ONDERZOEKERIJ

Master's programme

Innovation Sciences

Eindhoven University of Technology

Report of the limited programme assessment

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Contents

Executive summary

The outcome of the external assessment of the master's programme Innovation Sciences (IS) of Eindhoven University by an NVAO-approved panel is positive.

The IS master is a two-year English-taught programme, with a total study load of 120 European Credits (EC). The programme focuses on innovation and broader societal transitions towards sustainability (energy, mobility, urban transitions, etc.) as complex socio-technical processes. The panel values this unique relevant profile that is achieved by integrating technological and social sciences and humanities (SSH) perspectives in the field of innovation. It advises communicating this profile more explicitly to the students.

The programme's intended learning outcomes (ILOs) meet the level and orientation that can be expected of a master's programme in the field of innovation sciences.

According to the panel, the programme equips students to become the envisioned bridge builders between the different disciplines. The curriculum provides students with a broad and interdisciplinary perspective on innovation and has a good balance between mandatory courses, electives, and the Master Thesis Project. The panel values that students can tailor the programme to their interests.

Students are satisfied with the content and structure of the programme but are less satisfied with the overlap between IS bachelor's courses and several IS master's courses. The panel advises investigating the possibilities to reduce this repetition and to sufficiently challenge all students, for example by giving more in-depth assignments to students who did the IS bachelor.

The programme is embedded in a strong academic environment. The teaching staff is enthusiastic, well-qualified and knowledgeable in their respective areas. The programme offers intensive study-related guidance, and students appreciate the approachability of the lecturers.

The panel appreciates that the programme has a solid set of documents and procedures in place which secure a valid, transparent, and reliable system of assessment. The panel is pleased that the programme followed the recommendations of the previous accreditation panel to introduce rubrics for the assessment of the graduation project. However, it encourages the programme to further improve the transparency of the grading system. The Examination Committee does an excellent job of safeguarding the quality of assessment and the final attainment level of the master's graduates.

The panel established that graduates achieve the ILOs by the end of the programme. The theses demonstrate that students acquired broad knowledge and understanding of the innovation sciences as well as significant in-depth knowledge of certain parts of the innovation field. Graduates can integrate knowledge systematically and can analyse, assess, and manage complex phenomena, issues and situations connected to the innovation field. The theses are clearly of the level and quality that may be expected from a master's thesis in the field of innovation sciences. The panel encourages the programme to further strengthen the quality of the theses by making the multidisciplinary focus more visible in the theses. In addition, the panel advises training students more explicitly to critically evaluate their research methods.

The chair and the secretary of the panel hereby declare that all panel members have studied this report and agree with the judgements in the report. They confirm that the assessment has been conducted in accordance with the requirements relating to independence.

Date: 14 February, 2023

Wiebe Bijker	Esther Poort
(chair)	(secretary)

1. Introduction

1.1 Administrative data

Name of the programme:	M Innovation Sciences
CROHO number:	66265
Level of the programme:	Master
Orientation of the programme:	Academic
Study load:	120 EC
Location:	Eindhoven
Variant:	Full-time
Submission deadline:	1 May 2023

1.2 Introduction

This report focuses on the assessment of the master's programme Innovation Sciences. This assessment forms part of a cluster assessment of six programmes at three universities. Appendix A provides an overview of the six participating programmes.

The assessment is based on the standards and criteria described in the NVAO Assessment framework for the higher education accreditation system of the Netherlands 2018 (limited framework).

1.3 Panel composition

The panel that assessed this master's programme consisted of the following members:

- Prof. Wiebe Bijker (chair), emeritus professor of Technology & Society, Maastricht University;
- Prof. Magnus Klofsten, Professor in innovation and Entrepreneurship, Linköping University, Sweden;
- Dr. Lotte Krabbenborg, Associate Professor Public participation in the development of science and technology, Radboud University;
- Dr. Pieter Heringa, Strategic advisor research policy, Hogeschool Inholland;
- Iris Brugmans MSc (student member), student M Healthcare policy innovation and management, Maastricht University.

