The Research Council of Norway

Evaluation of Mathematics, ICT and Technology 2023-2024

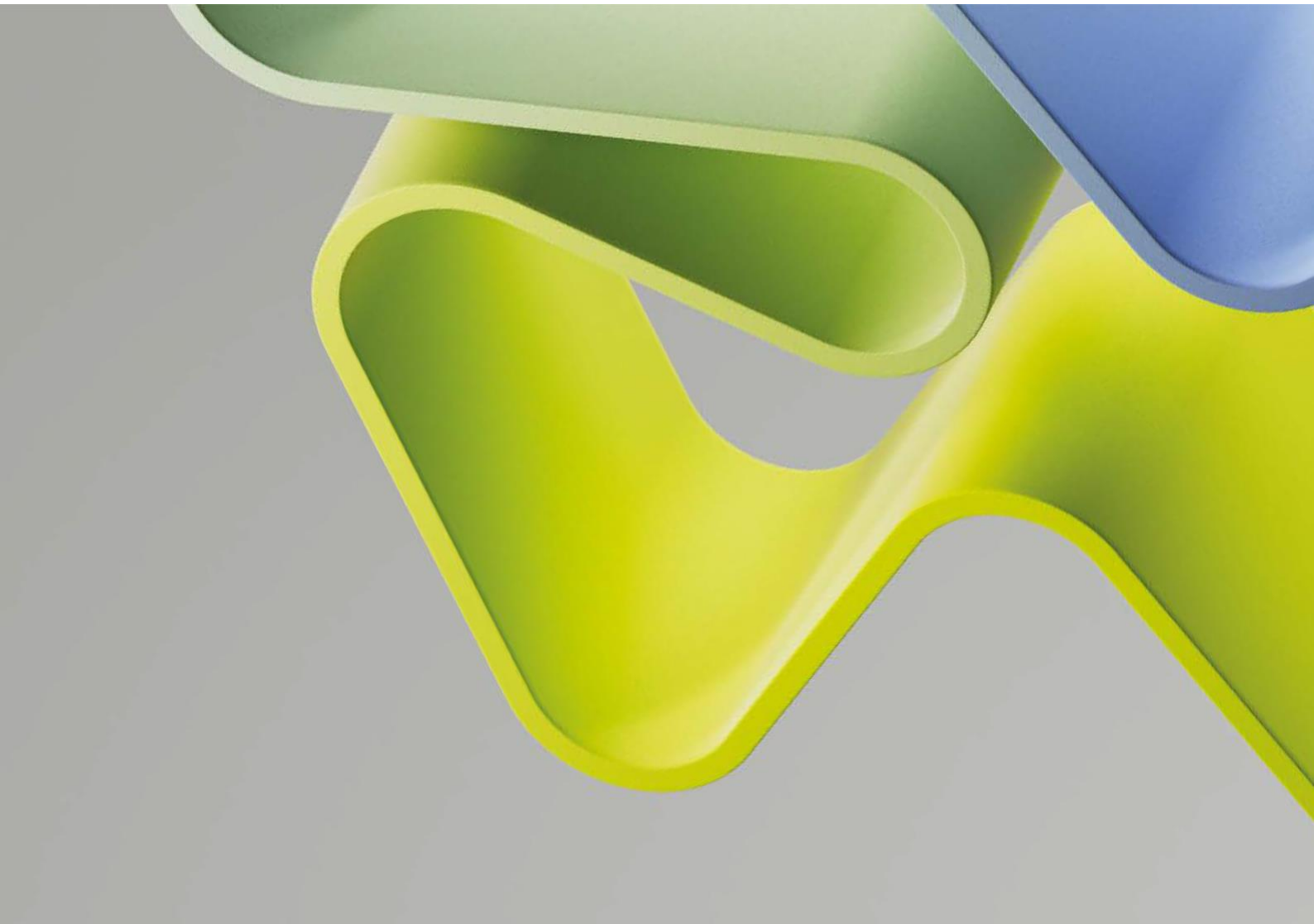
Evaluation Report for Administrative Unit

Administrative Unit: **Department of Mechanical and Structural Engineering and Material Science (IMBM)**

Institution: **University of Stavanger (UiS)**

Evaluation Committee Higher Education Institutions 4

December 2024



Contents

Statement from Evaluation Committee Higher Education Institutions 4

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 unit:

- Department of Building, Energy and Material Technology, UiT the Arctic University of Norway
- Department of Architecture and Technology (IAT), Norwegian University of Science and Technology (NTNU)
- Department of Civil and Environmental Engineering (DCEE), Norwegian University of Science and Technology (NTNU)
- Department of Geoscience (IGV), Norwegian University of Science and Technology (NTNU)
- Department of Structural Engineering (KT), Norwegian University of Science and Technology (NTNU)
- Department of Manufacturing and Civil Engineering (IVB), Norwegian University of Science and Technology (NTNU)
- Department of Energy and Process Engineering (EPT), Norwegian University of Science and Technology (NTNU)
- Department of Built Environment (BE), Oslo Metropolitan University (OsloMet)
- Department of Energy and Petroleum Engineering (IEP), University of Stavanger (UiS)
- Department of Mechanical and Structural Engineering and Material Science (IMBM), University of Stavanger (UiS)
- Department of Process, Energy and Environmental Technology (PEM), 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 Claudio Mazzotti, University of Bologna (Chair)

