

Assessment report
Limited Framework Programme Assessment

MSc in Construction Management and Engineering
Delft University of Technology

Contents of the report

1. Executive summary	2
2. Assessment process	4
3. Programme administrative information	6
4. Findings, considerations and assessments per standard	7
4.1 Standard 1: Intended learning outcomes	7
4.2 Standard 2: Teaching-learning environment	9
4.3 Standard 3: Student assessment	12
4.4 Standard 4: Achieved learning outcomes	14
5. Overview of assessments	15
6. Recommendations	16

1. Executive summary

In this executive summary, the panel presents the main considerations, which led to the assessment of the quality of the Master Programme Construction Management and Engineering of Delft University of Technology. The programme was assessed according to the standards of the limited framework, as laid down in the NVAO Assessment framework for the higher education accreditation system of the Netherlands, as published on 20 December 2016 (Staatscourant nr. 69458).

The programme aims to enhance students with technical as well as managerial knowledge and skills, so that students are trained for job roles, which focus on the management of engineering projects and processes. The programme's focus is on large and often multinational projects. In addition, the programme has a focus on information modelling and on processes and projects, which involve innovation. Graduates of the programme have obtained strong communication and collaboration skills, which are very important to their future roles. Another aspect, which is increasingly important is the use of BIM (Building Information Modelling), the panel encourages the programme to consider including BIM in the intended learning outcomes and the programme. The panel has established that the intended learning outcomes are formulated on a master's level and have a clear academic orientation. The intended learning outcomes have been benchmarked and have been revised in recent years and the panel is positive about the development of the intended learning outcomes. The panel concludes that the learning outcomes cover the knowledge and skills obtained by students in the four specialisations of the programme. The panel recommends to draft learning outcomes that elaborate on the distinction between the knowledge and skills obtained by students in the various specialisations of the programme. The panel assesses standard 1, intended learning outcomes, as satisfactory.

The programme is organized by three faculties, cooperating in the delivery of the programme. The programme offers cornerstone courses, which are specifically developed for the programme. The design of the programme displays coherency, consisting of cornerstone courses, compulsory course, specialisation courses and the thesis project. The cornerstone courses provide students with an integral outlook on the areas that are characteristic to management in engineering projects and processes. Students additionally follow a set of compulsory courses, providing students with fundamental knowledge in the areas of Legal and Governance, Project and Process Management, Asset Management, Markets and Organisation and Innovations and Integral Design. Students can then choose to specialise, in one of the following specialisations: asset management, infrastructure and environment, project management and legal and finance. Students can also choose a free programme, combining courses from the various specialisations. The programme has to be approved by the Board of Examiners. Students conclude their studies with a thesis project, which most students perform in collaboration with an organization in the professional field.

The panel concludes that the teaching and learning methods adequately facilitate student's learning process. The programme is organized in such a way that students can orient themselves before they decide on their specialisation, so that students make an informed decision. In addition, the structure provided by the specialisations provide coherence to the programme. The panel is positive about the course in project management. The course is an example of a conscious didactical approach. The panel observes that staff members of the programme are experts in their field and the programme provides students with ample opportunity to be in touch with the professional field.

The panel concludes that the programme allows students to obtain the intended learning outcomes and provides an adequate learning environment. The panel has some recommendations which mainly concern the staffing of the programme and the feasibility of the programme. The current workload of staff members is nearing the limits of what staff members can manage and should be reduced, for example by attracting additional staff. The panel recommends the programme to extend the number of staff members who are able to carry the programme and communicate the vision to other staff members as well. Another recommendation concerns the scheduling of courses and the feasibility of the programme. Since the courses are offered in other programme's as well, scheduling of the courses is complicated and can does not favour the feasibility of the programme. This is most notable for students commencing their studies in February, these students follow a study path in which the study load should be distributed more evenly. The panel strongly recommends the programme to improve this. The panel assesses standard 2, the teaching and learning environment, as satisfactory.

