The Research Council of Norway

Evaluation of Mathematics, ICT and Technology 2023-2024

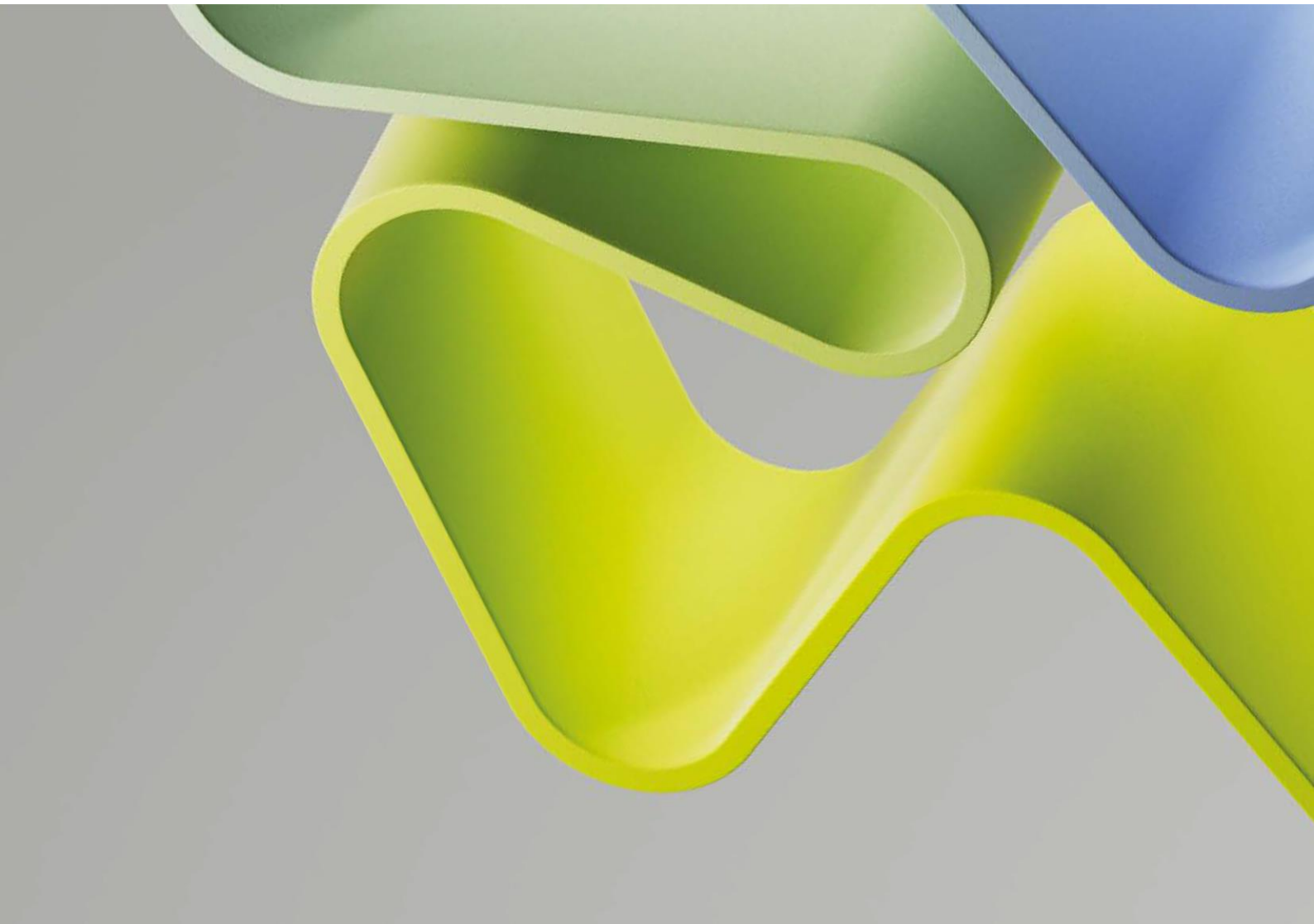
Evaluation Report for Administrative Unit

Administrative Unit: **Faculty of Engineering and Science (TekReal)**

Institution: **University of Agder (UiA)**

Evaluation Committee Higher Education Institutions 1

December 2024



Contents

Statement from Evaluation Committee Higher Education Institutions 1

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

- Department of Informatics, University of Bergen (UiB)
- Department of Mathematics, University of Bergen (UiB)
- Department of Informatics, University of Oslo (UiO)
- Department of Mathematics, University of Oslo (UiO)
- Department of Computer Science (IFI), UiT The Arctic University of Norway
- Department for Mathematics and Statistics (IMS), UiT The Arctic University of Norway
- Department of Mathematical Sciences (IMF), Norwegian University of Science and Technology (NTNU)
- Department of Computer Science (IDI), Norwegian University of Science and Technology (NTNU)
- Department of Mathematics and Physics (IMF), University of Stavanger (UiS)
- Faculty of Engineering and Science (TekReal), University of Agder (UiA)
- Department of Electrical Engineering and Computer Science (IDE), University of Stavanger (UiS)