Professor David Baglee, University of Sunderland

Professor Elsa de Sá Caetano, University of Porto

Professor Sebastian Geiger, TU Delft

Professor Per Heiselberg, Aalborg Universitet

Professor Mohamed Pourkashanian, University of Sheffield

Description of the Administrative Unit

The scientific staff of the Department of Mechanical and Structural Engineering and Material Science (IMBM) at the University of Stavanger (UiS) includes 18 professors, 12 associate professors, 2 postdocs, 36 PhD students, 4 researchers, 1 lecturer, and 18 engineers. The overall gender distribution among research personnel is 19 women (20%) and 75 men (80%). Among the 21 scientific employees in permanent positions, 5 are women (24%) and 16 are men (76%). While the ratio of professors to associate professors is balanced at 50/50, women are predominantly represented among the associate professors.

Each study-program and corresponding research group have a study-program leader, responsible for coordinating teaching activities and represent the group in the internal leader-group of the department. The department has two study-program boards: One for Structural Engineering and Marine- and Offshore technology, and the other for Mechanical Engineering, Materials Science, and Industrial Asset Management. An advisory board, consisting of four external members, along with internal academic staff, technical staff and students meet twice a year. The boards main tasks are to evaluate the teaching and research activities, along with giving advice towards strategic investments, changes in study-programs, outreach and promotion of the department.

The department is diverse, covering various research areas with common themes. Much of the research focuses on offshore activities and structures, shifting from traditional petroleum-related studies to include aquaculture and renewable energy, aligning with university and faculty strategies. The unit addresses topics from microscale to field-scale, with a strong emphasis on simulation and modelling, including machine learning and AI. Additionally, the department has initiatives in “health and technology,” involving material science and the “Pumps & Pipes” collaboration, which integrates engineering and medical science. The research is organised in the following research groups:

- Marine and Offshore Technology, Marin (M&O)
- Mechanical Engineering and Industrial Asset Management, (MEIAM)[1]
- Structural Engineering Research Group (BYGG)

The department aligns with the university’s green transition strategy and the Faculty of Science and Technology’s main fields. It focuses on energy and marine technology, including offshore structures, subsea technology, wind engineering, concrete structures, materials science, additive manufacturing, and more. The planned research aims to address major societal challenges, promote sustainable development, and improve resource management, requiring cooperation with the public and private sectors. Through strategic research, the university aims to accelerate the green transition and develop future-oriented, sustainable technologies, making it an attractive partner for the community and employment sector.

The administrative unit maintains robust collaborations with industry and research institutes. Ten adjunct staff members, all employed in the industry, serve as vital contact points within their companies, facilitating strong ties between the department and the industry. The department has a well-established local network, working closely with major industries. Additionally, the staff collaborates extensively with other universities and research centres both in Norway and internationally. The unit is also involved in several national and international collaboration consortia and networks.

[1] Actually, Mechanical Engineering and Industrial Asset Management are actually two separated research groups, which have been treated as one single group for purposes of this evaluation.

Overall Assessment

The Faculty of Science and Technology has four main fields of research which are aligned to a green and sustainable theme. Renewable energy, marine technology, health and technology, digital technologies and security.

The department of Mechanical and Structural Engineering and Materials Science is divided into three research groups:

- Structural engineering research group
- Mechanical Engineering and Industrial Asset Management
- Marine- and Offshore technology

The unit share close collaborations between the different research groups. Staff teach across the disciplines, with all laboratories organised to support the groups. In addition, the department is known for machine learning, AI, health related technologies. Ocean technology and offshore wind" is an internal research theme which has been developed to align to the university and faculty research themes. Based upon the documentation provided there seems to be no single topic more important than the others, although recently Ocean technology and energy is a priority research theme.

The department research groups ensure their research is relevant by engaging with industry and other academic institutions and research centres in several research themes. The aim is to ensure the research is current, innovative and multi-disciplinary. The unit has several adjunct professors from the industry, and work in general close with local and national companies, facilitated by the proximity to a large part of the industry operating within the energy sector. This enables the research and education to be continuously updated with the current applications.

The department does not have a defined research strategy. In the interview it was stated that they do not have a defined strategy, the faculty and institutional strategies are "more important" as they are a "small part of the faculty". The institutional and faculty strategies which, at university level, are focussed on several research themes centred upon the green transition and at faculty level centred upon marine and energy technologies.

The department has a strong reputation in offshore oil and gas, although recently focus has changed from oil and gas to aquaculture and renewable to align with the University and faculty strategy for more research on natural science and technology.

The team interviewed stated that participation in overarching centres shapes priorities, and defines strategic areas, it is a mix of academic freedom and aligning efforts.

The department collaborates with a very large number of national and international partners from academia and research institutes and industry including NORCE and SINTEF. In addition, the department is closely linked to the local municipality promoting offshore wind, and ocean technologies. The department has an advisory board who meet bi-annually and is supported by technical and academic staff, industry representatives and students. The boards main tasks are to provide advice on academic programmes, teaching, research and to promote the department.

