The Research Council of Norway

Evaluation of Mathematics, ICT and Technology 2023-2024

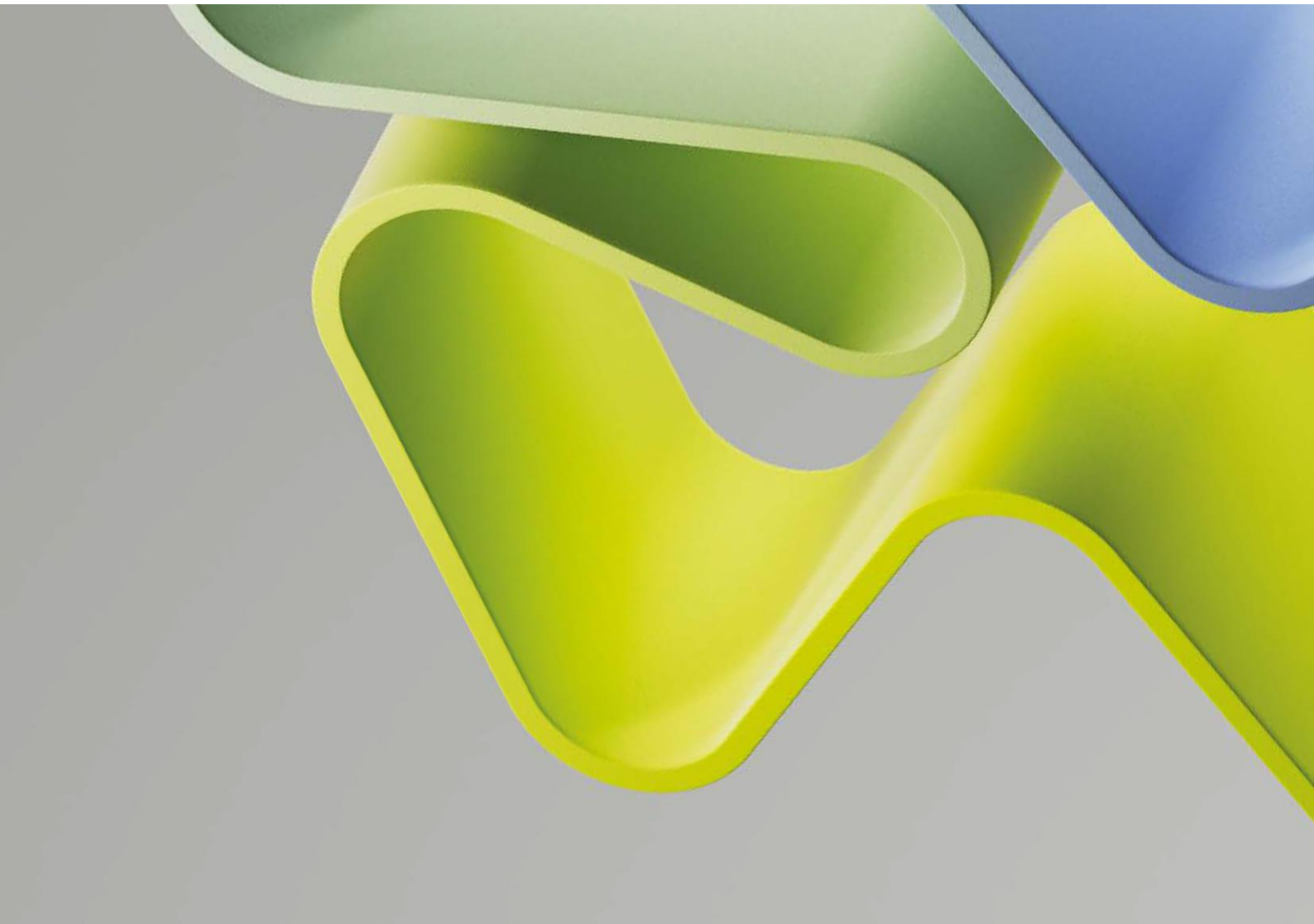
Evaluation Report for Administrative Unit