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 consisted of the following members:

Professor Rebecka Jörnsten (Chair)
Univ. Gothenborg/Chalmers

Professor Matthias Schütt
Leibniz Universität Hannover

Professor Jan Hesthaven
École Polytechnique Fédérale de Lausanne

Professor Mads Nielsen
University of Copenhagen

Professor Tiziana Margaria
University of Limerick

Dr. Joanna Staneva
Helmholtz Zentrum Hereon

Professor Björn Engquist,
University of Texas at Austin

Professor Plamen Angelov
Lancaster University

Description of the Administrative Unit

Research at the Faculty of Engineering and Science is organized into over 25 groups, each with a leader who coordinates activities and fosters communication within and across departments. Additionally, an external funding support unit aids in identifying and managing research grants and projects, playing a vital role in helping researchers submit competitive applications.

The Faculty Board oversees the administrative and academic organization, quality assurance, and development of the study portfolio, with shared operational leadership between the Dean and the Faculty Director. From 2024, UiA (University of Agder) has implemented a unified leadership model with the Dean as the top leader of the administrative unit. The faculty includes a Vice Dean for Research and Innovation, who assists the Dean with strategic research initiatives, and a research committee led by the Vice Rector for Research that advises the University Board. Divided into four departments, each led by a Department Head responsible for education, research, and innovation, the faculty emphasizes career development for scientific staff.

In 2022, the faculty's staff comprises 63 lecturers, 80 associate professors, 63 professors, 74 Ph.D. candidates, 123 research assistants, 20 researchers, and 17 postdocs, with a notable focus on promoting gender diversity, although leadership positions show lower representation of women. The following research groups have been involved in this evaluation:

- Mathematics Education Research Group Agder (MERGA)
- Functional Analysis (FA)
- Electronics, IoT, and Mobile Communications (EIMC)
- Cyber security, systems engineering, modelling (SYSEC)
- Top Research Center Mechatronics (TRCM)
- Renewable Energy (REN)
- Civil and Structural research group (CSG)
- Centre for Artificial Intelligent Research (CAIR)

The unit's strategy, aligned with the faculty and university plans for 2021-2024, emphasizes research and development (R&D) as a core activity, targeting key impact areas such as the offshore industry, education, and digitalization. To enhance the quality and relevance of R&D efforts, the unit aims to secure external funding, strengthen professional networks, and ensure that teaching is research-based. Key objectives include improving the success rate of research applications, supporting prioritized research centers, and facilitating collaborative opportunities for PhD scholars. Additionally, the unit plans to increase administrative support for project management and promote the visibility of individual researchers and research groups, thereby creating an environment conducive to impactful and relevant research.

National and international collaboration is essential to the faculty's operations, as it underpins their relevance and existence as an academic institution. Researchers leverage their individual networks to apply for and conduct externally funded research projects, resulting in a significant portion of the faculty's publications (51% from 2012-2022) involving international co-authorship. The faculty actively organizes and participates in numerous collaborative conferences, seminars, and workshops, with 53 events held between 2015 and 2022. Additionally, the faculty has established strategic partnerships with local and national industries, public institutions, and research organizations, enhancing their impact and fostering a robust research community.

Overall Assessment

The Faculty of Engineering and Science, henceforth referred to as the administrative unit, is a large administrative unit comprised of several research groups and constellations of varying size and research standing. When considered as a whole, the administrative unit is not doing well in terms of external funding and is highly heterogeneous and several research groups within the administrative unit have been highly successful. Likewise, while several research groups, or individual faculty members, publish in top-rated journals and are internationally recognized as excellent researchers, other groups are less active, have low visibility and productivity.

The administrative unit collaborates with local industry, other administrative units in Norway as well as with administrative units abroad. Again, these activities are unevenly spread throughout the faculty.

In this report, a number of detailed comments and recommendations are provided. Taken together, the comments and recommendations can be summarized as follows.

Strengths:

- The administrative unit has identified three research groups which are prioritized: CAIR, mechatronics and MatRIC (MERGA). Of these, CAIR and MERGA are examples where the administrative unit has strength that can be built upon to increase visibility, funding levels and scientific impact. Mechatronics has received center funding and represents an opportunity for the administrative unit to consolidate and increase industry involvement going forward.
- There are several strong research groups at the administrative unit that are internationally recognized.
- The administrative unit provides an enthusiastic and engaging teaching and educational environment. The academic programs are reviewed for content and relevance and students are involved in innovation.
- The administrative unit recognizes the challenges associated with being a young university in a small town and prioritizes and encourages mobility accordingly.