The panel was supported by Esther Poort, who acted as secretary.

All panel members and the secretary have signed a declaration of independence and confidentiality. In this declaration, they affirm not to have had any business or personal ties with the programme in question for at least five years prior to the review.

The NVAO approved the composition of the panel on 16 September 2022.

1.4 Working method

Preparation

The assessment process was development oriented. Before the site visit, the panel received the relevant documentation from the programme, consisting of an extensive set of current documentation pertaining to the four standards of the NVAO framework. The programme also provided an analysis of the programme's strengths and weaknesses, a separate and independent student chapter (movie), and a reading guide. The reading guide was structured along the lines of the four standards. The reading guide described the main characteristics of the standards. In addition, it provided a table with references to relevant documents, web pages, or online information. An overview of these materials can be found in Appendix B. The panel members prepared the site visit by analysing the documents provided by the programme.

The panel also studied a selection of fifteen master theses and the accompanying assessment forms from the programme. The theses selection was made by the panel's secretary based on a provided list of theses of the most recent years. In the selection, consideration was given to a variation in tracks, assessments (grades) and topics.

The panel members individually formulated their preliminary findings and a number of questions they wanted to raise during the site visit. The secretary made an overview of these preliminary findings and questions and sent these to the panel members. On 18 October 2022, the panel held an online preliminary meeting. In this meeting, the panel discussed the programme's preliminary findings and discussed the most important topics they wanted to touch upon during the site visit.

Visit

The site visit of both the bachelor's and master's programme Innovation Sciences took place on 8 November 2022 (see Appendix C for the schedule). During the preparatory meeting on November 7, the panel decided which questions to raise in their meetings with the programme representatives. During the visit, the panel spoke with representatives of the management, students, lecturers, alumni, and the Examination Committee. Everybody involved in the programme had the opportunity to inform the panel in confidence about matters they consider important to the assessment. No one made use of this opportunity. The panel used the last part of the visit to evaluate the interviews and had a second meeting with the programme's management to receive answers to remaining questions. At the end of the visit, the chair presented the panel's preliminary findings and impressions of the programme.

Report

The secretary drew up a draft report based on the panel's findings. This draft report was presented to the members of the panel and adjusted based on their feedback. After adoption, the draft report was sent to the institution for verification of factual inaccuracies. The secretary discussed the programme's comments with the chair, after which the secretary drew up the final report and circulated it to the panel for a final round of comments.

The report follows the four standards such as specified in the NVAO's Assessment Framework 2018 (limited framework): 1) the intended learning outcomes, 2) the teaching-learning environment, 3) assessment, and 4) achieved learning outcomes. Regarding each of the standards, the assessment

panel gave a substantiated judgement on a three-point scale: meets, does not meet, or partially meets the standard. The panel subsequently gave a substantiated final conclusion regarding the quality of the programme, also on a three-point scale: positive, conditionally positive, or negative.

Development dialogue

Although separated from the process of the programme assessment, the assessment panel members and programme representatives conduct a development dialogue, to discuss future developments of the programme in light of the outcomes of the assessment report.

2. Review

2.1 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, analysis, and considerations

Innovation Sciences (IS) is a 120 EC master's programme offered by the School of Innovation Sciences within the Department of Industrial Engineering & Innovation Sciences (Department of IE & IS) at the Eindhoven University of Technology (TU/e).

In the IS master's programme, students study processes of innovation and broader societal transitions towards sustainability (energy, mobility, urban transitions, etc.) as complex socio-technical processes. The programme aims for both understanding and, increasingly, intervention in these processes. The programme draws on fields such as the economics of innovation, sustainability transition studies, Science & Technology Studies (STS), and the history of technology.

The panel appreciates the multidisciplinary programme with a unique relevant profile in the Netherlands. This unique profile is achieved by integrating a plurality of relevant issues and actor perspectives and a diversity of research perspectives and methods to study these. Students are trained as π-shaped professionals with one leg in the social sciences and humanities (SSH) and the other in the technical sciences. The panel endorses the importance and relevance of these π-shaped professionals who can build bridges between these disciplines and thus will become future change agents who can contribute to solving sustainability issues. Based on the documents and the interviews with the students, it appears that students find it difficult to formulate their professional identity. Therefore, the panel advises the programme to communicate this highly relevant professional profile more explicitly to the students.