Administrative Unit: **Department of Electrical Engineering (IET)**

Institution: **UiT The Arctic University of Norway**

Evaluation Committee Higher Education Institutions 3

December 2024



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The members of this Evaluation Committee have evaluated the following administrative units at the higher education institutions/research institutes within Mathematics, ICT and Technology 2023-2024 and has submitted a report for each administrative units:

- Department of Industrial Technology, UiT The Arctic University of Norway
- Department of Electric Energy (IEL), Norwegian University of Science and Technology (NTNU)
- Department of Marine Technology (IMT), Norwegian University of Science and Technology (NTNU)
- Department of Mechanical and Industrial Engineering (MTP), Norwegian University of Science and Technology (NTNU)
- Faculty of Engineering and Natural Sciences (FIN) / Faculty of Technology, Environmental and Social Sciences (FTMS), from 1.1.2026, Western Norway University of Applied Sciences (HVL)
- Department of Mechanical, Electronic and Chemical Engineering, Oslo Metropolitan University (OsloMet)
- Faculty of Computer Science, Engineering and Economics (IIØ), Østfold University College (ØUC)
- Department of Electrical Engineering (IET), UiT The Arctic University of Norway
- Department of Technology and Safety (ITS), UiT The Arctic University of Norway
- Department of Electrical Engineering (IT) and Cybernetics (EIK), University of South-Eastern Norway (USN)
- USN School of Business, University of South-Eastern Norway (USN)
- Department of Microsystems (IMS), University of South-Eastern Norway (USN)

The conclusions and recommendations in this report are based on information from the administrative units (self-assessment), digital meetings with representatives from the administrative units, bibliometric analysis and personnel statistics from the Nordic Institute for Studies of Innovation, Research, and Education (NIFU) and Statistics Norway (SSB), and selected data from the National survey for academic staff in Norwegian higher education and the National student survey (NOKUT). The digital interviews took place in the autumn 2024.

The members of the Evaluation Committee are in collective agreement with the assessments, conclusions and recommendations presented in this report. None of the committee members has declared any conflict of interest.

The Evaluation Committee has consisted of the following members:

Professor Lina Sarro,
Delft University of Technology (Chair)

Professor Stefania Bruschi,
University of Padova

Professor Khaled Ahmed,
University of Strathclyde

Professor Andreas Müller,
Johannes Kepler University Linz

Professor Maria Teresa Correia de Barros,
University of Lisbon

Professor Kostas J. Spyrou,
National Technical University of Athens

Description of the Administrative Unit

Department of Electrical Engineering (IET)

UiT The Arctic University of Norway (UiT)

The administrative unit

IET works in electrical power technology, electronics and increasingly in satellites and satellite technology. It has two professors (1 woman), 11 associate professors (1 woman). There are 7 PhD candidates (1), 4 assistant professors (2) and one (male) post-doc.

The research groups of the administrative unit

IET has two research groups

- Electro-mechanical systems (details below)
- Mathematics and science didactics, which is newly established and was therefore not submitted to EVALMIT

The unit's work and strategies

Like other units at UiT, the Department of Electrical Engineering does not have its own articulated strategy, but follow strategic vision, missions, and ambitions in UiT's top-level strategy to develop the High North, focusing on:

- The Arctic and High North
- The major societal challenges
- Talent development and diversity

The Department prioritises and allocates its resources at plenary department meetings. UiT provides central support to career development and innovation.

The unit's work in its sector

The unit has three Batchelors programmes and two masters programmes, and also a small PhD activity. Commercialisation is handled centrally by the university. While the unit emphasises that its research is applied and depends upon industry contact, it also points out that its innovation and industrial project activities are small.

The future of the unit

Not discussed in the self-evaluation.

Overall Assessment

The Department of Electrical Engineering (IET) follows the strategy defined at top-level by the Arctic University of Norway, aiming at developing the High North. This strategy has 3 axes: Arctic and High North, major societal challenges, and talent development and diversity.

The administrative unit highlights as Terms of Reference (1) the research production, quality and integrity and (2) the relevance to society.

IET encompasses two active research groups: Electromechanical systems (ElMech) and Mathematics- and science didactics. Although only ElMech is under evaluation, it should be noted that the research conducted by the other group is on education in general, not within the scope of Electrical Engineering. It was set up too recently to be part of the EVALMIT evaluation.