As of October 2022, 97 staff who are supported by 18 engineers. The website states 92 staff? The support covers lab-teaching and engage in research projects. The gender mix reported in research positions was 19 women (20 %) and 75 (80 %) men. The 21 scientific employees in permanent positions (professors, associate professors, PhD students, and

post-doc staff) were represented by 5 (24 %) women and 16 (76 %) men. The proportion between professors and associate professors is 50/50, however, the genders are not distributed evenly, and the larger proportion of the women are associated professors. The Head of department is female. While it is difficult to see which countries the research staff come from, the self-assessment does state that a proportion of researchers are international which helps to attract international partners. However, the different nationalities and research field among the staff could prove problematic when trying to identify common research topics. Most of the facilities are on one campus, which allows for closer collaboration across different faculties and disciplines.

Due to the nature of the research into wind, ocean etc, large research equipment is needed which impose limitations on space. Facilities are available within Norway and or international collaborators, however, the high cost to use could prove prohibitive.

The department places a strong emphasis on early career researchers and several opportunities / activities are available for staff such as soft skills workshops to improve writing and time management. The department offers a career development program for early-stage researchers, plus several other initiatives. The number of opportunities is impressive and developed to support the PhD candidate and early career researcher. Staff have a yearly appraisal interview with their line-manager to discuss their development programme. Mobility is important to the department, funded sabbatical leave is available for permanent staff.

The internal budget is, on average, 46MNOK, with a peak in 2021 at 51 MNOK. The external funding represents on average, 24% of the budget. It is difficult to determine if the % of internal and external is calculated on the number of staff, or if staff can apply centrally for additional internal budget, or what would be the consequence of a much lower return of external funding. No formal system to record exact numbers of proposals is available, although it was stated that a system is being worked on at faculty/university level. Overview 2012-22: 10 NFR granted, 16 EU/EEA, 63 others, it is estimated that approximately one third of proposals have been successful.

Between 2013 and 2022 the number of journal publications increased from 53 publications in 2013 to 163 in 2022. However, this increase was sporadic with a series of peaks and troughs. The reasons have not been supplied.

The balance between time spent on research, on teaching, and on administrative tasks, is divided at 40-40-20. This is in line with the national average. Other institutions within Europe have, as one example, 70% teaching and 30% research, while all admin, tasks (which need to be clearly defined) are given to non-academic staff. This approach prompts the inclusion of income targets for academic staff.

It is evident from the current number of national and international projects that the department is internationally recognised. The department is on the European Marie Curie system, although it is not possible to find the department on several other European databases such as COST. They are many databases available which allow staff promote their research, group skills within the unit or department. These portals have proven to be key ensuring your department research and] staff profiles are visible and accessible to potential project partners.

The use of, and future needs for, local/national/international research infrastructure has been raised within the unit TOR. Based upon the information provided the unit and department are in a strong position to develop a national network of labs to share equipment, share ideas

and bid as a “one centre” for research funding. The network would provide a unique combination of cutting-edge facilities and the technical expertise to support industry.

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

Recommendations

It is difficult to provide recommendations to a well-developed set of research groups, with clear themes which impact society and are embedded within the green sustainable research agenda. The staff are developing leading edge innovations with many high-quality publications.

However, some recommendations can be indicated:

1. Given the evident capacities of the RGs, the Department can set a general strategy, shaping its future in a five-to-ten-year time range. To follow the higher order institutions is a passive attitude while the Department could set the pace. This type of approach will allow a possible growth of the AU, since small and happy is a risky position in a world of everchanging policies and priorities.
2. The group is strongly encouraged to set independent KPIs, which are linked to the faculty but remain independent and based upon the unique selling point of the unit. A clear set of KPIs would allow the department to monitor and evaluate the level of achievement from staff, identify and target new areas to diversify income and help balance the time spent on teaching and what time is required for research to increase income. An independent strategy would remove some of the need to be governed centrally and help to identify which roles and responsibilities could be devolved to the staff.
3. The level of income seems low based upon the number of research active staff and the current research themes. A greater emphasis could be placed upon international research funding and closer cooperation with international research and industrial partners.
4. The brand and reputation of the department is well known and needs little advice on how best to increase the awareness amongst academia and industry. However, working closely with the alumni to reach different networks, or ensure the publications remain high and in high-ranking journals.

1. Strategy, Resources, and Organisation of Research

The research link between the faculty (green economy and digital technologies) and the department is very well aligned. The department has a small number of research groups, Marine- and offshore-technology, “Industrial Asset Management”, “Mechanical Engineering” and “Structural engineering”, however, all groups have a “large” number of themes. In addition, other areas of research which fall under the main themes are offshore structures, operations and subsea-technology, wind engineering and extreme loads, concrete structures and technology, fatigue and structural integrity, materials science, design, additive manufacturing, computational fluid dynamics (CFD), life-time prediction, health-monitoring, maintenance, operations and asset management. This is a very broad “spread” of research themes. It is difficult to see if one area has “more support” than others from the department or faculty.