The programme formulated a set of intended learning outcomes (ILOs). The ILOs are divided into general ILOs (common to all master's programmes of TU/e) and domain-specific ILOs that are characteristic of the IS programme. The general ILOs include research and design skills, problem-solving skills, cooperative and communicative skills (also in an international context), and broad societal awareness. The domain-specific ILOs include a thorough knowledge of Innovation Sciences (incl. transition studies), research skills in the IS domain, and the ability to translate the results of research into design (which typically includes interventions such as policy or strategy recommendations) while taking into account broader societal considerations. The panel studied the ILOs and concluded that they form a convincing and well-structured overview of the main goals of the programme. The use of the Meijers' criteria in designing the ILOs guarantees that they meet the master's level and academic orientation, as well as comply with general engineering skills required by the academic and professional field. Overall, the panel is of the opinion that the ILOs fulfil all requirements in terms of level, and orientation.

The panel noted with appreciation that sustainability has gained in prominence in the programme profile since the previous visitation in 2016. It learned from the documents that this development was at least partly inspired by the changing research and impact ambitions of the Technology, Innovation & Society (TIS) research group that hosts the program. The panel advises updating several ILOs to

better align with the programme's focus on sustainability. It advises using the joint domain-specific reference framework (see below) as a source of inspiration. The panel supports the plans of the programme to include the students' role as future change agents in the ILOs. In addition, the panel advises the programme to explore if insight in the underlying normative dimensions of science, technology and innovation could be made more explicit in the ILOs.

The programme has two tracks: Global Sustainability (GS) and Innovation Strategy and Policy (ISP). The GS track focuses on the role of innovation in making societies (sectors, cities, regions, etc.) more inclusive and sustainable, both in the Global North and South. The ISP track focuses on creating and governing more innovative societies, serving welfare, well-being, and sustainability. The panel endorses the relevance of the two chosen domains. However, it suggests broadening the scope of the programme by also focusing on other sustainability domains, such as the sustainable fashion industry (by linking with the Design Academy in Eindhoven).

In close collaboration with the programme directors of the affiliated programmes at Utrecht University and VU University Amsterdam, a domain-specific reference framework (DSRF) was established in 2021, in which the respective bachelor's and master's programmes were included that educate students in the field of innovation sciences. The panel was impressed by this joint effort and considers the framework to be a coherent description of the international academic field of innovation sciences and the identity of the innovation sciences programmes in the Netherlands. The panel established that the ILOs of the IS master meet the DSRF and, therefore, are well aligned with the international standards set for the discipline. However, the panel advises to explicate more clearly how the TU/e master relates to the framework and what the unique position of the TU/e programme is in the landscape of innovation sciences in the Netherlands. This would also be helpful to strengthen the formulation of the ILOs and to clarify to students what the unique profile of the programme is and what their specific added value is in the professional field.

The IS programme has multiple connections to industry, among which the Societal Council. In the Societal Council, which is shared for all IE&IS programmes, various types of companies and government-related organizations are represented. The Societal Council functions as a sounding board for the department's research and education. According to the panel, the IS master's programme could benefit more from this Societal Council, for example by involving them in defining the unique profile of the IS graduates and in updating the ILOs.

Conclusion

The panel concludes that the programme meets standard 1.

2.2 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, analysis, and considerations

Curriculum

IS is a two-year English-taught master's programme, with a total study load of 120 European Credits (EC). The programme consists of 25 EC of mandatory core courses common to all students, 20 EC of semi-elective track courses, 45 EC of electives, and a Master Thesis Project (MTP) of 30 EC. Apart from the MTP, all courses have a study load of 5 EC.

During the five mandatory courses, students learn to analyse a specific sustainable innovation niche. In addition, students learn to situate innovation and socio-technical transitions as long-term and transnational processes with many twists and turns.