The ElMech group has a well-organised planning process with focus on applied research and applications for electromechanical systems. It performs with a good quality along four lines: electrification, energy conversion and wireless battery charging technologies and in control engineering applications on unmanned aerial vehicles. These topics are relevant for the Artic and the High North and are well aligned with the objectives on sustainability. The quality is attested by publications in highly-ranked, peer-reviewed journals. Notwithstanding, the international visibility is very low.

The well-organised planning is a strength. The wide diversity of applied research topics in a small group of researchers, some with a very high teaching load, may lead to fragmentation.

The number of PhD students is small, lower than the number of staff members. This allows a close supervision of PhD students that may be considered a strength, but in itself is a weakness that seriously impacts research production and prevents the administrative unit establishing a reputation as University Faculty.

Collaboration with local industry is relevant, although limited. Public outreach of research results is also limited.

Part of the teaching staff does not hold a PhD and there is an excessive teaching load that affects research and public outreach.

The unit has a significant gender imbalance.

The Terms of Reference for the administrative unit is attached to the report.

Recommendations

Based on the overall assessment of the Department of Electrical Engineering at the Arctic University of Norway, the Evaluation Committee recommends the following:

1. To refine the department's research strategy which, while aligned with the university's overall research strategy, should be to emphasise its unique characteristics relevant to the High North. This includes outlining a clear plan effectively to implement the strategy at the local level.
2. To define clear benchmarks, and regularly evaluate activities and outcomes.
3. To build stronger links with local stakeholders, ensuring that the community and regional industry may benefit from the closeness with an institution whose research strategy is to “Develop the High North”.

4. To implement reasonable and sustainable strategies to balance teaching and research responsibilities across the research groups, ensuring uniform research engagement and productivity.
5. To pursue additional national and industrial funding, especially from local companies, to diversify and stabilise research funding sources.
6. To set-up a clear strategy for recruitment of permanent staff as well as PhD students and Post-Docs. This should include to increase the number of PhD students, to strengthen recruitment efforts to attract PhD-qualified professors and to develop adequate initiatives to increase the percentage of female professors.
7. To encourage the Assistant Professors to pursue a PhD and create the necessary conditions for their success.
8. To establish internal incentives or support mechanisms to increase publication rates and improve citation impact, encouraging equitable contributions across the department.
9. To encourage the development of scientific competencies and networking through sabbaticals and fellowships at leading research institutions. The department should work to reduce teaching obligations, enabling staff to take full advantage of these opportunities.
10. To invest in state-of-the-art research infrastructure and increase participation in both national and international research networks, ensuring equitable access for all researchers.
11. To strengthen efforts to disseminate research findings to enhance the visibility of the administrative unit's research outcome.

1. Strategy, Resources, and Organisation of Research

The administrative unit IET (Department of Electrical Engineering) does not have its own articulated strategy, nor does it define its lines of research and innovation.

IET follows the strategic vision of the Artic University of Norway (UiT), contributing to the defined mission and ambitions. The ultimate strategic top-level objective is Developing the High North, by:

- Being international leaders on developing and disseminating knowledge about the Artic and the High North;
- Contributing to solutions for major societal challenges, covering climate and environment, food security, demography, and health;
- Being a centre for talent development based on diversity.

However, IET relies on the development plans established by the research groups, thus research activity is defined at the research group level.

The main strategic objective of the administrative unit is providing the required resources.

IET is organised in two research groups: Electromechanical systems (ElMech) and Mathematics- and science didactics, this one having been recently established. Therefore, only the ElMech research group is evaluated. However, it is important to decide how the two research groups will coordinate research activities in the future, as this impacts the cohesiveness and adequacy of the administrative unit's organisation for its research activities.

1.1 Research Strategy

Academic freedom is respected, and The department does not have specific research and innovation fields or foci, arguing that it respects academic freedom. Research groups are required to have a 5-year development plan. The research group on Electromechanical systems (ElMech), founded in 2000 along with the establishment of UiT/ Faculty of Engineering Science and technology (IVT) has a well-organised planning process. The focus is on applied research and applications for electromechanical systems, four topics being identified: electrification, energy conversion and wireless battery charging technologies and in control engineering applications on unmanned aerial vehicles. These topics are relevant for the Artic and the High North and are well aligned with the objectives on sustainability.