While the department strategy follows the faculty and in turn follows the institution strategy, it is difficult to see if the key measures or indicators for success for the department strategy

are based upon only dept, or faculty or a mixture. It is also difficult to understand what drives the measurable success of the department.

A strength of the department is the link with industry and the public sector. The departments employ adjunct professors from industry to provide guest lectures and arrange company visits for students and researchers. At the time of writing the report, the department had more than 10 active industrial PhDs.

Based upon the needs of industry, interdisciplinary collaboration is needed, this allows staff from different groups and disciplines to share expertise and resources.

1.1 Research Strategy

A clearly defined strategy is not presented but the Department follows those provided by the Faculty and the University. In this respect, the KPIs adopted to measure the level of success of the strategies are again coming from the higher order institutions, the Department playing a passive role. Only some strategic overarching projects can be found directly sustained by the AU and mainly concerning ocean technology.

During the interview emerged that, among the many research topics pursued by the RGs, there is no one topic more important or strategic than the others. Participation in overarching centres shapes priorities and defines temporary strategic areas. It is a mix of academic freedom and aligning efforts.

The department has a very good publication record in all groups /themes mainly within high quality journals. The publications show strong to national and international collaboration in all areas. Research outputs are internationally recognised, and the promotion of high-quality research is evident. The faculty strategy claims “recognised for good teaching and for having a research culture” however, it is difficult to see how one supports the other. Staff teach and undertake research activities, although it was difficult to obtain direct evidence of research outputs informing new academic programmes both at under and postgraduate level. It was also difficult to know if publication strategy per group / theme was available and known to staff.

To maintain collaboration across the research groups, the department holds bi-annual seminars in which to develop closer working environments by team building and social activities. The department has organised international conferences utilising staff from across several disciplines.

As with most universities the workload model follows a 40-40-20 allocation. This can be adjusted to suit and individual. It is unclear if this is a contractual obligation or if the department, Faculty or University can amend to focus more hours allocated to research or academic programmes. The department has a good mobility programme for staff and PhD researchers which is funded by the faculty.

<u>Recommendations</u>

- Given the evident capacities of the RGs, the Department can set a general strategy, shaping its future in a five-to-ten-year time range. To follow the higher order institutions is a passive attitude while the Department could set the pace. This type of approach will allow a possible growth of the AU, since small and happy is a risky position in a world of everchanging policies and priorities.
- To sustain a dedicated strategy, the unit must develop a clear and specific set of KPIs for research staff, i.e. papers, income, PhD completions, etc... and to monitor them to

evaluate the level of achievement of the planned strategy and, eventually, to introduce corrective actions

- Recommendations include a review of the workload model. Is it possible to adjust the split to allow more time for research with set KPIs. PhD students could act, for example, as “teaching assistants” helping to reduce the teaching and or admin, burden on professors and associate professors.

1.2 Organisation of Research

While a separate department research strategy does not exist, the research activities are planned well and led by a team of academic and technical staff. Management of the link between research groups and academic programmes is clear and managed by dedicated programme leads. The four research groups have corresponding master-degree programmes which are supported by academic and technical staff utilising dedicated state of the art labs.

The department is successful in attracting external income, publishing papers in high quality journals, attracting “recognised” professors and associate professors. This helps to support cross disciplinary research between different groups and departments. The staff balance within the professoriate is approximately 50/50. Although a higher number of females are classed as associate professor, it is unclear why.

Staff incentives for mobility or CPD are very good and financially supported by the faculty. The organisation of the research activities and support for staff development is very good and aligned to the institution priorities.

Academic and research staff are involved in international research conferences which are run during the year, both are very popular and attract delegates from both academia and industry. Several initiatives are available for ECR, workshops, seminars, training for staff and student etc. The unit is very active in introducing plans to support early career researchers and PhD students. For example, every semester the department organises “PhD Get Started”, introductory courses for PhD and supports soft skill development workshops during their PhD period. Other initiatives sauch as time and stress management o how to plan your career are available. Recently a new program, organised into 4 modules with a mentor, was introduced to support early career researchers with developing their career plans.

Annual appraisals support research and teaching development. (blank copy of appraisal not available). The university signed and agreed to follow the code of conduct for recruitment of researchers HRS4R. Staff follow the 40/40/20 rule which is common across institutions. PHD are 100% on their programme of study. Sabbaticals are available for staff. Funding is available via the institution and or ERASMUS. It is unclear the uptake / adoption by staff of the available funding.

The organisation and management of the unit and staff development initiatives are very good.

<u>Recommendations</u>

- The organisation and management of research activities, and research active staff is very good and therefore it is difficult to recommend an action which would help to increase, broaden or strengthen the research portfolio. However, a simple recommendation is to evaluate the usefulness of the standard workload of 40-40-20. The workload should provide a fair, transparent and effective framework for the allocation and distribution of academic workloads across the University. However, the department wishes to grow their research portfolio, more emphasis should be placed upon

discussion with research active staff who are able to “offset” teaching in favour of research. ECR, or PhD students could be utilised. Internal funding could be sought to employ academic tutors or marking assistants to reduce the burden of teaching activities.