Students are assessed in various ways and the panel has established that the assessment is aligned to the intended learning outcomes of the programme and the content of the courses. The panel was impressed by the extent to which the assessment is supportive to the achievement and demonstration of student's intended learning outcomes. The programme management and the Board of Examiners take measures to ensure valid and reliable testing and students are informed on the assessment. The programme has a good overview of assessment methods throughout the programme as a whole. The assessment of the thesis is done in an adequate way, and the rubrics available to assess the thesis function well. The panel recommends the programme to further improve a consistent use of the assessment form. The panel is positive about the functioning of the Board of Examiners, although the review of theses is introduced comparatively late. Overall, the panel concludes that both in terms of rules and regulations and in terms of enhancing a quality culture, the Board maintains a high standard. The panel is positive about the system of assessment in the programme and assessed standard 3, assessment, as satisfactory.

Students demonstrate their knowledge and capacity to apply knowledge in the thesis work. In the choices of the topics, students demonstrate to be aware of relevant themes. In order to research these themes on the level as is demonstrated in the thesis, both technical as well as managerial knowledge are necessary. The panel observed that the extent to which students are required to reflect on the chosen methodology has improved since last accreditation and applauds the programme for the improvements made in this respect. The professional field is positive about the soft skills and communicative skills of the programme's graduates. Graduates speak both the language of technical experts and the language of managers: precisely what the programme intends to teach to its graduates. Graduates of the programme are very appealing to the professional field and find jobs relatively easy. The panel assesses standard 4, achieved learning outcomes, as good

The panel that conducted the assessment of the Master programme in Construction Management and Engineering of Delft University of Technology assesses this programme to meet the standards of the limited framework, as laid down in the NVAO Assessment framework for the higher education accreditation system of the Netherlands, judging the programme to be satisfactory. Therefore, the panel recommends NVAO to accredit this programme.

Rotterdam, 12 April 2019

Prof. dr. P. Bosch
(panel chair)

Jetse Siebenga MSc.
(panel secretary)

2. Assessment process

The evaluation agency Certiked VBI received the request by Delft University of Technology to support the limited framework programme assessment process for the Master Construction Management and Engineering of this University. The objective of the programme assessment process was to assess whether the programme would conform to the standards of the limited framework, as laid down in the NVAO Assessment framework for the higher education accreditation system of the Netherlands, published on 20 December 2016 (Staatscourant nr. 69458).

The management of the programmes in the assessment cluster Civil Engineering convened to discuss the composition of the assessment panel and to draft the list of candidates.

Having conferred with management of the programme, Certiked invited candidate panel members to sit on the assessment panel. The panel members agreed to do so. The panel composition was as follows:

- Prof. dr. Petra Bosch, Professor of Management, Technology and Innovation, Chalmers University of Technology (Chair);
- Prof. dr. Jos Arts, Professor of Environmental and Infrastructure Planning, University of Groningen;
- Prof. Dr. Ir. Geert de Schutter, Professor of Concrete Technology, Ghent University;
- Ir. Adriënne van der Sar, Deputy Staff Director of the Delta Programme Commissioner;
- Quinten Swanborn BSc, student Master Industrial Engineering & Management, University of Groningen.

On behalf of Certiked, J.W. Siebenga MSc. served as the secretary in the assessment process. The overall coordination of the assessment cluster Civil Engineering was executed by drs. W. Vercouteren.

All panel members and the secretary confirmed in writing being impartial with regard to the programme to be assessed and observing the rules of confidentiality. Having obtained the authorisation by the University, Certiked requested the approval of NVAO of the proposed panel to conduct the assessment. NVAO has given its approval.

To prepare the assessment process, the process coordinator convened with management of the programme to discuss the outline of the self-assessment report, the subjects to be addressed in this report and the site visit schedule. In addition, the planning of the activities in preparation of the site visit was discussed. In the course of the process preparing for the site visit, programme management and the Certiked process coordinator regularly had contact to fine-tune the process. The activities prior to the site visit have been performed as planned. Programme management approved of the site visit schedule.

Well in advance of the site visit date, programme management sent the list of final projects of graduates of the programme of the last two complete years. Acting on behalf of the assessment panel, the process coordinator selected 15 final projects from this list. The grade distribution in the selection was ensured to conform to the grade distribution in the list, sent by programme management.