So far, the research strategy has contributed to promoting high quality and productivity in research and its contribution to innovation. The research environment can be further improved.

Researchers are not assigned to a specific research group. They choose to be members of one or more research groups, either within the department or any other department in the university. This may impact negatively on developing the research environment and promoting high quality and productivity in research.

The research group on Electromechanical systems (ElMech) has a well-organised planning process. The focus is on applied research, four topics being identified. The specific research projects are in line with the areas 1. “The Arctic and High North” and 2. “The major societal challenges” of top-level strategy, thus meeting strategic goals related to institutional strategies and scientific priorities.

Considering that the focus is on applied research, the fact that half of the bachelor and master theses are done in connection with industry is positive. Such collaboration includes the identification of topics and supervision.

Area 3 of the top-level research strategy being “Talent development and diversity”, it is noticed that there is a very good supervision of students, but the unit should pay more attention to diversity. In particular, the research staff is not gender balanced (overall, 16% women, 84% men). There is balance in Professor and Assistant Professor categories, but only 9.1% of Associate Professors are women. Furthermore, only 14.3% of PhD candidates are women.

Recommendation:

- The administrative unit should establish and pursue goals on diversity, including gender balance.

1.2 Organisation of Research

The IET encompasses two active research groups: Electromechanical systems (ElMech) and Mathematics- and the recently established science didactics group. Therefore, only the ElMech research group is evaluated. The group on Mathematics and science didactics conducts research on Pedagogy and is hosted by IET is due to its leader belonging to this administrative unit. It is not likely that the two research groups will coordinate research activities in the future, so to achieve global strategic goals.

There is a research support team, led by the UiT vice dean of research and development, assisting the department. Further to monitoring achievement of the research goals, the research support team promotes cooperation with external entities and assists the research groups on project proposals and organisation of workshops.

The ElMech research group focuses on a diversity of application topics, which is not reflected in the organisational structure.

The fact that researchers are not assigned to a specific research group, possibly being members of one or more research groups, either within the department or any other department in the university, may be a matter of concern. There is no structure for supporting researcher career opportunities at the department. It only exists at university level. Career opportunities for PhD candidates are discussed in a yearly seminar at the department level. There are guidelines for eligibility and applications for “Research and education sabbatical, including mobility for faculty members”. However, at IET only outbound mobility of PhDs took place. There was no outbound mobility of faculty members or Master students. IET receives undergraduate students and PhD candidates, specifically for performing experimental work. Summer schools, workshops and seminars are organised for students from Norway and other Europeans countries.

The split between research and teaching time is different per staff category: 50/50 % for Professors and Associate Professors, 30/70% for Associate Teaching Professors, and 20/80% for Assistant Professors. The latter are teaching staff, not holding a PhD, which explains their extremely high teaching load, and may have a negative impact on the education of masters students. Furthermore, only Professors and Associate Professors (2+11) can conduct training and mentoring of PhD candidates and post-docs/young researchers. It is noticed that their number is higher than the number of PhD candidates and Post Docs (7+1). PhD candidates are jointly supervised by two researchers, can be a good concept if their expertise is complementary and justified by the thesis coverage. Otherwise, it may result in a loss of efficiency.

Given the above, the organisation of research could be improved.

Recommendation:

- The administrative unit should promote recruitment of PhD. Candidates.

1.3 Research Funding

Funding for research activity is provided by the administrative unit/university and by external entities. These include the Research Council of Norway, the EU through framework programmes, regional counties and industry. Internal funding is provided in the form of regularly awarded PhD and Postdoc positions, in addition to own share in research projects.

The ElMech group has been quite active in applying for research funding. The role of the administrative unit is not clear, as at higher level, the research support team, led by the UiT vice dean of research and development, provides assistance. The group's activities are mainly financed by externally funded research projects. The group has an equivalent of governmental funding of two PhD positions permanently, and also receives a small amount of core funding from the administrative unit for the group's overall activities as well as support for members who lack project funding. Most external funding comes from RCN. Obtaining funding from industry is very important, but has yet to reach 10% of research income. Overall, the research funding per group member is small and shows very large fluctuations.