The programme consists of the two tracks mentioned in Standard 1 (GS and ISP) and a third, free track which is meant for excellent students. Within the predefined 20 EC track courses, students choose four courses from a pre-structured list of electives. Within the free track, students choose the electives in close collaboration with a personal mentor. The choice of the free track electives must be approved by the Programme Chair as well as the Examination Committee.

Within the 45 EC free electives, students must choose at least 10 EC of engineering courses. The international semester (30 EC) in the first half of the second year is also part of the free elective space. Students follow courses that complement the study programme at TU/e, either deepening their knowledge of subjects studied at TU/e or introducing new topics not available at TU/e. Students who don't have any international experience are required to study at a host university in another country. The international component has a minimum requirement of 15 EC and students can extend this to a maximum of 30 EC. The department maintains an active exchange programme with several international universities. During the COVID-19 crisis, the international semester exchanges could not continue. Students were given a range of alternatives that made it possible for them to complete their studies. The Examination Committee (EC) checked all deviations from the default programme.

The programme provides opportunities for students to shape their own learning paths. Students must substantiate their choice of electives in a form and submit this to the EC. The EC evaluates the proposal for the elective space based on coherence, depth, and overlap.

In the Master Thesis Project (MTP) students specialize in a subject that fits with ongoing research within the Technology, Innovation & Society (TIS) group as well as with their specialization in the field of innovation sciences. Students typically address questions and problems that are relevant to larger real-world economic, societal, and/or sustainability challenges. They develop their research proposal with support from their supervisor. After the research proposal has been approved, the students execute the research and report the result in the form of a written thesis and an oral presentation. Most students do an external project in a company, policy organization, or NGO. Students can also choose to do a project at the university.

The panel is of the opinion that the programme successfully translated the ILOs into a coherent curriculum. The curriculum has a good balance between mandatory courses, electives, and the MPT. The panel established that students acquire a broad and interdisciplinary perspective on innovation and are well-equipped to become the envisioned bridge builders between the SSH and the

technological sciences. The panel appreciates the freedom students must shape their own learning path. Students are well guided in their choices and the programme has sufficient measures in place to guarantee the coherence of each induvial learning path. The panel also values the high proportion of students that follow an international semester, allowing them to develop a truly international orientation and broaden their horizons.

The panel noted that the programme pays sufficient attention to critical thinking. The lecturers with whom the panel met explained that critical thinking is part of the research methodology course. In addition, the supervisor plays an important role in training the students to critically reflect on, for example, research methods and theoretical frameworks.

The students with whom the panel met, were positive about the content and the structure of the programme. They highly appreciate the freedom to select electives and to shape their own programme and learning path. They spoke very positively about their international semester. Furthermore, students are pleased with the small-scale atmosphere and the approachability of their lecturers. They indicated that lecturers respond well to their suggestions for improvements to the courses. Students are less satisfied with the overlap between IS bachelor's courses and several IS master's courses. The panel understands that some overlap is inevitable because many subjects are new for students who come in from other faculties or other universities. However, the panel advises the programme to investigate the possibilities to reduce this repetition for students who did the IS bachelor. It encourages the programme to sufficiently challenge these students, for example by giving more in-depth assignments to these students.

Student intake

Admission to the programme is open to a) students who have a bachelor's degree in Sustainable Innovation (TU/e), b) students who have a degree in another TU/e bachelor's programme, provided that they have followed three specific courses of the IS bachelor, c) students who have a degree in a specified bachelor's programme of another Dutch university, and d) students who have a comparable (inter)national bachelor and have sufficient proficiency in English. For this category, a homologation programme consisting of at most three courses may be required. Students with a bachelor's degree in applied sciences (HBO) can enrol after having followed a pre-master's programme. The panel is pleased with the admission criteria and onboarding process because they ensure that all incoming students are well-equipped to complete the programme.