1.3 Research Funding

Funding is diverse and split between government and external funding. The department is successful in attracting income from industry and funding bodies, but figures showing success vs unsuccessful applications were not available. It can be argued that due to the number of research active staff, international funding is lower than expected and lower than several competitors with small departments. It is difficult to reconcile with the levels of funding as “detailed” staff metrics are not available. For example, the Civil and Structural Engineering research group has currently 13 live projects, and staff levels at 14 professors, 5 associate professors and 3 adjunct professors. The data supplied does not indicate who, at which level, was responsible for attracting the funding.

Income generation is low, and as previously stated this could be due to the time given for research. Strong collaboration with national and international partners have supported research proposals in aquaculture, offshore wind, sub-sea technology, education etc. This has generated income from a mix of funding agencies including ERC, NFR, the Norwegian Public Roads Administration and Marie Curie, amongst others.

During the interview, staff stated that Income has ranged from approx., 6.3 MNOK to 12 MNOK over the period 2018-2022. The “wide range” could be due to Covid. With regard to proposals, between 2012-2022: 10 NFR granted, 16 EU/EEA, 63 others. The staff believe approxmatly one third were successful. The Department is trying to become less dependent from funding coming from the oil & gas industry while transitioning toward renewable energies and acquaculture. From the information provided it is difficut to know if the income attracted by an individual unit is retained within that unit,or divided amongst other units to ensure sustainabilty and growth across the department. Figures proivided above, do not indicate a spread of income across other units within the department.

<u>Recommendations</u>

- As stated previously, it is recommended that the department develops a specific and “aggressive” strategy to increase international funding and diversify income.
- Clear targets / KPIs should be set for active research staff and early career researchers. The KPIs and research objectives should align with the broader university and faculty goals, taking into consideration factors such as industry needs, available funding, changes in technology and future student employment. This will strengthen the transition toward new topics (renewable energy, marine technology, etc..) also in terms of economic sustainability, looking for funding opportunities in new directions and with new subjects. This should give you a future proof strategy.
- It is recommended to review the use of staff from across the faculty. It is important to encourage staff from different departments to help strengthen links between teaching and research activities, and create interdisciplinary research focused on the broader needs of industry. This could open new opportunities for collaborations and income.

1.4 Research Infrastructures

A very good research infrastructure can be found, where and labs and workshops are well equipped. The department works with other well-known infrastructures including NorTEM Norfab, ESS and ESRF. This has helped to develop strong links with academic infrastructures at Trondheim and Bergan and others with a strong international reputation.

However, the provided reports are not explicit on how the unit will maintain the relationship or grow to find new collaborations.

All laboratory infrastructures are organised to support all research group; however, it is difficult to identify if one group used the labs more than others, if students had access outside of teaching hours and if the lab was used for recruitment activities. It was stated in the self-assessment report that the use of the national and international infrastructures is costly and/or have limited access, especially European facilities. This limits the use of these types of infrastructure. Participation is mainly funded by the projects where the department researchers take part or in collaboration with other universities or projects.

The department follows institutional regulations that align with the Research Council's and EU's guidelines for managing research data. These guidelines can be summarised as "Open as standards" and "As open as possible, as closed as necessary." This seems a standard approach across the sector. The FAIR principles are followed, although the information on how this is achieved and measured is limited. The university ensures all research data is managed in a manner that complies with the FAIR principles.

Recommendations.

- It is recommended that the department maintains and builds upon the excellent relationships with national and international research centres. The department could consider using the labs for additional activities such as student recruitment days or showcasing activities to attract local, national industry who may not know these labs and the state-of-the-art equipment exist.
- Since there is a transition in place from fossil energy to renewable energy and related issues, consider if new types of infrastructures can be developed or if connections with new partners with unique labs, could strengthen the research portfolio.

1.5 National and international collaboration

The department has an excellent network of international collaborators both academic and industrial, including universities from across Europe, the USA and the UK. An extensive list was provided on international collaborations. The profile is extensive and varied and supports the ambition to be known as an international research department. The collaboration plan is successful and built upon a common expectation for the quality of its outputs. The advisory board are critical for this to happen as well as a policy for openness and for effective data sharing via the FAIR principles.

The department has a number of European research-projects, and a number of research projects with national and international industry. Areas where funding has been attracted is varied and includes aquaculture, offshore wind and ocean and subsea-technology. Funding has been awarded from ERC, NFR, EEA, the Norwegian Public Roads Administration, and Marie Curie European grants.

The department has strong collaborations with industry and research institutes including SINTEF, IFE and NORCE. Currently 10 adjunct staff are employed via industry collaborations. The department has strong links with several universities and research centres in Norway and abroad.

Recommendations to administrative unit.

- The recommendation is to continue to grow the industrial and academic network throughout Norway and beyond into Europe. Ensure new collaborations are developed

with academic and industry with skills sets that complement and enhance the current skill sets of the department.

- Countries such as the UK, have strong networks with Subsea7, for example. Parentships could be formed with existing companies based in Norway who have a subsidiary in other countries, and excellent task for an early career researcher.