The ElMech group got European grants and it is understood that a significant amount of international research funding was also applied in grants, but the amount is not specified.

The group reports that an increase of the total amount of external funding is expected in future, corresponding to several larger projects financed by the Research Council of Norway and Horizon Europe.

Recommendation:

- The administrative unit should improve its international visibility and public outreach. This can help the unit access funding by increasing collaboration in research projects and attract the attention of industry and decision-makers in politics and in funding organisations.

1.4 Research Infrastructures

The administrative unit mentioned participating in the E-infrastructure Library. No participation on other national or international infrastructure was reported.

Recommendation.

- The administrative unit is encouraged to establish partnerships aiming at participating in national and international infrastructures.

1.5 National and international collaboration

In line with the university policy, the department gives preference to collaboration in the Nordic/Artic region, so the geographical affinity appears to be prioritised over a research area affinity. Collaboration with 4 national and 1 international institution is identified. Success of the collaboration is considered moderate by the administrative unit.

Given the applied nature of the research conducted, it is important for the unit to collaborate with industry. However, overall financing of research by industry is very small (about 1% of research income).

Recommendation:

- The administrative unit should promote international collaboration, including research projects and staff exchanges with research universities.

1.6 Research staff

There are 25 researchers (2 Professors, 11 Associate Professors, 4 Assistant professors, 7 PhD candidates and 1 Post doctor), including 14 permanent positions (2 Professors, 9 Associate Professors and 3 Assistant professors), and 11 temporary positions (2 Associate Professors, 1 Assistant professors, 7 PhD candidates and 1 Post doctor). Gender unbalance is pronounced. No information was provided on what PhD programmes the PhD candidates are pursuing.

The teaching time for Assistant Professors (70%) is higher than for Professors and Associate Professors (50%). The administrative unit orally reported that this is bound by law. Assistance Professors are teaching staff, not holding a PhD degree. This impacts negatively research, as well as education of master students, and only Professors and Associate Professors can be involved in training and mentoring of PhD candidates and post-docs/young researchers.

There are guidelines for eligibility and applications for research leave/sabbaticals, but we the resulting numbers must be increased, since members of staff are reluctant to spend time abroad.

Recommendation:

- The administrative unit should encourage the Assistant Professors to pursue a PhD and create the necessary conditions for their success.

1.7 Open Science

The open access publishing statistics for the department of Electrical engineering does not show a pattern, since the percentages of Archived, Gold OA and Not OA varying from year to year, rather than following a trend. This suggests that no clear policy has been implemented.

Researchers are encouraged to publish research results scientific papers, research data, software and tools) in repositories, following the policy “as open as possible, as closed as necessary”. The impact that this policy had, so far, on visibility of the unit is not clear.

Project leaders and researchers have full responsibility for publication. There appears to be no institutional data management system.

Recommendation:

- To promote open science, the administrative unit should debate publishing options aiming at defining a policy. Funds necessary for Gold OA should be made available.

2. Research production, quality and integrity

The IET encompasses two active research groups: Electromechanical systems (ElMech) and Mathematics- and science didactics, this one having been recently established. Therefore, only the ElMech research group is evaluated. Given the nature of research conducted by the other group, so called on Mathematics and science didactics, it is not likely that the administrative unit can benefit from coordinated research activities by the two groups.

The ElMech research group comprises 15 scientific staff members (2 professors, 9 associate professors and 4 assistant professors). Overall, the department has 17 staff members, meaning that 2 associate professors are not included in the research group.

Three research areas are identified: (1) electricity distribution, production, storage and use (research on icing on grid structures and renewable energy, focusing on the energy situation in remote or isolated areas); (2) energy conversion and power electronic applications (Research on electric transport and integration of hydrogen fuel cells and batteries); (3) autonomous platforms (research on control methods and experimental verification for satellites, drones and marine vessels).