Weaknesses

- The organization of the administrative unit is fragmented. There is a lack of cohesive strategic planning, in particular for professorial hires.
- The PhD program is undersized.
- There appears to be limited follow-up to evaluate the effects of prioritizations.
- There is a lack of a concrete recruitment strategy, which is highly problematic given the recent rapid growth of the administrative unit.
- The contribution, or level of productivity, within the administrative unit/research groups is uneven, which could indicate unsuccessful recruitment/mentoring of scientific staff, or limited collaboration within the administrative unit/research group.
- The level of external funding is low.
- The active involvement of industry partners, including for funding, is lower than expected given the research focus and relevance for industry of prioritized areas.

The evaluation committee considered the points raised by the administrative unit in their Terms-of-Reference document. As mentioned above, the prioritized areas CAIR and MERGA are examples of a mostly successful strategic prioritizations. That being said, MERGA could improve visibility and impact through better publication strategies (see research group evaluation for more details). The visibility and recognition of CAIR could be increased through specialization and a longer term strategy. The Mechatronics center would benefit

from more direct involvement and active partnership with industry. In addition, the research groups and the administrative unit need to review the downward trend in productivity to identify action plans to remedy this.

The administrative unit also identified infrastructure involvement as a question of special interest. However, the administrative unit report did not provide context beyond participation in various national and international infrastructures and the evaluation committee is therefore unable to provide specific comments/recommendations here.

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

Recommendations

1. The administrative unit should review the organizational structure. This includes staff composition, size and membership of research groups, as well as departmental organization.
2. The administrative unit should review the leadership organization within the administrative unit. Departments may be given more autonomy regarding strategic planning, recruitment and economic planning. The strategic thinking appears to be undertaken far from the active research environments. In particular hiring priorities should be driven by a strategic plan and not simply opportunities.
3. The administrative unit should follow up on prioritizations, recruitments and other strategic decisions.
4. The administrative unit should build on areas of strength and utilize mobility programs and other support mechanisms to strengthen collaborations with other administrative units and/or industry within these areas. Finding niches where the administrative unit already has strength and build on these will help increase the visibility of the administrative unit.
5. The PhD program is undersized. Consider allocating resources accordingly. Approach industry partners regarding industry PhD funding opportunities.
6. Develop deeper collaboration with local industry partners where academic staff is directly involved in innovation.
7. Identify collaborative opportunities where the administrative unit members can play a substantial role. This may lead to new funding opportunities and increased visibility. Be strategic and selective.
8. Review mentoring of academic staff and encourage collaborations within the administrative unit to increase the wider contribution of staff to the administrative unit's productivity.
9. Assess current allocation of research time. Are senior staff that are allocated 40-50% research time productive? Can resources be allocated to provide better career building opportunities for junior staff, or be allocated to strengthen areas where the administrative unit is producing high impact research?
10. Identify niche areas that the administrative unit has unique strength or potential to build on, e.g., MERGA, where the administrative unit can work branding/identity.
11. There should be clear and concrete strategic thinking at all levels of the administrative unit with metrics that enable direct follow-up of resource allocation and prioritizations.
12. Develop long-term recruitment strategies with clearly stated strategic goals for the research groups, departments and the administrative unit.
13. Work with bottom-up initiatives for increased external funding levels.

1. Strategy, Resources, and Organisation of Research

The administrative unit is organized into four departments and 35 research groups that are then organized into the eight research groups each of which were evaluated by the EVALMIT group panels. The eight research groups comprise, for the most part, areas that the administrative unit or University of Agder have identified as prioritized research fields.

The administrative unit has prioritized research into education in mathematics, AI and mechatronics. The groups vary considerably in terms of size and breadth of research. Overall, the administrative unit research spans quite broadly from mathematical theory to engineering applications. Some of the research units are quite small whereas other groups are as large as some of the other administrative units that this panel has evaluated.

The organizational structure of this administrative unit differs substantially as compared to other units under evaluation. In part, this is explained by the relative youth of UiA and the administrative unit. However, in recent years, the administrative unit has undergone a considerable growth and is now, in some research areas, staffed at the level of the corresponding units at other universities. This growth has been rapid and appears not to have been undertaken with a clear long-term strategy in mind but rather based on hiring opportunities. The result is an uneven organization where research groups are fragmented, lack synergy and are in some parts too narrowly focused and in other cases too broad to build a profile with direct impact and visibility.

1.1 Research Strategy

The administrative unit strategy is outlining an organizational structure but is vague and remains unclear on specifics in terms of recruitment strategies, or prioritizations between and within research groups. The heads of departments do not hold the economic responsibility as this lies with the dean and vice-dean of the faculty, but decisions are anchored atthe department level in dialogue with the heads of department.