The panel chair and the panel members were sent the self-assessment report of the programme, including appendices. In the self-assessment report, the student chapter was included. In addition, the expert panel members were forwarded a number of final projects of the programme graduates, these final projects being part of the selection made by the process coordinator.

A number of weeks before the site visit date, the assessment panel chair and the process coordinator met to discuss the self-assessment report provided by programme management, the procedures regarding the assessment process and the site visit schedule. In this meeting, the profile of panel chairs of NVAO was discussed as well. The panel chair was informed about the competencies, listed in the profile. Documents pertaining to a number of these competencies were presented to the panel chair. The meeting between the panel chair and the process coordinator served as the briefing for panel chairs, as meant in the NVAO profile of panel chairs.

Prior to the date of the site visit, all panel members sent in their preliminary findings, based on the self-assessment report and the final projects studied, and a number of questions to be put to the programme representatives on the day of the site visit. The panel secretary summarised this information, compiling a list of questions, which served as a starting point for the discussions with the programme representatives during the site visit.

Shortly before the site visit date, the complete panel met to go over the preliminary findings concerning the quality of the programme. During this preliminary meeting, the preliminary findings of the panel members, including those about the final projects were discussed. The procedures to be adopted during the site visit, including the questions to be put to the programme representatives on the basis of the list compiled, were discussed as well.

On 4 December 2018, the panel conducted the site visit on the Delft University of Technology campus. The site visit schedule was in accordance with the schedule as planned. In a number of separate sessions, the panel was given the opportunity to meet with Faculty Board representatives, programme management, Board of Examiners representatives, lecturers and final projects examiners, professional field and students and alumni.

In a closed session at the end of the site visit, the panel considered every one of the findings, weighed the considerations and arrived at conclusions with regard to the quality of the programme. At the end of the site visit, the panel chair presented a broad outline of the considerations and conclusions to programme representatives.

Clearly separated from the process of the programme assessment, the assessment panel members and programme representatives met to conduct the development dialogue, with the objective to discuss future developments of the programme.

The assessment draft report was finalised by the secretary, having taken into account the findings and considerations of the panel. The draft report was sent to the panel members, who studied it and made a number of changes. Thereupon, the secretary edited the final report. This report was presented to programme management to be corrected for factual inaccuracies. The programme management was given three weeks to respond. Having been corrected for these factual inaccuracies, the Certiked bureau sent the report to the University Board to accompany their request for re-accreditation of this programme.

3. Programme administrative information

Name programme in CROHO: M Construction Management and Engineering
Orientation, level programme: Academic Master
Grade: MSc.
Number of credits: 120 EC
Specialisations: n.a.
Location: Delft
Mode of study: Full-time (language of instruction: English)
Registration in CROHO: 21PF-60337

Name of institution: Delft University of Technology
Status of institution: Government-funded University
Institution's quality assurance: Approved (until 20/11/23)

4. Findings, considerations and assessments per standard

4.1 Standard 1: Intended learning outcomes

The intended learning outcomes tie in with the level and orientation of the programme; they are geared to the expectations of the professional field, the discipline, and international requirements.

Findings

The programme aims to train students to become engineering professionals who work with a critical view and as self-starters, and who integrate construction, management and engineering sciences. The programme covers all aspects of construction management processes, including the definition, appraisal, design and delivery of projects, as well as the operation and maintenance phases of the life-cycle management of objects.

The programme performed an international benchmark, which compares the programme to the other Construction Management and Engineering programmes in the Netherlands and several other comparable programmes in Europe and the USA. Whereas other programmes depart from either a traditional approach to management or focus on the operational implementation of technological aspects in construction management, this programme strongly combines these aspects. In comparison to the Dutch programmes in Construction Management and Engineering, the programme focuses on large projects and networks and is further specialised in analytical tools and information modelling. It has a multidisciplinary and a clear, international focus. Other programmes in the Netherlands have either a stronger focus on markets and organisations or on the implementation of Urban Development processes.

The programme drafted the intended learning outcomes in accordance with the Meijers Criteria, which have been developed by the 3TU Federation and are related to level 7 of the Netherlands Qualification Framework (NQLF). The programme's character is mainly constituted by graduates of the programme being able to combine management theory and technical knowledge. Students can choose among four specialisations in the programme, which are: asset management, infrastructure and environment, project management and legal and finance.