The influx in the programme is about 20-45 students per year. This number fluctuates over the years. The panel supports the ambition of the programme to grow moderately. As mentioned before, the panel endorses the need for change agents who can contribute to solving sustainability issues. Furthermore, the panel thinks that having slightly larger groups will allow more interaction between different groups of students without losing the advantages of the small-scale atmosphere and the approachability of their lecturers.

Teaching methods

The panel is positive about the diversity in different types of education (lectures, work groups, projects), fitting the learning objectives of the different courses. The combination of group work and individual work is balanced and prepares students for their work in a future professional setting. TU/e recently adopted Challenge-Based Learning (CBL) as their educational principle. Central to CBL at TU/e is that students acquire knowledge by engaging in real-life interdisciplinary challenges often defined

in collaboration with external partners (challenge owners). While working on prototype solutions that contribute to these challenges, students seek out and apply knowledge, individually or in groups. This approach is under development, but several courses already use the CBL approach. In the student chapter, students indicated they value this approach and would appreciate more courses adopting this method. The panel would support this because CBL provides good opportunities for students to develop their professional skills.

Study load and study guidance

Students consider the programme feasible. The panel values that the mentor system provides intensive study-related support and guidance to students. Students select a mentor based on their research interests. To this end, mentors provide an overview of their research interests and the methodologies that are within their domain of expertise. The mentor is the contact person for the student throughout the programme and helps and guides the student in making decisions that affect the specialisation of the student, the choice of the international semester, and the preparations related to the MTP. The mentor assists the student with developing a thesis topic and choosing the first supervisor. The mentor may also become the first supervisor of the MTP. In addition, the mentor discusses the development plan of the student based on the TU/e Diagnostic Test of Professional Skills. Students were very satisfied with the support they received from their mentor, and they feel well guided and supported.

Based on the documents, the panel established that some students have problems finishing their thesis within an acceptable timeframe. The programme explained in the documents that most students prefer, and are supervised accordingly, to work along a clear project planning. Other students take more of a 'research' attitude and allow for a non-linear learning process that sometimes defies planning. Some supervisors do not strictly adhere to the timelines described in the study guide, while others do. This difference in the regime between supervisors was also confirmed in the interviews with the lecturers and the students. Although the panel acknowledges that less strict deadlines may allow some students to produce the most innovative results, the panel thinks that the programme and students would benefit from stricter adherence to timelines. The panel, therefore, supports the recently introduced policy in which supervisors need to be more proactive in ensuring that students finish their thesis within the given timeframe and adhere more strictly to deadlines. In addition, the panel thinks that students would benefit from more guidance at the start of their thesis project.

Professional orientation

The previous panel recommended informing students more about their career perspectives. The programme took several measures to improve this, for example by introducing more external guest lectures and more real-world cases in courses as well as new perspectives in their studies. Recently, the programme participated in the TU/e's Professional Identity Training (PIT) pilot. In PIT, students fill in a questionnaire to identify their strong skills and the skills to be developed. Trained students help them in working on the latter skills. Participating in PIT is highly recommended but not compulsory. The programme considers making it a mandatory part of the programme. The panel would support this.

Staff

The academic staff for the bachelor's programme Innovation Sciences and the master's programme Innovation Sciences amounts to 44 lecturers and researchers (5 full professors, 4 associate professors, 9 assistant professors and 26 PhD candidates). Lectures are taught by professors (full, associate, or assistant). Apart from the regular academic staff, guest lecturers contribute to the courses. After following the appropriate courses, PhD candidates can contribute to group and thesis supervision. In addition, teaching assistants (typically master students) provide tutoring in the bachelor programme. Of the academic staff (not including PhD candidates), 72% has passed the University Teaching Qualification (UTQ) and 6% are in the process of doing so. All new academic staff will follow the UTQ programme. The panel ascertained in the interviews with the teaching staff that there is a well-functioning system in place to help (new) staff members to further professionalise.

The panel has met with a team of enthusiastic lecturers. It is clear to the panel that students are part of a high-quality and committed teaching and research environment. All teaching staff members hold a doctorate, are active researchers and are very dedicated to teaching within the master's programme.

