indicates an opportunity to further strengthen internal quality selection processes and to focus efforts on research that offers the greatest potential for significant contribution.

In addition, although international engagement is evident, there is scope to deepen and expand collaboration with leading research institutions. Sustained and strategic international partnerships would support the development of more ambitious research projects and contribute to increasing both the originality and global impact of future outputs.

1.3. General conclusions on scientific outputs

In summary, the sub-panel concludes that the scientific outputs represent a strong and coherent body of work with clear international relevance, demonstrating consistent methodological rigour and engagement with both fundamental and applied aspects of the field.

The research makes a meaningful contribution to the advancement of mechanical engineering and related disciplines, particularly through its links to practical applications and collaboration with external partners.

At the same time, the sub-panel identifies several areas for further strengthening. In particular, increasing the proportion of outputs with clearly world-leading characteristics will require fostering research with greater originality and transformative potential.

A more strategic and selective approach to publication - prioritising the most impactful contributions - would further enhance visibility and scientific influence. Additionally, deeper and more sustained international collaboration with leading research institutions would support the development of more ambitious research and increase global impact.

2. SOCIAL IMPACTS

The sub-panel conducted a qualitative assessment of social impacts based on 19 case studies submitted by 9 scientific institutions. The evaluation focused on the relevance, reach, and demonstrable effects of research beyond academia, as well as the strength of the connection between underpinning research and observed societal outcomes.

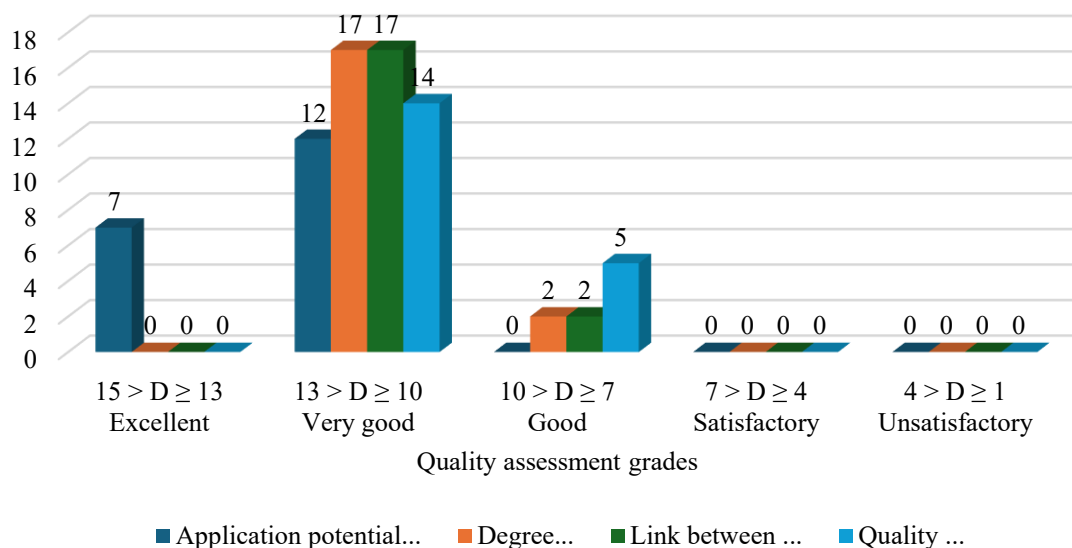


Figure 2. Number of individual categories for social impact.

2.1. Application potential of underpinning research

The sub-panel finds that the underpinning research across the assessed cases demonstrates a consistently strong potential for practical application. The research is generally well aligned with real-world challenges and shows clear pathways to implementation within socio-economic contexts.

Many cases reflect close collaboration with external stakeholders, including industry and public sector partners, which enhances the applicability and relevance of the research.

Overall, the work is characterised by a clear orientation towards use, with outcomes that are capable of informing practice, supporting innovation, or contributing to technological and societal development.

2.2. Degree of social impact

The assessed cases indicate that research activities have led to tangible and meaningful societal effects. In most instances, the impact extends beyond immediate academic outputs and contributes to observable changes in industrial practices, technological development, or broader socio-economic contexts.

While the scale and reach of impact vary across cases, the sub-panel notes that the majority demonstrates clear and credible benefits. These impacts are often realised through sustained engagement with external partners and through the translation of research results into applied solutions.

2.3. Link between underpinning research and social impact

The sub-panel observes a generally strong and well-articulated link between the research conducted and the resulting social impact. In most cases, it is possible to trace a clear pathway from research findings to their application in practice.

This connection is supported by coherent narratives and, in many instances, by evidence of collaboration with stakeholders involved in implementation. The ability to demonstrate this link reflects positively on the strategic orientation of the research towards achieving impact beyond academia.