The programme has developed its intended learning outcomes in recent years. These define several sub-areas in which students can gain knowledge. The subareas are (i) Project and Process Management in the field of Construction Engineering, (ii) Asset Management, (iii) Legal and Governance, (iv) Markets and Organisations and (v) Innovations and Integral Design. Students are further competent in designing, know how to cooperate and communicate and take into account the (societal) context of construction management and design. They are competent in doing research and have a scientific approach.

There are three faculties involved in the programme, which jointly offer the programme. The programme combines knowledge of several research groups, amongst others involved in the study of asset management, project management, design processes, policy management and governance, 'information, communication and systems' and construction law.

Students are educated as engineers, consultants, risk managers and researchers. They can work for engineering consultancy firms, contractor firms, and construction companies, which operate in a variety of fields such as infrastructure, real estate, oil and gas, water, buildings and energy.

The programme regularly receives advice from representatives of the professional field and intends to install a formal advice committee. The demand from the government for graduates of the programme is increasing. In the self-reflection and during the site visit, the growing importance of BIM, the digital representation of all characteristics and features of a building, is mentioned by various stakeholders to the programme.

Considerations

The panel is positive about the intended learning outcomes of the programme. They are formulated at the master's level and reflect a scientific and academic orientation. The panel is positive about the fact that the programme has revised the intended learning outcomes over the past few years. The panel concludes the intended learning outcomes to cover the knowledge and skills obtained by students in all the specialisations. The panel recommends to draft more specific intended learning outcomes for each of the specialisations of the programme, these being specifications of the programme intended learning outcomes. The panel believes this would better reflect the specific features of the specialisations. The panel believes this would strengthen the extent to which the distinction between the graduates of the programme is made visible in the intended learning outcomes.

The programme's benchmark displays the specific profile of the programme in comparison to the other Dutch programmes in Construction Management and Engineering as well as to some international programme. The programme is embedded in a scientific environment that offers more than sufficient outlook on relevant developments in academia. In addition, the panel concludes that the programme is familiar to developments in the professional field. The panel is therefore positive about the programme's awareness of relevant academic and professional developments and has one recommendation in this regard: to incorporate in the programme the opportunity for students to familiarize with BIM.

Assessment of this standard

These considerations have led the assessment panel to assess standard 1, Intended learning outcomes, to be satisfactory.

4.2 Standard 2: Teaching-learning environment

The curriculum, the teaching-learning environment and the quality of the teaching staff enable the incoming students to achieve the intended learning outcomes.

Findings

Organization and student body

The programme is jointly delivered by three faculties: Civil Engineering and Geosciences (coordinating Faculty), Technology, Policy and Management and Architecture. The programme sees to it that the faculties are represented in the various governing bodies of the programme. The Director of Studies of the coordinating faculty has the managerial responsibility for the programme and the daily management of the programme is in the hands of the programme director, also from the coordinating faculty. The Board of Studies, being composed of lecturers and students, advises the programme management on the quality of the programme, the Teaching and Examination Regulations as well as the implementation of the Teaching and Examination Regulations. Its chair represents the Faculty of Architecture. The Board of Examiners has the authority to ensure the quality of the examinations and assessments of this programme and is chaired by a staff member from the Faculty of Technology, Policy and Management.

The programme admits students with a relevant BSc. degree from a Dutch University. The Teaching and Examination Regulations, give an overview of relevant bachelor programmes. Graduates of some bachelor programmes have to complete a bridging programme or a 30 EC minor before they are admitted to the programme. International students need a relevant Bachelor education and additionally a cumulative Grade Point Average of 75% of the scale maximum as well as sufficient mastery of the English Language (IELTS 6.5, TOEFL 90). Students with a Civil Engineering bachelor degree from a university of applied science are admitted to a pre-master programme. The number of students has increased over the past years and peaked on 82 students in the year 2014-2015. Over the years 2013-2014 to 2016-2017 the average number of students was 74. The number of international students in the programme has increased over the last few years: half of the student population is from abroad.