Even so, the size of the administrative unit and research groups/department is now at the level that this might warrant a clearer line-structure regarding strategic and economic autonomy. Whether the maturity of the administrative unit warrants this must be discussed.

The research group evaluations reflect very different circumstances, and while some groups perform quite well on all evaluation metrics, others clearly struggle.

The administrative unit has decided to prioritize CAIR, MERGA and Mechatronics. The evaluation of CAIR and MERGA are for the most part positive. MERGA could increase its international impact by improving publication rates and contributions. CAIR could improve in terms of visibility by strengthening collaborations and focus research directions. The level of productivity is good but unbalanced across group members. The research group evaluation committee identified several weaknesses for the Mechatronics group, including lack of cohesiveness in the group, low level of funding and room for improvement in terms of involving external partners directly in research.

The evaluation committee had an opportunity to discuss the group evaluation scores with the administrative unit. The administrative unit did not recognize some of the critique regarding collaboration and societal impact. Even so, taken together the group evaluation committee and the administrative unit evaluation committee are in agreement that there is an organizational disconnect at the level of the administrative unit that adversely impacts the unit’s ability to meet its targets.

Recommendations

- The evaluation committee recommends that the administrative unit undertakes a major review of the organisational structure; including department organization, research group membership, and strategic focus. The administrative unit must build on strength and focus its activities.
- Consider an organization that creates more autonomous research groups where the members can work more closely to derive clear strategic goals in terms of prioritized areas, recruitment strategies, resource allocations and strategies for branding/creating a visible profile for national and international communication and networking. The strategy outlined by the administrative unit is vague and focuses on administration. Strategic planning for how to increase external funding levels or visibility should be more concrete and directly impactful if undertaken at the department level.
- Increase collaborations with other administrative units in the administrative unit's areas of strength. The mobility target for staff is one way to do this. However, the evaluation panel recommends that areas and collaborations are selected with care and long-term impact in mind.

1.2 Organisation of Research

The organization of the administrative unit appears to be less than ideal for formulating clear and measurable strategic goals. The evaluation committee recommends that the administrative unit reviews how to best organize the faculty into clear department structures with partial autonomy at the level where strategies can be formulated that are cohesive and more easily translated to concrete plans of action.

The administrative unit "hosts" a PhD program with four specializations. The faculty is very focused on education quality and student recruitment at the bachelor and master's level. PhD students are linked to research groups but there is also a PhD forum where PhDs can receive support and interact outside of the research group structure.

Sabbatical and promotional programs are in place. There are courses for faculty on how to apply for external funding. Research time is allocated at 40-50% research for professors and associate professors, but at 15-30% for junior staff which might be negative for career development and something for the administrative unit to review.

Recommendations

- Consider a re-organization of the administrative unit. This will enable the formulation of more concrete strategies connected to specific targets.
- Due to the rapid growth in recent years, the administrative unit needs to develop a long-term plan for strategic recruitment. This includes reviewing the sizes of the research groups as well as the staff composition.
- There is a large number of research assistants at the administrative unit. By contrast, the ratio of PhD students-to-faculty is very low. The evaluation committee recommends that the administrative unit works strategically to expand the research education programme
- Reconsider the current model for allocation of research time between junior and senior researchers with a focus on strengthening talent development through research and mentoring.

1.3 Research Funding

The external funding level to basic funding is below expectations. However, several research groups have been successful at obtaining research funds from external sources (RCN, and ERC coordination, participation in centers-of-excellence).

The evaluation committee recommends that the administrative unit tries to collaborate more with industry to increase funds from external stakeholder. The evaluation committee also recommends that the administrative unit strongly encourages all faculty members to network and collaborate outside the university and across disciplines to identify new funding opportunities and diversity fundings sources.

It is difficult to compete at the national and international stage as a relatively new academic institution. Name recognition/branding can help but requires a focus and a prioritization of areas of strength where the administrative unit has something unique to offer.

Recommendations:

- Increase collaboration with industry. Investigate the possibility for industry-funded PhD students.
- There are highly successful groups at the administrative unit. Build on the strengths of these groups through collaboration within the administrative unit and with external partners in academia and industry.
- Be selective when choosing which collaborations and partnerships to commit to.

1.4 Research Infrastructures

The administrative unit is hosting, participates and partners several Norwegian research infrastructures as well as participate at CERN. The administrative unit report did not elaborate to which extent these infrastructures contribute to excellence of research at the administrative unit or provide the level of participation at the administrative unit.

Recommendations

- The administrative unit states that they may consider recruitment in areas of research connected to participation in international infrastructures. The evaluation committee emphasize the need for the administrative unit to consider an overall, long-term recruitment strategy for the administrative unit to ensure that appropriate prioritizations are made that will lead to targets being met (e.g. increased external funding, increased visibility).