The department does not have a research integrity policy, nor established preventive measures, relying on the university “Guideline for research ethics”.

2.1 Research quality and integrity

Research group Electromechanical systems (ElMech) overall assessment

The group has a well-organised planning process and performs with a very good quality in a variety of subjects. Although the group claims being interdisciplinary, all research topics are on systems and control engineering with a theoretical frame of system and control theory and sensor technology. The applications are diverse, to power engineering on the one side and autonomous vehicles or satellite control on the other.

The well-organised planning is a strength. The wide diversity of applied research topics in a small group of researchers, some with a very high teaching load, may lead to fragmentation. Another strength is a close supervision of PhD students, of whom there are fewer than there are staff members. The group can rely on usually one new PhD position every two years. This is a weakness that seriously impacts research and prevents the administrative unit on establishing a reputation as University Faculty. Notwithstanding, the quality of research is

attested by publications in high-ranked peer-review journals and is higher than could be expected given the low average funding per person. Citation numbers (5 to 10) could be increased by promoting international collaboration that reinforces visibility.

At national level, the group collaborates with the Norwegian Research Center (NORCE) and the Foundation for Industrial and Technical Research (SINTEF). International (European) collaborations are foreseen. The group works with the local industry, attracting 9% of their total research funding. Collaboration with local industry is important as it contributes to UiT's ambition to be in the international forefront in knowledge and competence about and for the Arctic and High North. The group also contributes towards UN's sustainable development goals. However, public outreach of research results is limited.

The group's main weakness is the excessive teaching load that affects research and public outreach.

3. Diversity and equality

No specific policy or practice towards discrimination or diversity is set at the administrative unit level. It relies on the university policy and instrument: "Equality, diversity and inclusion at UiT Norway's Arctic University." Launching at UiT of the book "Gender Diversity, Equity, and Inclusion in Academia: A Conceptual Framework for Sustainable Transformation" is commendable.

Attention on diversity is required. In particular, the research personnel is not gender balanced (overall, 16% women, 84% men). There is balance in Professor and Assistant Professor categories, but only 9.1% of Associate Professors are women. Furthermore, only 14.3% of PhD candidates are women. The administrative unit is engaged on increasing this number by prioritising female candidates.

It was reported that there are candidates from all over the word, but their integration is difficult due to cultural differences.

4. Relevance to institutional and sectorial purposes

IET is responsible for three bachelor and two master programmes in the fields of electrical engineering. High quality in education is targeted with the support of high-quality research, internal seminars and UiT's organised courses on university pedagogics and research supervision.

Aiming at "Research and education for welfare, value creation and innovation" the education profile is tightly linked to the needs in the industry. The study programmes are evaluated by external examiners from other HEI and companies every third years. Specific industrial needs are incorporated in teaching activities. Research activities consider specific problems faced in industry.

IET contributes to facilitate access to education by teaching the majority of the majority of the bachelor courses online. This also contributes to efficiency, diversity and solidity of the higher education sector and research system.

5. Relevance to society

The group's relevance and impact in the fields of research and applications in electrification are very high: energy conversion and wireless battery charging technologies and in control engineering applications on unmanned aerial vehicles. However, no impact cases were

submitted and user-oriented and popular-scientific publications were not included in the submitted report. In the oral interview some impact cases were mentioned: SMART SENJA, impacting on small communities, and Storage and Demand Side Management in which social scientist were involved.

5.1 Impact cases

No impact cases were submitted.

Methods and limitations

Methods and limitations

Methods

The evaluation is based on documentary evidence and online interviews with the representatives of Administrative Unit.

The documentary inputs to the evaluation were:

- Evaluation Protocol that guided the process
- Terms of Reference
- Administrative Unit’s self-assessment report
- Administrative Unit’s impact cases
- Administrative Unit’s research groups evaluation reports
- Bibliometric data
- Personnel and funding data
- Data from Norwegian student and teacher surveys (only for HEI’s)

After the documentary review, the Committee held a meeting and discussed an initial assessment against the assessment criteria and defined questions for the interview with the Administrative Unit. The Committee shared the interview questions with the Administrative Unit at least two weeks before the interview.