1.6 Research Staff

The department staff consist of one head of department, 18 professors, 12 associate professors, 4 researchers, 36 PhD students and 15 engineering staff. Data on PhD student mobility and from which country is not available in the self-assessment.

During the interview it was mentioned that the department does not have a written strategy for recruitment although they are aware it is an important topic and are left vulnerable. The department suffers from a lack of opportunities to grow from internal funding, but with external funding a couple of recruitments are planned.

The gender split is in line with other universites. 24% are women and 76% are men. The proportion between professors and associate professors is 50/50.

The department 40/40/20 model is used to attract the “better” scientist. A faculty wide strategy is in place to ensure 40% is allocated to research. Sabbaticals, funded by the faculty are available and promoted to staff. However, it is difficult to know if new staff are incentivised to join with an offer of less teaching and more research, thus allowing an ECR more time to develop his portfolio and reputation as a researcher. It is not evident from the self-assessment documentation if a succession plan is in place.

Recommendations

- Even if the recruitment process is driven by the faculty, the unit should try to address that policy along the direction of the Department strategy (non-existent). This is the only possibility to grow and to draw the characteristic of the Department of the future.
- It is recommended that the department creates its own strategy to attract female staff, possibly based upon flexible work schedules, parental leave, sabbaticals, and childcare assistance and leadership programs specifically for women. In addition, ECR should be allowed the flexibility to build their reputation through a reduced teaching load to help attract funds via Europe or create new collaborations with industry.

1.6 Open Science

The department general policy covers the DORA-declaration and a commitment to FAIR-principles. The NOR-CAM agreement and annual funding of approx. 1 MNOK for Open Access publications are available. The university has two local open access publication platforms for scientific literature and introduced a new rights retention strategy for employees for open access. A strategy is in place to ensure ownership stays with the author and not the publisher. Open access funds are available, yet data is limited how this is managed or measured. Research staff are encouraged to publish in open access journals. The faculty has an open access fund, organised by the university library, to ensure that as many as possible publications are open access. FAIR principles are in place to ensure data management and confidentiality.

Recommendations:

- It is recommended that the department continues with the current strategy for open access and implements a plan to manage and measure the benefits of open access to

ensure quality is not suppressed for the sake of quantity. It was not clear if a department or faculty used a repository of publications which is external facing and allows externals to browse the publications staff current and past. This could be developed by theme, department, faculty etc.

2. Research production, quality and integrity

The departments research has four main themes which fall broadly within construction engineering, chemistry and material sciences. The department has a large number of "sub-themes" in which many are established, with one or two new themes such as ocean technologies. The number of staff and the main roles are clear, yet it is unclear how this is managed or measured regarding who has KPIs, who has academic freedom and how ECR staff are supported through the development phase of their research career. The production and quality of work is internationally recognised as excellent, hence the number of international academic and industry projects currently awarded to the department.

2.1 Research quality and integrity

The department has steadily increased the number of publications in previous 10 yrs. Increasing from approx., 51 in 2013 to 160 in 2023. This is a level which puts the unit within the top institutions nationally. A large number of publications are with conference proceeding such as IOP Conference Series: Materials Science and Engineering.

The data on citation analyses show a high percentage of most highly cited papers between 2017/2018 however, the percentage has dropped significantly over the past 3 – 4 years. Data on why is not available. Although Covid may have had an influence.

Over the last 10-12 years the numbers of national co-authors have remained steady at around 14%. However, the number of international authors has significantly increased from 22% to 62% in the same period. The number of international co-authors has increased in the same period, reflecting the increase in international collaboration.

All groups have published in high quality, peer reviewed conferences and high impact journals, although it is difficult to determine which group has published in which ranking score (Q1-Q3).

From the information provided it is very difficult to separate the groups. The budget is provided from central funds and the income from research is not attributed to an individual member of staff.

As with the previous group, it is very difficult from the information provided to separate the Mechanical engineering and materials science group from the others. This group has broad expertise in the design testing and development of materials, manufacturing methods and methods for load calculations and fluid dynamics. The group has a number of international professors and associate professors supported by PHD students and post doc and supported by state-of-the-art labs. Publications are generally in international journals. The group has the same issues with regard to funding from central and the lack of formal strategy could hinder their development. A plan is required which has clear goals, KPIs, which could be further divided by industry required research and knowledge transfers and innovative research with a high technology readiness level (TRL). The labs, seem capable of supporting this approach. However, this group is successful in attracting funding, working closely with local, national and internal institutions from academia and industry showcasing excellent labs which supports industry required research.

Research group: Civil and Structural Engineering research group

The Faculty of Science and Technology stands at the forefront of research within the University of Stavanger (UiS). BYGG is engaged with the University's strategic view and has access to relevant laboratory facilities. The group has a very good organisation and has shown stability in its resources over the years, contributing to education at the bachelor, master and PhD levels and satisfying the industry's demands.