1.5 National and international collaboration

The administrative unit recognizes the need to collaborate with other administrative units. Roughly half of publications are co-authored with international collaborators.

The administrative unit organizes conferences to increasing networking, collaborates with other academic institutions on grant applications and PhD supervision. The administrative unit has also recruited part-time and affiliated staff to enhance collaborations. The administrative unit is part of an EU alliance.

The evaluation committee recommends that the administrative unit continues to collaborate with national and international academic partners. However, it is important that the research groups, departments and administrative unit continually review collaborations, prioritized networks and part-time recruitment (which costs resources) to ensure that these efforts result in direct impact (research excellence, research applications, visibility and participation in research panels and networks). While top-down initiatives, like EU alliances, may create a setting for academic leadership to share experiences and discuss overall strategic goals, for

more direct impact in terms of improving productivity and externals funds it is important that the faculty members and research groups are directly involved.

Recommendations

- Focus and prioritize collaborative efforts
- At the department level, strategies for sabbatical visits and other mobility opportunities can be used to build deeper collaborations with academic and non-academic partners which may identify new funding opportunities for the administrative unit and increase visibility.
- Increase collaboration with local and national industry.

1.6 Research staff

There is an imbalance across several research groups in terms of productivity and contribution. Since the administrative unit has grown rather rapidly it is important that the research group and department leaderships works together to formulate plans to increase activity across the whole group/department/faculty. Increasing collaboration within and between research groups is recommended.
The resource allocation of 40-50% research should allow for faculty members to publish at a reasonable rate. The evaluation committee recommends that the administrative unit tracks activity levels and resource allocation to ensure that the allocation leads to high levels and high impact of research.

Recommendations

- Review the composition of the staff at the administrative unit. The PhD program is undersized given the size of the faculty.
- There is a gender imbalance among permanent staff. The evaluation committee recognizes the difficulty with recruitment of women and recommends close collaboration with industry and other external partners to identify hiring opportunities for the significant other.
- Develop long-term recruitment plans that are directly linked to strategic objectives at the research group level. Review the relative size and impact of the research groups when planning recruitments.
- Strive for junior faculty to have increased research time, possibly at the expense of the research time of established faculty if required to fulfil teaching obligations.

1.7 Open Science

The administrative unit and UiA have a policy and support system in place for Open Access. The administrative unit publishes in Open Access at 70% rate which is a considerable improvement compared to the beginning of the evaluation period. However, there is still room for improvement and the evaluation committee encourages the administrative unit to stay the course. OA publications increase the visibility of the administrative unit and increases the odds of contributing in rapidly moving research fields.

2. Research production, quality and integrity

The UiA has identified nine prioritized areas, five of which are located at the administrative unit. Each research group/prioritized area is different, where some are large and contain several subgroups or a wide range of application or methodology foci. Others are more narrowly defined and build on the research program of a smaller number of researchers.

As mentioned previously, the evaluation committee recommends that the administrative unit reviews the organizational structure to more clearly identify areas of strength and more

easily recognizable and cohesive research strategies. The administrative unit is very broad, and it is difficult to recruit and maintain excellence across all these areas. The administrative unit could identify areas of strength and build around these rather than “spreading the resources too thinly”.

The administrative unit has policies in place for research integrity, but ultimately, this is the responsibility of the individual researchers.

2.1 Research quality and integrity

The research groups in the administrative units are of very different size and character. Some groups are performing well while other struggle. For several research groups, a common critique from the evaluation committees have been the lack of a cohesive strategy, which, as mentioned before, may be a result of poor organization at the administrative unit and an overall impact below expectations.

While some research groups would benefit from broadening their focus (FA, REN), others may benefit more from specialization to increase impact (CAIR).

Research group Functional Analysis (FA) overall assessment

The Functional Analysis group at UiA keeps a good scientific level, however in a pretty narrowly defined field related to the convexity of Banach spaces. They publish regularly in internationally recognized journals but mainly at level 1, not in the higher ranked ones (level 2 journals). To prosper, the group should expand its scope to topics of higher current interest, and the internationalization process which is ongoing should expand further. The already existing scientific contacts with Tartu (Estonia) and Besancon (France) could suitably be expanded further to include more broadly defined areas of research. On a positive note, the group has managed to recruit a new member in 2018. Possibly a competitive international recruitment could be highly beneficial to the development of the scientific productivity of the group. The rather low productivity criteria set by the department can be expected to be met. The societal impact of the group contribution consists mainly in a solid production of suitable textbooks for undergraduate students, which is deemed highly beneficial.