Following the documentary review, the Committee interviewed the Administrative Unit in an hour-long virtual meeting to fact-check the Committee’s understanding and refine perceptions. The Administrative Unit presented answers to the Committee's questions and addressed other follow-up questions.

After the online interview, the Committee attended the final meeting to review the initial assessment in light of the interview and make any final adjustments.

A one-page summary of the Administrative Unit was developed based on the information from the self-assessment, the research group’s evaluation reports, and the interview. The Administrative Unit had the opportunity to fact-check this summary. The Administrative Unit approved the summary without adjustments.

Limitations

The Committee judged that the Administrative Unit self-assessment report was insufficient to assess all evaluation criteria fully. However, the interview with the Administrative Unit filled gaps in the Committee's understanding, and the information was sufficient to complete the evaluation.

List of administrative unit's research groups

Institution	Administrative Unit	Research Groups
UiT The Arctic University of Norway	Department of Electrical Engineering (IET)	Electromechanical systems (ElMech)

Terms of Reference (ToR) for the administrative unit

The board of Faculty of Engineering Science and Technology mandates the evaluation committee appointed by the Research Council of Norway (RCN) to assess Department of Electrical Engineering based on the following Terms of Reference.

Assessment

You are asked to assess the organisation, quality and diversity of research conducted by Department of Electrical Engineering as well as its relevance to institutional and sectoral purposes, and to society at large. You should do so by judging the unit's performance based on the following five assessment criteria (a. to e.). Be sure to take current international trends and developments in science and society into account in your analysis.

a) Strategy, resources and organisation

b) Research production, quality and integrity

c) Diversity and equality

d) Relevance to institutional and sectoral purposes

e) Relevance to society

For a description of these criteria, see Chapter 2 of the mathematics, ICT and technology evaluation protocol. Please provide a written assessment for each of the five criteria. Please also provide recommendations for improvement. We ask you to pay special attention to the following 2 aspects in your assessment:

1. … Research production, quality and integrity

2. … Relevance to society

In addition, we would like your report to provide a qualitative assessment of Department of Electrical Engineering as a whole in relation to its strategic targets. The committee assesses the strategy that the administrative unit intends to pursue in the years ahead and the extent to which it will be capable of meeting its targets for research and society during this period based on available resources and competence. The committee is also invited to make recommendations concerning these two subjects.

Documentation

The necessary documentation will be made available by the mathematics, ICT and technology secretariat at Technopolis Group.

The documents will include the following:

- a report on research personnel and publications within mathematics, ICT and technology commissioned by RCN
- a self-assessment based on a template provided by the mathematics, ICT and technology secretariat.

Interviews with representatives from the evaluated units

Interviews with the Department of Electrical Engineering will be organised by the evaluation secretariat. Such interviews can be organised as a site visit, in another specified location in Norway or as a video conference.

Statement on impartiality and confidence

The assessment should be carried out in accordance with the *Regulations on Impartiality and Confidence in the Research Council of Norway*. A statement on the impartiality of the committee members has been recorded by the RCN as a part of the appointment process. The impartiality and confidence of committee and panel members should be confirmed when evaluation data from Department of Electrical Engineering are made available to the committee and the panels, and before any assessments are made based on these data. The RCN should be notified if questions concerning impartiality and confidence are raised by committee members during the evaluation process.

Assessment report

We ask you to report your findings in an assessment report drawn up in accordance with a format specified by the mathematics, ICT and technology secretariat. The committee may suggest adjustments to this format at its first meeting. A draft report should be sent to the Department of Electrical Engineering and RCT. The Department of Electrical Engineering should be allowed to check the report for factual inaccuracies; if such inaccuracies are found, they should be reported to the mathematics, ICT and technology secretariat within the deadline given by the secretariat. After the committee has made the amendments judged necessary, a corrected version of the assessment report should be sent to the board of Faculty of Engineering Science and Technology and the RCN no later than two weeks after all feedback on inaccuracies has been received from Faculty of Engineering Science and Technology

Appendices

1. Description of the evaluation of EVALMIT
2. Invitation letter to the administrative unit including address list
3. Evaluation protocol
4. Template of self-assessment for administrative unit (short-version)

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