Language

The language of instruction is English. The programme management substantiates its choice by arguing that English is the dominant language in academia and the professional field of innovation sciences. This means that the English language is essential to be able to participate in the international field of innovation sciences. The direct environment, including the companies where students do internships, requires students to have good English language skills. As the staff in the Department is very international, the use of English means that all staff members can participate in teaching. Due to the international context, all teaching staff works and communicates in English on a day-to-day basis. The panel considers the choice of English as the language of instruction a natural choice for an academic master's programme and t supports this choice.

Conclusion

The panel concludes that the programme meets standard 2.

2.3 Student assessment

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

Findings, analysis, and considerations

Assessment policy and assessment system

The panel noted that the programme has a solid set of documents and procedures in place which secure an adequate assessment system. The Assessment Policy of the Department IE&IS describes the vision on assessment in line with the educational vision. It also describes the quality assurance of examinations, and the quality assurance of the final level of students. Important principles are, among others, that examiners (appointed by the EC) are competent in assessment, and that the grading of the exams and theses is checked by a second examiner. Validity is also assured by a prior check of exams and answer models by multiple content experts. Reliability is enhanced through rubrics in

many assignments and the thesis. The Assessment Plan relates the ILOs to the various courses and examinations. The panel verified that the Assessment Plan covers and thoroughly assesses all exit qualifications.

The specific form of testing within a course depends on the learning goals of the course and includes written examinations, individual assignments, group assignments and presentations. Through the OSIRIS course catalogue, students are well informed on the modes of assessment and the evaluation criteria.

The panel appreciates that the programme not only uses assessment to evaluate the student's performance but also uses assessment as a tool for learning. Therefore, examinations do not just mark the reaching of the final stage of education (summative examination) but also provide feedback on how much progress a student has made in the learning process (formative examination). This was confirmed in the interviews with students who indicated receiving ample and valuable qualitative feedback on their assignments.

During the site visit, the panel discussed the assessment of group projects with both the students and the lecturers. The programme is aware of the risks of free riding and guides students in a well-considered way to avoid this as much as possible. However, the panel thinks that there could be a more structural embedding of individual assessment within group projects. As mentioned before, several courses already include CBL projects. In CBL courses, a trained group coach monitors the balanced contribution of all participating students. In addition, specialized assessment methods are used to assess the individual contribution to the group work. The panel encourages the programme to explore how these methods can be used in other group-based courses or assignments.

Assessment of the Master Thesis Project (MTP)

The thesis is graded by the supervisor and two other assessors. The supervisor and second assessor are involved in the thesis process. After completion of the MTP, the student submits the thesis to the supervisor, the second assessor and the third assessor. After the supervisor and the two assessors have approved the thesis, a date is set for the thesis defence. The thesis defense consists of 1) an oral presentation by the student on the methodology and main results of the project; 2) an oral exam, in which the student is questioned on his/her project and thesis. The assessment committee rates the content of the thesis and the process and other skills on ten criteria (insufficient – sufficient – good – excellent). The committee then assigns a final grade (1-10) to the MTP by grading the thesis (70% of the final grade) and the process (30% of the final grade).

The panel is pleased that the programme followed the recommendations of the previous accreditation panel to introduce rubrics to assess the graduation project. Examiners are obliged to provide narrative feedback and need to pay attention to the alignment between written comments and grades. As part of its thesis review, the panel studied a sample of the master theses and corresponding evaluation forms, completed in 2020, 2021 or 2022. The panel established that the evaluation combines relevant assessment rubrics with obligatory personalised overall feedback. However, it is not fully transparent to the panel how the designations of 'insufficient', 'sufficient', 'good', or 'excellent' are awarded to the various assessment criteria because the substantiation is missing on the rubric. In addition, it is not clear to the panel how this grading system is translated into the grade awarded to the final thesis. The panel encourages the programme to further improve the transparency of the grading system.