Students are closely involved in the programme. They organise themselves in a study association, and closely collaborate with the programme in reflecting on the quality of the programme with students and the organization of extracurricular activities related to the study, such as field trips. This provides students with a strong sense of community.

The programme translated the intended learning outcomes into learning goals on course level. Courses in the programme are divided in cornerstone courses (28 EC), compulsory courses (31 EC), elective courses (25 EC) and graduation work (36 EC). Cornerstone courses address management of (collaborative) projects and processes and their legal context. These are developed especially for the programme.

The compulsory courses introduce students to the four specialisations of the programme, and students gain knowledge in the sub-areas of Construction Management and Engineering. The compulsory courses in addition contain a course on intercultural relations and project management, a course on philosophy, technology assessment and ethics and a course on research methodology. The programme management intends to improve the scheduling of the courses, since the current scheduling results in a suboptimal distribution of the study load. The course in research methodology is an online course. The programme management has evaluated the course and has observed that it needs to be revised since it does only to a limited extent encourage students to engage in the studying the courses topics and content. In line with

the programme intentions, the panel suggests to revise the course to make the course more attractive to students.

Students choose a specialisation and within this specialisation choose elective courses. Students who prefer to study a different programme than one that is offered in the selection of specialisations, have the possibility to opt for a free study programme. Students can choose from the electives offered within the different specialisations. The cohesion of the programme is made up by alignment of the cornerstone courses, the compulsory courses and the selection of possible electives belonging to a certain specialisation. The programme gradually builds towards the writing of the thesis. In response to a questionnaire on the programme, students report to find the coherence of the programme good.

The programme uses a variety of educational methods such as lecturers, guest lecturers, excursions, workshops, presentations and projects. In the cornerstone courses, the programme applies various activities and assignments, which require students with various disciplinary and national backgrounds, to collaborate. The teaching methods support the achievement of the intended learning outcomes. The programme presented an example of the project management course during which students have to cooperate in large groups of about 30 students. One of the learning goals of this course is for students to learn how to find their place within large groups and to reflect on this process. The setup of the assignment reflects the setup in large projects where projects are delivered in multicultural teams of similar size.

Students complete the programme by a graduation project and the writing of a thesis. In order to prepare their graduation project and thesis, students take a 4 EC thesis preparation course during which they write their research proposal. Most students develop a project in cooperation with the professional field during their graduation project. During the writing of this proposal, they can get advice of a graduation coordinator on finding a company and the composition of the graduation committee. Students receive a handbook, in which all the procedures are explained, as well as the assessment criteria of the thesis. The programme provides a clear structure to the thesis process.

The programme's teaching and learning environment consists of various courses offered by various faculties and are offered in several study programmes. Since students' backgrounds differ, the level of some courses as experienced by students from different backgrounds varies. Students report that they experience that lecturers from the cornerstone courses are more focussed on dealing with the diversity of the student population than the lecturers of some other courses. Nevertheless, students report to be satisfied with the extent to which staff members of these courses address individual questions.

As mentioned, the scheduling of the programme does not enhance the feasibility of the programme, the panel observed that most students do not think that the programme is doable in two years. The workload of the individual courses is balanced, but the division of courses over the eight periods make it harder for students to succeed in all the courses scheduled in the second and fourth period. Partly due to this, the average number of months it takes students to complete their studies is 33 (over the last three academic years), whereas the programme is a two-year programme. Other reasons for study delay are students who take more time for their internship or their thesis project abroad, in addition some students work alongside their studies.

The programme is delivered by a group of staff members involved in various related programmes. Almost all of the staff members involved in the programme have obtained their University Teaching Qualification (UTQ). In addition, staff members have been tested on their level of English. Some lecturers had to take

courses to improve their English. The group of staff members is not as diverse as the group of students, in terms of the variety of national backgrounds. However, PhD-students with various national backgrounds assist in teaching in various courses and add the diversity of staff members, to the benefit of international students.