2.4. Quality of evidence of social impact

While the majority of cases provides credible evidence supporting claims of impact, this area shows the greatest variability. In several instances, the documentation of impact could be strengthened through more systematic and detailed evidence.

In particular, there is scope to enhance the use of measurable indicators, longitudinal data, and formal validation from external partners. More structured approaches to impact monitoring and reporting would improve the robustness and transparency of the evidence base.

2.5. General conclusions regarding social impact in institutions

Overall, the sub-panel concludes that the social impact of the assessed research is strong, particularly in terms of its application potential and the clear linkage between research and its practical outcomes. The institutions demonstrate a consistent ability to translate research into societal and economic value.

At the same time, further strengthening is needed in the systematic documentation and evidencing of impact. Developing more structured and comprehensive approaches to capturing impact would enhance the credibility and visibility of these contributions.

3. CREATIVE ENVIRONMENT

The sub-panel conducted a qualitative assessment of the creative environment based on 9 cases submitted by 9 scientific institutions. The evaluation focused on the extent to which institutional strategy, scientific profiling, staffing conditions, collaboration patterns, and overall workplace sustainability create an environment conducive to high-quality research, scientific development, and broader societal relevance.

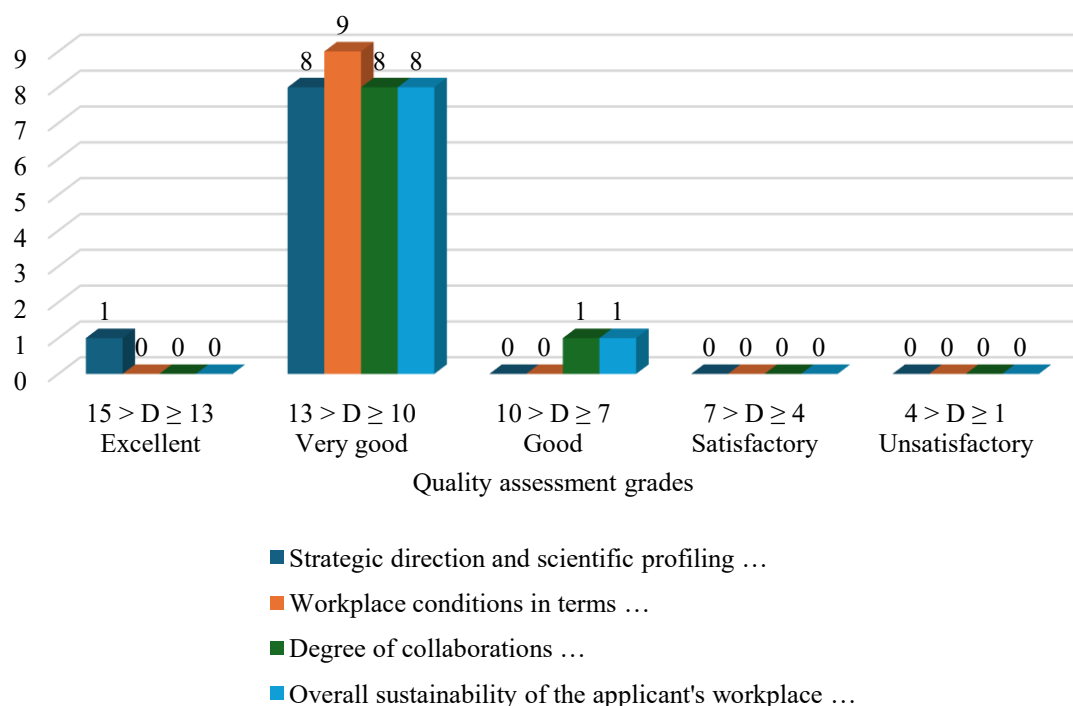


Figure 3. Number of individual categories

3.1. Strategic direction and scientific profiling of the submitting institution in the area of research, artistic activity, and social impact

The sub-panel finds that the assessed institutions generally demonstrate a coherent relationship between their organizational structures, scientific profiles, and declared development strategies.

In many cases, research directions are clearly articulated and aligned with the expertise of specific institutes, departments, or research teams, which supports the concentration of knowledge and the development of identifiable areas of specialization.

A notable strength across the cases is the effort to combine fundamental and applied research within a broader strategic vision. Several institutions show an awareness of the

importance of linking scientific development with wider societal and economic challenges, including through engagement with external stakeholders and participation in national and international research programs.

At the same time, the clarity and focus of strategic positioning vary across institutions. In some cases, research priorities remain relatively broad, making it more difficult to identify a distinctive scientific profile or a clearly prioritised long-term direction. Where thematic fragmentation is present, this may reduce the visibility and critical mass of institutional strengths.