Examination Committee

The Examination Committee (EC) of the School of IS operates independently of the programme management. The panel was impressed with the strong commitment of the EC to the programme. It was also pleased to hear that the EC separates the roles of an examiner and that of a member of the EC to ensure the independence of both roles. The EC checks the assessment of courses every quarter. Observations and recommendations are discussed with the responsible examiner. Every two years, the EC checks a sample of theses on the thesis level and the grading quality. In addition, the EC approves all project proposals for the MTP and performs regular spot checks on the quality and the level of the theses. Based on the documents, as well as the interview with the chair of the EC, the panel concludes that the EC does an excellent job of safeguarding the quality of assessment and the final attainment level.

Conclusion

The panel concludes that the programme meets standard 3.

2.4 Achieved learning outcomes

The programme demonstrates that the intended learning outcomes are achieved.

Findings, analysis, and considerations

The master's thesis is the final, individually written report of the master's thesis project and assesses the student's final academic proficiency concerning the programme's learning objectives. To judge whether students achieve the ILOs by the end of the programme, the panel studied a selection of fifteen theses. The selection covered the different tracks and included a balanced range of final marks.

The panel concludes that the final products of the MTP demonstrate the realisation of the programme's ILOs. The theses demonstrated that students acquired broad knowledge and understanding of the innovation sciences as well as significant in-depth knowledge of certain parts of the innovation field. Graduates can integrate knowledge systematically and analyse, assess, and manage complex phenomena, issues and situations connected to innovation. The theses are clearly of the level and quality that may be expected from a master's thesis in the field of innovation sciences. The panel considers the theses' quality to be in line with the grades given.

The panel is convinced that the multidisciplinary programme creates students that can build bridges between the different disciplines. However, the panel noted that the emphasis within the thesis lies on social sciences research. The panel encourages the programme to make the multidisciplinary focus more visible in the theses, for example by adding a required chapter on how the student made use of the technological sciences knowledge and skills acquired during the programme (or, if the thesis is mostly natural science based, how the social sciences have been used). In addition, the panel would welcome more critical reflection on the research methods. The panel advises the programme to further strengthen the quality of the theses by training students more explicitly to critically evaluate their research methods.

An essential indicator of the level of the graduates is that they quickly find a relevant, programme-related job. Graduates typically work in jobs requiring combining knowledge of engineering and social

dynamics, often as an internal or external consultant, manager, or policy advisor in a company, policy organization or a non-governmental organization. Some graduates continue in research.

Alumni of the programme are encouraged to become a member of ITEM, the alumni association. The panel encourages the programme to benefit better from regular contacts with alumni by monitoring more systematically the actual relevance of the programme for the performance of graduates in the field.

Conclusion

The panel concludes that the programme meets standard 4.

3. Strengths and recommendations

3.1 Strengths of the programme

The panel is impressed by the following features:

- Unique profile - The multidisciplinary programme has a unique relevant profile in the Innovation Sciences in the Netherlands by integrating technological and social sciences and humanities (SSH) perspectives;
- Student-centred - The programme gives students ample opportunities to tailor the programme to their interests;
- International semester - The international semester allows students to develop a truly international orientation and broaden their horizons;
- Teaching team - The teaching staff is enthusiastic, well-qualified and knowledgeable in their respective areas;
- Mentor system - The programme provides intensive study-related support and guidance to students;
- Assessment system - The programme has a solid system of assessment in place. The Examination Committee does an excellent job of safeguarding the quality of assessment.

3.2 Recommendations

For further improvement of the programme, the panel makes the following recommendations:

- ILOs - Update several ILOs to better align with the programme's focus on sustainability;
- Professional profile - Communicate the highly relevant unique profile and the specific added value of IS graduates to the professional field more explicitly to the students;
- Repetition - Reduce the repetition in several master's courses, for example by giving more in-depth assignments to students who did the bachelor's programme IS;
- Thesis assessment- Further improve the transparency of the assessment of the thesis of the MTP;
- Master's thesis - Further strengthen the master's thesis by making the multidisciplinary focus of the programme more visible in the theses and by training students more explicitly to critically evaluate the research methods.