Staff members of various faculties meet in graduation committees and in various committees responsible for the programme. In addition, there is an annual staff meeting. The number of staff members is sufficient but some members report a very high workload. The courses in project and process management are taught by one staff member, since these courses are fundamental to the programme, the programme sees this is a vulnerable construction. It considers to implement the policy that cornerstone courses are not taught by single staff members. The programme closely involves the professional field in its education. For several courses, guest lecturers are invited, in one of the courses, students receive feedback on an assignment from an expert from the professional field, various cases are used and experts from the field are involved in the master's thesis supervision. Students go on a field trip in various courses.

Considerations

The teaching and learning environment of the programme offers students a learning experience, which allows them to obtain the combination of technical insight and project management. To this end, the programme uses adequate teaching methods and closely involves the professional field within the learning environment. The programme is populated by a diverse group of students, with differences in disciplinary backgrounds and nationality. The panel concludes that the programme allows all students to engage in the programme and obtain the intended learning outcomes and that the admission criteria and procedure are adequate. It is unavoidable that due to differences in the students' background, the level of courses is experienced differently, the panel observes that these differences are of an acceptable level. Since an important number of courses is shared with other study programmes and as a result, the scheduling of the programme is complicated and the distribution of the study load is suboptimal, it is difficult for students to complete the programme within two years. The panel has observed that the programme is constantly trying to address scheduling issues and understands how complicated the issue is. Nevertheless, it strongly recommends the programme management to improve the programme's feasibility and improve the extent to which the programme allows students to graduate within two years, if necessary, with the support of the Faculty and University Management. The programme is delivered by a group of staff members with expertise in their field and specifically with relevant expertise in combining technical knowledge and project management. The panel recommends the Faculty to reduce the workload of research groups which experience a very high workload and ensure that the workload does not exceed what is reasonable. and implement the measures to ensure that the fundamentals of the programme are carried by a larger group of staff members.

Assessment of this standard

These considerations have led the assessment panel to assess standard 2, Teaching-learning environment, to be satisfactory.

4.3 Standard 3: Student assessment

The programme has an adequate system of student assessment in place.

Findings

The programme examination and assessment rules are derived from the Faculty's rules and regulations. The main principle on which the assessment system is based is that of constructive alignment, which aims to connect the intended learning outcomes to the learning goals for each course and the tested knowledge and skills in each course. To this end, lecturers define an assessment matrix for their course, which includes the check that all main learning objectives in the exam are listed, including the weight of each topic in the final grade. The actual test a lecturer develops is based on the assessment matrix. Lecturers with a UTQ are trained in drafting assessments in order to strengthen validity and reliability thereof.

Students receive information on the forms of assessment in particular courses as well as the weight of each part in case the assessment consist of various parts. The programme has developed an assessment plan, which gives an overview of the assessment methods used in each course. Most courses assess students in various ways and on various moments. Half of the cornerstone and compulsory courses provide group assignments in order for students to develop their project management skills.

Assessment methods used in the programme are written exams, papers, presentations, group work assessment and oral exams. In case of group work, the individual commitment of a student is recognised and free-rider behaviour is strongly discouraged. In case of an oral assessment, there are at least two examiners. For the assessment of the thesis, the programme uses an elaborate rubric. The rubric provides lecturers with the criteria to score the thesis on. The assessment of the thesis is performed by a graduation committee consisting of at least three members, representing at least two disciplines. The panel studied 15 theses and the assessment forms. The panel observes that the extent to which feedback is provided on the assessment form varies.

Programme management and the Board of Examiners have taken measures to promote the validity, reliability and transparency of examinations and assessments. The Board of Examiners appoints the examiners, staff members without a UTQ cannot be appointed as examiners. In addition, the Board of Examiners ensures a bi-annual review of the programme's thesis. This policy has been implemented recently. The Board of Examiners meets four times a year and invites lecturers to present and discuss their assessment policy. The Board of Examiners invites lecturers from all involved faculties. During the meetings the Board of Examiners gives feedback on the assessment in the reviewed course. Staff members generally appreciate the discussions. Within the Board of Examiners, different practices of the involved faculties are discussed. When a decision has to be made, often the Board decides to follow the most stringent policy.