The Civil and Structural Engineering research group has core skills in design, analysis and testing of materials and structures. The group has a number of international projects, this was determined by the title and not by the allocation of resource, and employs several internationally renowned professors and associate professors supported by PhD students, post-doc staff and dedicated lab engineers. The group has published several high quality and high impact journal papers. It does state in the documentation that the group support UN sustainability goals. From the self-assessment supplied, it seems the focus is teaching, and research is secondary, while the success of the department is clear, it is not clear if this division is driven by income or another strategic decision. This lack of clarity could be attributed to the lack of a formal strategy for the group which clearly shows the needs of the group regarding time allocated for teaching and research. The group has an international reputation, attracts funding, and although they may not lead the projects, they have a strong international network of collaborators from academia and industry.

By promoting mobility and different forms of interaction, the group shows openness and positions itself in the international landscape with high credibility. Regarding outcomes, BYGG has a very good record of publications per year per Professor, which exceeds the UiS benchmark of 1.2. Overall, the quality of the listed publications is very good, with selection of high-impact journals in many cases, reflecting international and national collaborations and visibility of the research group at an international level. However, the level of publication among the different members of the group is heterogeneous and the level of international collaborations is still limited. The group provides evidence of relevant funded projects between 2012 and 2020, most involving the industry and relevant national partners, and some involving international collaborations.

Research group: Mechanical Engineering and Industrial Asset Management

The research group has a broad range of skills in terms of experimental and numerical approaches, from materials and processes to industrial management. The number of permanent and non-permanent research staff appears adequate for the research domains in which the group is interested. The presence of adjunct professors within the research staff engaged from industry can be a great asset, especially when it comes to connecting academic and industrial interests and needs. The available equipment is adequate, even if it could be further strengthened via participation in national infrastructures.

Even if it was not possible to break down the budget to the research group level, it is evident from the project list that the number of projects funded by companies is small, and there is no indication that the group is involved in Framework Programme projects. The industrial purposes of the group are illustrated by the production of patents and spin-off companies. Participation in international projects would require more robust efforts to build relationships with foreign partners.

Another major weakness is the limited number and impact of the research group’s publications compared to similar groups, especially at the international level. Although on average all the full-time professors perform pretty much the same at the scientific level, there

is scope to increase scientific performance given that they work in research domains that can lead to cutting-edge research.

Given the evaluation and based on some limitations in the available quantitative data, the overall performance of the research group can be regarded as moderate.

Research group: Marine and Offshore Technology / Ocean Technology

The Group has strengths in marine and offshore structure hydrodynamics, marine and offshore structure strength and fatigue analysis, marine and offshore operations and installations to achieve its goals. The Group includes research staff from other groups within the IMBM Department to apply and carry out projects that require additional strengths like artificial intelligence, machine learning and robotics.

The overall performance across the evaluation criteria and the overall contribution of the research group in terms of quality of publications, research income generated and the Group's Societal impact compares well with the research groups of similar size and infrastructure in other similar institutions worldwide. The Institution provides adequate support for the production of excellent research. Judging from the number of research projects and the journal publications the Group is fairly strong in an international context.

The societal contribution of the research group is significant, including actions to support important projects, the development of guidelines and standards for the industry and a grant to support ocean and river cleaning, helping communities to develop self-sustained businesses.

3. Diversity and equality

The institution has a number of good policies in place which are focused on protecting staff against discrimination and to promote equal opportunities, The university supports the European Charter for researchers and the Code of Conduct for recruitment of Researcher (HRS4R). Job advertisements, explicitly state applications from individuals regardless of their gender, disability, or cultural background are welcome. The university states a strict zero-tolerance policy against discrimination, and established mechanisms for reporting any issues.

The university has published several documents including the Recruitment policy Action plan for equality and diversity for students and employees and the National legislation - Equality and Anti-Discrimination Act. All are available on the university website.

4. Relevance to institutional and sectorial purposes

The research groups support two bachelor programs in structural and mechanical engineering and are used as a pathway to master's programmes. At bachelor level, the students are mainly Norwegian as many of the courses are taught in Norwegian. At master-level, about 50 % of the students are international. The department has approximately 600 students at both undergraduate and postgraduate, according to the department website. However, data identifying the number of students on each programme is not available within the self-assessment.

Due to the strong links with industry, academic programmes are constantly updated to include new advances in research and the latest challenges within the industry. Student projects are supported by industry introducing a more work-based learning approach.

Master's students are offered practical training within industry and have an opportunity to present their work at specific conferences arranged by the department and industry. In addition, students can undertake a research project supported by an academic member of staff, which provides an insight into life as an academic.

5. Relevance to society

The report describes that the department has established a long-term plan based upon the needs of society with a focus on "oceans and coastal areas", and "climate, the environment and energy". Mechanical, structural engineering, digitalisation and machine learning foster collaboration and multidisciplinary research with industry, this is a strength of the department.

The Department has close collaboration with industry also through a number of adjunct professors, collaborating with local industry. The teaching and research activities are aligned with the university priorities and the Norwegian long-term plan. The department, as with other departments in the faculty are involved with the Future Energy Hub, although it is unclear how time is allocated to the hub. The hub is part of the impact case study.

As stated before, the numerous activities devoted to the public engagement and toward a societal impact could be better organised in a department strategy, justified by a given purpose and not left to the random initiatives of the professors.