4. Conclusion

The panel has found that the intended learning outcomes (standard 1), the teaching-learning environment (standard 2), the assessment system (standard 3) and the achieved learning outcomes (standard 4) meet the criteria.

The intended learning outcomes reflect the programme's aims and vision and are in line with the discipline and international requirements. The curriculum, the teaching methods, the quality of the teaching staff and the assessment system enable the incoming students to achieve the intended learning outcomes.

Standard	Judgement
Standard 1	Meets the standard
Standard 2	Meets the standard
Standard 3	Meets the standard
Standard 4	Meets the standard
Final conclusion	**Positive**

Appendix A –Programmes of the cluster

The cluster Innovation Sciences consists of six programmes:

56265	B Technische Innovatiewetenschappen	Eindhoven University of Technology
66265	M Innovation Sciences	Eindhoven University of Technology
56982	B Natuurwetenschap en Innovatiemanagement	Utrecht University
60709	M Science and Innovation	Utrecht University
50670	B Science, Business & Innovation	Vrije Universiteit Amsterdam
69320	M Science, Business and Innovation,	Vrije Universiteit Amsterdam

Appendix B – Documents studied

- Reading guide MSc Sustainable Innovation
- SWOT analysis MSc Sustainable Innovation
- Fifteen final reports of the MTP with assessment forms
- Student chapter (movie)
- The domain-specific framework of reference: Innovation Sciences
- MSc SI Learning outcomes and domain spec disciplines 2022
- Agendas and minutes of the Societal Council
- List of lecturers
- Minutes of semester evaluation and evaluation reports
- Assessment policy School of Industrial Engineering and School of Innovation Sciences
- Assessment Plan MSc IS
- Programme and Examination Regulations
- Examination Regulations of the EC
- Assessment dossier of three different courses
- Study MTP
- List of thesis graduates 2020, 2021 and 2022 (until August 2022)
- Annual reports of the Examination Committee 2018-2019, 2019-2020, 2020-2021
- Annual reports School of IE&IS 2019-2020, 2020-2021
- Minutes of semester evaluation and evaluation reports
- Nationale Alumni Enquête 2017, Tabellenboek Technische Universiteit Eindhoven
- Report previous accreditation

In addition, the panel had access to:

- OSIRIS provides information on all courses: purpose and content, lecturer, assessment, and literature.
- Canvas provides detailed information on all courses, including the syllabus, and assignments.
- BI-portal provides, among others, statistical information on the inflow and outflow of students. It also includes the NSE.

Appendix C – Schedule of the visit

7 November, 2022

Time	Session
17:00-19:00	Preparatory meeting panel

8 November, 2022

Time	Session
8:30 - 9:15	Welcome and preparation interviews by panel
9:15 - 10:00	Meeting with the Management
10:15 - 10:45	Meeting with the BSc IS students
11:00 - 11:40	Meeting staff about BSc IS assessment
11:50 - 12:30	Meeting staff about BSc Teaching and learning environment
12:30 - 13:15	Lunch
13:15 - 13:45	Meeting with the BSc IS students
14:00 - 14:40	Meeting staff about MSc IS assessment
14:50 - 15:30	Meeting staff about MSc Teaching and learning environment
15:30 -15:45	Internal discussion panel
15:45 -16:15	Final interview management
16:15 -17:30	Internal discussion panel
17:30	Presentation preliminary findings

Appendix D – Abbreviations

CBL	Challenge-Based Learning
DSRF	domain-specific reference framework
EC	Examination Committee
EC	European Credit
GS	Global Sustainability
IE & IS	Industrial Engineering & Innovation Sciences
ILO	intended learning outcomes
IS	Innovation Sciences
ISP	Innovation Strategy and Policy
LCA	Life Cycle Analysis
MTP	Master Thesis Project
NVAO	*Nederlands-Vlaamse Accreditatieorganisatie*
TIS	Technology, Innovation & Society
TU/e	Eindhoven University of Technology
UTQ	University Teaching Qualification
Vwo	*Voorbereidend wetenschappelijk onderwijs*