Research group Mathematics Education Research Group Agder (MERGA) overall assessment

The research group exhibits excellent organisational support aligned with its research objectives, yielding high-quality outcomes that positively impact society, culture, and the economy. A notable strength lies in the exchange of diverse research experiences among professors, associate professors, young researchers, and international collaborators, fostering the development of excellent research. Both internal funding from the University and external funding provides necessary resources, enabling the recruitment of new staff members, offering scholarships for PhD fellows, and facilitating short visits to international research centers. The group’s research is published in top international journals, and it is one of Europe's largest and most robust groups in mathematics education research. However, some weaknesses persist, including the limited number of funded research projects and the necessity to enhance the involvement of non-academic partners beyond teachers in the research process. Addressing these weaknesses could further fortify the group's research production and broaden its impact across diverse sectors.

Research group Cyber security, systems engineering, modelling (SYSEC) overall assessment

The group's overall research goal is to establish the Cybersecurity research group as a leader, nationally and internationally, in advancing cybersecurity and systems studies. They list many strategies that would help them obtain the goal, but they are all very vaguely formulated, and no clear benchmarks are given. The group has a large teaching responsibility for the bachelor's and master's programmes in computer science and cyber security. The group mostly maintains their activities with basic funding.
The group has many goals related to high-quality research, dissemination, funding, and recruitment, but no concrete steps are listed to achieve those goals. Most of the EU projects listed were completed a while ago, and there are no new ones. The amount of teaching could limit other activities, but a clear vision is needed to become a relevant partner again in international and national collaborations. There is much room for improvement in attracting funding and producing publications.

Research group Electronics, IoT, and Mobile Communications overall assessment

The EIMC research group consists of two teams leading in Internet of Things and mobile communications research on an international level, respectively. Overall, the group is scientifically excellent and internationally highly competitive. Project acquisition, particularly on the national basic research level (RCN) is excellent. EU funding exists but can be improved significantly. Good laboratory facilities are available and maintained. International visibility and collaborations demonstrated by many publications with international co-authors are very strong. The societal impact can be improved by better-exploiting research results for commercialisation and making research results publicly available. The group has clear benchmarks for high-quality publications, projects, international collaborations, and graduates, which have been achieved to a large extent. The group is strongly involved in master's and PhD student education. International collaboration is strongly demonstrated by many joint publications with international co-authors. Several transdisciplinary projects, for example, from the health sector, were performed successfully. Publication track records and awards demonstrate the excellent level of research. The group has a clear strategy for achieving excellent research results and publications. International and transdisciplinary collaborations exist.

Research group Top Research Center Mechatronics (TRCM) overall assessment

The group's strengths are that they bring together many different research disciplines and application areas, with close collaborations with other research groups within UiA, international universities and regional industries. Another strength is the SFI Offshore Mechatronics, which involves an international collaboration coordinated by UiA and which fosters a culture of innovation leading to societal contributions. As a weak point, the Expert Panel noted a lack of overarching vision, objectives, strategies, benchmarks or reflections related to the entire research group. Also, apart from a reflection on the societal contribution, the information requested in the self-assessment report was often merely listed without any interpretation. Overall, the organisational environment is modest for supporting the production of excellent research. The research group produces publications in high-quality journals which contribute to advancing the international state of the art in their field and are of an internationally recognised level in terms of originality, significance and rigour. However, it is unclear how representative these publications are for the whole TRCM team. The group has played a considerable role in the research process from the formulation of overarching research goals and aims via research activities to the preparation of the publications. The group's contribution to economic and societal development in Norway and internationally is

on par with what is expected from groups in the same research field. There is however little documentation of societal partners' participation in the research process, from problem formulation to the publication and/or process or product innovation, making it difficult to make a well-founded evaluation. Finally, the visibility and recognition of the group in the international scientific community is still modest.

Research group Renewable Energy (REN) overall assessment

The research group has as a suitable structure and composition to conduct its research activities. The group focus on four different research areas with a board range of scope from energy materials to energy systems. The host organisation supports the research group with basic funding around 9% of the total funding. This is a very good level to support the broad research program and the large group. This is evident also by the large number of full-time academic staff members in the group. The group facilities and infrastructures are adequate, and the group co-manages few national infrastructures, which provides a clear impact of their research at the national level. These infrastructures are important to support the research program and provide the group with competitive research environment. The group research topics are aligned very well with the regional and national strategies for implementing renewable energies and supporting industry in the energy transition. There is now a group leader nor deputy group leader for the research, and it seems that the research activities are managed by the individual members, which is a critical aspect for the future growth of the group. Thus, the strategy of the research group is mainly driven by the interests and initiatives of the individual members. Some of the research outputs of the research group have been recognised internationally but they should seek to be world leading with clear ambition plan. The research group does not have a clear focused strategy for its research activities, recruitment, and internationalisation. Focusing on four different broad research areas may have weakened the quality of the research output. The research group's societal contribution has a little contribution to economic, societal and cultural development in Norway and internationally. There is no clear evidence of their contributions in delivering high impactful research. In addition, there is little engagement of societal partners' participation in their research activities to create new product, software, ideas, knowledge patents, and innovation.