Comments to impact case 1: Title Search and Rescue in Polar Water

The project aim was to review rescue and survival equipment in the Arctic. The research was caried out, at that time, by one professor and one PhD candidate between 2016 – 2022. The project required and in-depth evaluation of the equipment used in terms of safety and functionality and to examine the functionality of the existing SOLAS (International Convention for Safety of Life at Sea) equipment and the functionality required by the IMO (International Maritime Organisation) Polar Code. The conclusion was the equipment would not be sufficient to fulfil IMO polar code requirements.

The very good underpinning research is predicated upon initial work carried out by the Universities of Stavanger and Tromsø and the Norwegian Coast Guard.

A number of journal publications were produced as well as three project reports (web links provided) and two PhD theses. Evidence provided shows changes to policy and current regulations governing safety and equipment were updated. The findings were also used for discussion with the Norwegian Ministry of Trade, Industry and Fisheries.

An excellent impact case study with good supporting research.

Comments to impact case 2: Title Applied 3d printing in medical science

Exploring the use of additive manufacturing to design and develop prosthetics, implants and surgical planning utilising modern technologies in applied 3D Printing in medical science. The work, started in 2020 is currently ongoing and involves a number of research active staff and the head of school, however, the projects presented are led by PhD candidates.

1) MetAMeT- is an international project including partners from China, India and Norway. The project aims to use 3D printed implants for medical prostheses. 2) This is a PhD project examining the use of "3D printing for surgical planning. Both projects are driven by the PhD-

candidates, and according to the information provided, there is not a large amount of publication on the subject. As the projects are still ongoing the impact has not been fully realised. However, both are medical and have the ability to revolutionise medical practices for often severe and life changing medical problems. The potential impact from the use of technology to support advances in medical procedures is enormous. However, as good as this is, this is not describing actual impact, only the possibility of impact.

Comments to impact case 3: Future Energy Hub

The Future Energy Hub (FEH) is a project funded by NFR, Rogaland County Municipality, local industry and UiS. The Hub has developed as an energy-laboratory at UiS to increase expertise within renewable energy and energy efficiency. The aim is to accelerate the development of green technology and services. The project seems to have started in 2018 and is still running. Several staff have been involved in the development and projects involved within the hub.

The aim of the project is to create greener buildings and neighbourhoods in collaboration with industry and the public sector. This is a cross disciplinary project involving several departs across the university and industry. Pilot-projects are initiated by industry and the hub uses staff from different disciplines to conduct research to solve a particular industry problem. The pilot-projects seek additional funding from different local sources. The projects have different impacts and examples are provided in journal articles and weblinks.

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 three 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 assessment, and the interview. The Administrative Unit had the opportunity to fact-check this summary. It was approved with minimal adjustments.

Limitations

The Committee judged that the Administrative Unit's self-assessment report was insufficient to assess all evaluation criteria fully, and some information gaps remained after the interview with the Administrative Unit. The information gap refers mostly to the relationship between the department and faculty, i.e. how much autonomy the faculty provides for each department to develop its own strategy and make independent budget decisions.

List of administrative unit's research groups

Institution	Administrative Unit	Research Groups
University of Stavanger (UiS)	Department of Mechanical and Structural Engineering and Material Science (IMBM)	Mechanical Engineering and Industrial Asset Management, Maskin og IAM (MEIAM)
		Structural engineering Research group (BYGG)
		Marine and Offshore Technology, Marin (M)

Terms of Reference (ToR) for the administrative unit

The board of University of Stavanger mandates the evaluation committee appointed by the Research Council of Norway (RCN) to assess the UiS Department of Mechanical and Structural Engineering and Materials Science based on the following Terms of Reference.

Assessment

You are asked to assess the organisation, quality and diversity of research conducted by the UiS Department of Mechanical and Structural Engineering and Materials Science 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 4 aspects in your assessment:

1. The balance between time spent on research, on teaching, and on administrative tasks, in a national and international context. If possible, suggest actions that may be taken to adjust this balance to national and international standards.

2. The national and international visibility and brand of the group/institution. If possible, suggest actions that may be taken to strengthen the visibility. Does the brand and visibility correctly represent the actual scientific quality?

3. The research group's potential for acquiring national funding and EU-funding, in particular national research center (SFF, SFI, FME), innovation (IPN)/researcher (forsker) projects, HE and ERC starting/consolidator/advanced funding within the coming 10-year period. If possible, suggest actions that can be taken to develop this potential.

4. The use of, and future needs for, local/national/international research infrastructure. If possible, suggest actions that can be taken to consolidate/develop existing activities: Laboratories and laboratory equipment, HPC, membership of international consortia and large scale experimental facilities.

In addition, we would like your report to provide a qualitative assessment of the UiS Department of Mechanical and Structural Engineering and Materials 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 UiS Department of Mechanical and Structural Engineering and Materials Science 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 UiS Department of Mechanical and Structural Engineering and Materials 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 UiS Department of Mechanical and Structural Engineering and Materials Science and RCN. The UiS Department of Mechanical and Structural Engineering and Materials 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 board of University of Stavanger and the RCN no later than two weeks after all feedback on inaccuracies has been received from the UiS Department of Mechanical and Structural Engineering and Materials 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 978-82-12-04147-9 (pdf)