Considerations

The panel has established that the programme's assessment policies stimulate a reliable, valid and transparent way of testing. The programme uses a wide variety of assessment methods and the panel is impressed by the extent to which the assessment is supportive to the achievement of the intended learning outcomes by students. The programme has a good overview of assessment methods throughout the programme as a whole. The assessment of the thesis is done in an adequate way, the rubrics available to assess the thesis function well. The panel recommends the programme to further improve a consistent use of the assessment form. The panel is positive about the functioning of the Board of Examiners. In terms of rules and regulations as well as in terms of enhancing a quality culture, the Board maintains a high

standard. However, the implementation of quality assessment activities such as reviewing these work was rather late.

Assessment of this standard

The considerations have led the assessment panel to assess standard 3, Student assessment, to be satisfactory.

4.4 Standard 4: Achieved learning outcomes

The programme demonstrates that the intended learning outcomes are achieved.

Findings

The programme's graduates start working in a wide range of organisations, such as Engineering Consultancy Firms, large Contractor Companies, Public Organisations and Research Institutes. Most graduates (71%) work for large companies with more than a thousand employees. Alumni find jobs easily and soon after graduation. From the response to the alumni questionnaire, it shows that alumni mention the following strong points of the programme: the multi-disciplinary character of the programme and the cooperation with other students and group work. The panel discussed the extent to which graduates work as managers. Analysis of job roles of graduates show that graduates obtain managerial positions after they have obtained experience in other job roles.

The programme has interviewed 17 companies that employ graduates from the programme. The companies regard the ability to speak the language of both the manager and the engineer, as an important attribute of the programme. Graduates are easily deployable in new jobs or tasks and have good communication skills and people skills. Compared to graduates from other master programmes, the soft skills of the graduates from this programme are strong. Graduates of the programme know how to manage stakeholders.

The panel reviewed 15 theses. Students address relevant research questions on a wide variety of topics. The theses contain an extensive analysis of relevant issues for Engineering projects or solutions, such as circular economy, or research methods and instruments used in Engineering projects and processes, such as virtual reality. The length of the theses varies, the panel has reviewed several theses which are relatively lengthy. The panel remarks that the extent to which students reflect on the chosen methodology has been a point of attention since last accreditation. The theses reviewed by the panel demonstrate considerate attention for this element. To the panel, this gives proof of the capacity of the programme to reflect on its quality and improve the programme and the results of the programme accordingly.

Considerations

The panel is positive about the extent to which students demonstrate their knowledge and capacity to apply knowledge in the thesis work. In the choices of the topics, students display an awareness of what are relevant themes. In the thesis, they demonstrate their analytical skills, as well as their knowledge and insight in the complexities of large Engineering projects and the management thereof. The panel is positive about the attention for reflection on the chosen methodology in the theses. The theses reviewed by the panel, contain a multidisciplinary perspective. The panel agrees with the grades given and concludes that the reviewed theses demonstrate the achievement of the intended learning outcomes. The panel has one recommendation related to the variation in length of the thesis and recommends the programme to develop a standard with regard to this length.

The alumni of the programme are appreciated by the professional field. The programme supplies large engineering companies with specialists that are able to speak both the language of technical experts and the language of managers: precisely what the programme intends to teach to its graduates.

Assessment of this standard

The considerations have led the assessment panel to assess standard 4, Achieved learning outcomes, to be good.

5. Overview of assessments

Standard	Assessment
Standard 1. Intended learning outcomes	Satisfactory
Standard 2: Teaching-learning environment	Satisfactory
Standard 3: Student assessment	Satisfactory
Standard 4: Achieved learning outcomes	Good
Programme	Satisfactory

6. Recommendations

In this report, a number of recommendations by the panel have been listed. For the sake of clarity, the most important ones have been brought together below. The panel recommends the programme:

- to draft more specific intended learning outcomes for each of the specialisations of the programme;
- to ensure the workload of staff does not exceed a reasonable level;
- to improve scheduling of the courses in order to improve the feasibility of the programme and allow students to graduate within two years;
- to ensure that cornerstone courses, which are fundamental to the programme, are taught by a sufficiently large group of staff members;
- to establish a consistent practice with regard to the use of the thesis assessment form;
- to establish a recurrent practice with regard to the attention in the thesis for a reflection on the chosen methodology;
- to provide students with a standard concerning the length of the thesis.