Research group Civil and Structural research group (CSG) overall assessment

This research group operates at the national level, with some "special laboratories" in a teaching University and focuses on education and working with industry. Though there is clear collaboration with industry, at the moment there is not much evidence of international activity in the group. There is potential to further develop its work with industry and to create a strong regional group to compete at the national level. More international collaborations also need to be established. Though the group aims are aligned with Institutional priorities, its research strategy is generic, and the benchmarks are not specific, measurable, achievable, relevant, and timebound). Furthermore, their organisation and strategy for development is not well articulated. The group has a rather weak external research income for its size and does not appear to have any research facilities with unique equipment. More external research income is required to enable the development of the research facilities and capacity. Their publications are in good journals and reflect the general direction of the research focusing on practical issues, however, these are led by a few individuals from the group. The overall performance of the group is modest, and more time needs to be freed for research to increase its research capacity.

Research group Centre for Artificial Intelligent Research (CAIR) overall assessment

The research group's future research goals are focusing in areas that the group is not currently performing strong research activities but would like to expand into. The majority of the publications and the research funds are currently focusing in areas such as: Tsetlin machines, hydropower optimisation, smart cities, computer vision, recycling, and mental health and thus the vision/goal to focus the group on more philosophical/soft aspects of AI might be difficult to reach in a short term, since it requires corresponding thematic funding support from the research grants in line with the envisioned goals. The research group is also vulnerable to changes in national funding and an unfortunate reduction of this source of funding e.g., from an increase in the national competition will have a significant impact on the research group. Thus, a more balanced National and European funding approaches on applied research grants should be targeted. The research group has a very good performance in research publications output, but this is also unbalanced among the group's members and a more detailed analysis is needed on the outcome of the scientific publications from each senior within the group. The societal contributions of the group could be also strengthened in order to have a more direct impact to the society since currently these activities are all limited to the production of research articles. In international context the group is very good, and it would be of great value to strengthen the international collaborations further under common research grants. Though the performance of the group in terms of its progress towards the KPIs they have set seem to be strong, the research group did not set any benchmarks for comparison.

3. Diversity and equality

The administrative unit describes policies and policy documents and resources that are in place at UiA to ensure that UiA is a safe and inclusive place of work.

The gender balance at the administrative unit among permanent staff is poor. However, the evaluation committee recognizes the difficulty in recruiting women to mathematics and engineering in general, perhaps even more so to a small place like Agder. The evaluation committee recommends that the administrative unit works with local industry and other external stakeholder to identify opportunities for joint recruitments as well as job opportunities for significant others. The administrative unit may also consider joint recruitments with other administrative units (shared appointments) is possible to make the job offerings more attractive. Finally, development of local talent by supporting international postdoctoral stays of 2 years with an intend to offer a faculty position upon return could be considered.

4. Relevance to institutional and sectorial purposes

The administrative unit describes the innovation support at UiA and lists several success stories (start-ups and patents). MSc projects are often conducted within research projects and students can apply for innovation funding from the university.

The administrative unit is involved in several BS and MSc programs but the connection to department/research groups is not clear.

The administrative unit report describes how PhD students are supported and thesis quality ensured.

The administrative unit report is not very clear in terms of research institute involvement. The report mentions cross-faculty connections within CAIR as an example.

5. Relevance to society

The faculty report stresses the connection to region-based industry and regional interests, including off-shore industry and clear energy. In addition, several prioritized areas are directly related to UN goals, including health care and diagnostics (linked to CAIR), energy production and sustainability (battery technology), and education needs.

The domain application areas are of relevance to society, certainly. The education in mathematics is an area where the faculty has potential to stand out.

5.1 Impact cases

Comments to impact case 1: Off-shore mechatronics

The off-shore mechatronics impact case relates to a center grant (SFI) awarded for the period 2015-2023. The administrative unit's commitment to the consortium involved 29 PhDs and staff.

The center involves several academic partners, including NTNU and NORCE. The center activities are summarized primarily from the academic standpoint. The scientific output has been relatively high with 200+ papers published over the award period. 200+ master thesis projects and 21 PhD theses have been produced through research at the center. The productivity appears to have peaked mid-through the project period. The administrative unit mentions the negative impact of the pandemic on several subprojects and plans for collaborative or innovation activities.

The center has disseminated research through common channels, including webpages and linkedIn, and have also arranged several public events.

The administrative unit mentions difficulty in involving industry partners directly in the center and states that the innovation aspects of the center were conducted by the industry partners. It is not clear if the staff at the administrative unit have been involved in these processes. An example of a knowledge transfer is mentioned, with a coordinator at NOV stating that internal expertise increased as a result of collaboration with the center.