Overall, the sub-panel considers strategic direction and scientific profiling to be one of the stronger dimensions of the creative environment. Further progress would benefit from sharper prioritisation of key areas of excellence and from more explicit alignment between institutional strategy, research specialization, and long-term societal needs.

3.2. Workplace conditions in terms of staffing for the creative environment

The sub-panel considers staffing conditions to provide an adequate basis for scientific activity, although this dimension appears somewhat less developed than the strategic and collaborative aspects of the assessed environments. In most institutions, research is supported by teams with the expertise and capacity necessary to conduct projects, publish results, and participate in broader academic activities.

A positive feature observed in several cases is the presence of transparent recruitment, evaluation, and promotion procedures, along with opportunities for professional development through conference participation, training, and research mobility. These elements contribute to an environment that can support both individual growth and collective research capacity.

However, some limitations are also evident. In particular, the sub-panel notes that a number of institutions appear to face challenges related to generational balance and the renewal of research staff. In some cases, the pipeline of early-career researchers and doctoral candidates appears limited relative to the institution's longer-term development ambitions. This may affect continuity, dynamism, and the future sustainability of research teams.

The sub-panel therefore sees scope for further strengthening staffing conditions, especially through measures aimed at attracting young researchers, supporting career progression, and enhancing the international openness of recruitment. More structured mentoring and talent-development mechanisms would also contribute positively to the creative environment.

3.3. Degree of collaborations and their contribution to the relevant research area and workplace

The sub-panel finds that scientific collaboration constitutes an important and generally well-developed element of the creative environment across the assessed institutions. Many cases demonstrate active participation in national and international research networks, as well as collaboration through joint projects, applied research, technology transfer activities, and research consortia.

Partnerships with industry are particularly significant in several institutions and contribute positively to the relevance, applicability, and visibility of the research. Such collaborations often strengthen the connection between scientific work and practical implementation, while also enriching the workplace through access to broader expertise, external challenges, and additional funding opportunities.

Nevertheless, the depth and sustainability of collaborative activity vary. In some cases, international collaboration appears to be project-based rather than embedded in longer-term strategic partnerships. Similarly, participation in large-scale European research

programs is not equally strong across all institutions. Where collaboration remains limited in scope or duration, its contribution to institutional development may be more restricted.

Overall, the sub-panel views collaboration as a clear strength, while also identifying room for further development. In particular, stronger strategic international partnerships, deeper engagement in European research frameworks, and continued strengthening of industry links would enhance both the research environment and the broader institutional profile.

3.4. Overall sustainability of the applicant's workplace, considering its strategic direction, scientific profiling, collaboration and staffing conditions for creative activity

The sub-panel considers the overall sustainability of the assessed workplaces to be generally sound. The institutions typically demonstrate the core conditions necessary for the continued development of scientific activity, including functioning research structures, access to infrastructure, established collaboration networks, and a degree of organizational continuity.

An important strength is the presence, in many cases, of laboratory and instrumentation facilities that support experimental work and the implementation of applied research. These material conditions, combined with scientific expertise and collaborative activity, create a reasonably stable basis for both current performance and future development.

The sub-panel also notes that several institutions benefit from diversified funding structures that include public resources, competitive grants, and collaboration with external or industrial partners. This diversity supports resilience and provides greater flexibility in sustaining research activity over time.

At the same time, some vulnerabilities remain. In certain cases, funding appears to depend heavily on public sources, which may limit adaptability or long-term capacity growth. In addition, research infrastructure is not always sufficiently embedded in broader

international networks, which can reduce opportunities for visibility, exchange, and strategic development.

In summary, the sub-panel finds that the workplaces assessed are generally sustainable, but that long-term resilience would be further strengthened by broader funding diversification, continued investment in people and infrastructure, and stronger integration into international research ecosystems.

3.5. General conclusions regarding creative environment aspects in institutions

Overall, the sub-panel concludes that the assessed institutions provide a generally stable and supportive creative environment for scientific activity.

The strongest aspects are the relative coherence of strategic direction and scientific profiling, as well as the presence of meaningful collaborative activity that supports both research quality and broader relevance.

The institutions demonstrate that they possess the essential organisational, human, and infrastructural foundations needed to conduct research effectively. In many cases, these foundations are complemented by external partnerships and an orientation towards socially and economically relevant challenges.

At the same time, the evaluation also points to several recurring areas for further strengthening. These include the need for more focused long-term strategic prioritization in some institutions, greater investment in the renewal and development of human resources, and stronger embedding in sustained international collaboration structures.

The sub-panel therefore considers the overall creative environment to be solid and functional, with clear strengths but also with opportunities for further enhancement. Future development should focus in particular on strengthening internationalisation, improving

talent recruitment and retention, and reinforcing strategic partnerships that can support a more dynamic, distinctive, and sustainable research environment.

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