The impact case is rather vague and specific innovations, industry collaboration and dissemination beyond scientific publication are not provided.

The administrative unit states that the desire to keep the center and lists several areas of potential growth in terms of both academic research (e.g., AI) as well as areas of potential industry involvement with direct societal impact.

Given that the downward trend in productivity, the administrative unit needs to consolidate and prioritize collaborations within the center, aiming to increase direct involvement with industry partners and close collaborations with academic partners in order to increase external funding to the center.

Comments to impact case 2: Nurturing Inclusivity and Mastery: The Combined Effect of Mathematics Bridging Interventions and Accessible Learning Opportunities on Economics Students' Progression

It has been observed that students admitted to economics and finance programs often struggle with the mathematical courses and/or mathematical concepts in program courses. To address this challenge, the research group MERGA at the administrative units have collaborated with the UiA school of business and law, as well as the University of Newcastle, to develop a bridging course in mathematics.

The research project has collected data on course structure components as well as student performance and presented these results to the scientific community at didactic conferences. The results from the research have been used to create a bridging course which can directly benefit business schools in Norway and abroad. The impact on student performance is substantial with a documented 30% reduction in failure rates.

The impact case mainly involves one researcher at the administrative unit. It is a good example of cross-faculty collaboration and a research project that can have broad impact in Norway and at international business schools.

The research has been disseminated through conference papers, podcasts and collaboration with other universities. The course is a valuable tool to lift competence and enable recruitment of students with diverse background.

Comments to impact case 2: Tsetlin machines

Tsetlin machines is a new paradigm for logic-based machine learning. As such, these constitute transparent and interpretable alternatives to deep neural networks. Tsetlin machines were proposed by a member of the CAIR research group. Since its conceptualization in 2018, Tsetlin machines have garnished a lot of attention in the scientific community. There is much ongoing research at the administrative unit, collaborations with international partners and publications by other academics building on the proposals of the original author.

The research concept has been presented in top journal outlets, in books, in webforums and more, reflecting the importance and high impact of interpretable machine learning.

Tsetlin machines have been used to develop low-energy hardware solutions. There are several examples of industry innovation and involvement. Tsetlin machines have also been recognized by international press and the scientific community at large. Researchers at the administrative unit have also developed transparent machine learning solutions for health care.

This impact case is an example of academic research that quickly leads to direct impact on society at large and international recognition of research excellence at the administrative unit.

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 and asked for the following changes:

- Indicate that from 2024, UiA has implemented a unified leadership model with the Dean as the top leader of the administrative unit

The Committee judged the information received through documentary inputs and the interview with the Administrative Unit sufficient to complete the evaluation.

List of administrative unit's research groups

Institution	Administrative Unit	Research Groups
University of Agder	Faculty of Engineering and Science	Functional Analysis (FA)
		Electronics, IoT, and Mobile Communications
		Civil and Structural research group (CSG)
		Mathematics Education Research Group Agder (MERGA)
		Top Research Center Mechatronics (TRCM)
		Centre for Artificial Intelligent Research (CAIR)
		Cyber security, systems engineering, modelling (SYSEC)
		Renewable Energy (REN)

Terms of Reference (ToR) for the administrative unit

The Faculty of Engineering and Science, UiA, mandates the evaluation committee appointed by the Research Council of Norway (RCN) to assess The Department of Engineering Sciences (IES), The Department of Information and Communication Technology (ICT) and The Department of Mathematical Sciences (MS) based on the following Terms of Reference.

Assessment

You are asked to assess the organisation, quality and diversity of research conducted by Department of 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 aspects in your assessment:

1. Artificial intelligence including the research center CAIR at ICT
2. Mechatronics including the associated national center of excellence (SFI) at IES
3. Mathematics education including the associated national center of excellence (MatRIC) at MS
4. Infrastructure at IES and ICT

In addition, we would like your report to provide a qualitative assessment of IES, ICT and MS 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. 2

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 IES, ICT and MS 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 The Faculty of Engineering and Science 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 Faculty of Engineering and Science and RCT. The Faculty of Engineering and Science 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 Faculty of Engineering and Science and the RCN no later than two weeks after all feedback on inaccuracies has been received from the Faculty of Engineering and Science.

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)

The Research Council of Norway

Norges forskningsråd
Besøksadresse: Drammensveien 288
Postboks 564
1327 Lysaker

Telefon: 22 03 70 00

post@forskningsradet.no
www.forskningsradet.no

Publikasjonen kan lastes ned fra
www.forskningsradet.no/publikasjoner

Design: [design]
Foto/ill. omslagsside: [fotokreditt]

ISBN 978-82-12-04165-3 (pdf)