



NVAO • THE NETHERLANDS

INITIAL ACCREDITATION

ACADEMIC MASTER

DATA SCIENCE AND ARTIFICIAL
INTELLIGENCE TECHNOLOGY

TU Delft

FULL REPORT

11 DECEMBER 2023

Content

1	Peer review	3
2	New programme.....	4
	2.1 General data.....	4
	2.2 Profile	4
	2.3 Panel.....	4
3	Outcome	5
4	Commendations	6
5	Recommendations.....	7
6	Assessment.....	8
	6.1 Standard 1: Intended learning outcomes.....	8
	6.2 Standard 2: Teaching-learning environment.....	10
	6.3 Standard 3: Student assessment.....	14
	6.4 Degree and field of study	16
	6.5 Extension of Study Load	16

1 Peer review

The Accreditation Organisation of the Netherlands and Flanders (NVAO) determines the quality of a new programme on the basis of a peer review. This initial accreditation procedure is required when an institution wishes to award a recognised degree after the successful completion of a study programme.

The procedure for new programmes differs slightly from the approach to existing programmes that have already been accredited. Initial accreditation is in fact an ex-ante assessment of a programme. Once accredited the new programme becomes subject to the regular review process.

The quality of a new programme is assessed by means of peer review. A panel of independent peers including a student reviews the plans during a site visit to the institution. A discussion amongst peer experts forms the basis for the panel's final judgement and the advisory report. The agenda for the panel visit and the documents reviewed are available from the NVAO office upon request.

The outcome of this peer review is based on the standards described and published in the limited NVAO Assessment framework for the higher education accreditation system of the Netherlands (Stcrt. 2019, nr. 3198). Each standard is judged on a three-point scale: meets, does not meet or partially meets the standard. The panel will reach a conclusion about the quality of the programme, also on a three-point scale: positive, conditionally positive or negative.

NVAO takes an accreditation decision on the basis of the full report. Following a positive NVAO decision with or without conditions the institution can proceed to offer the new programme.

This report contains the findings, analysis and judgements of the panel resulting from the peer review. It also details the commendations as well as recommendations for follow-up actions. A summary report with the main outcomes of the peer review is also available.

Both the full and summary reports of each peer review are published on NVAO's website www.nvao.net. There you can also find more information on NVAO and peer reviews of new programmes.

2 New programme

2.1 General data

Institution	TU Delft
Programme	Data Science and Artificial Intelligence Technology
Variants	Full time
Degree	Master of Science
Tracks	Non applicable
Locations	Delft
Study load	120 EC ¹
Field of study	Technology (as confirmed by the panel)

2.2 Profile

The new master's programme Data Science and Artificial Intelligence Technology (DSAIT) aims to prepare future graduates to design and build intelligent software systems for various application domains. The main technological challenges related to data science and artificial intelligence (AI) are approached from an engineering perspective. The focus of the programme is on advanced software systems with AI and data-driven components that heavily rely on computer systems and software engineering.

The programme to be offered by TU Delft is to be delivered by the Faculty of Electrical Engineering, Mathematics and Computer Science. In the first year, a common core is developed; in addition, students choose two DSAIT themes (subject areas) to establish in-depth knowledge. In the second year, students can either deepen or broaden their knowledge and skills through electives. The programme will be concluded with a comprehensive research project (45 EC), including the thesis.

2.3 Panel

Peer experts

- Prof. dr. ir. Arend Rensink (chair), Professor in Software Modelling, Verification and Transformation, University of Twente;
- Prof. dr. Lejla Batina, Professor in Digital Security and Director of Education, Institute for Computing and Information Science, Radboud University, Nijmegen;
- Dr. rer-nat. Dirk Fahland, Associate Professor in Process Analytics on Multi-Dimensional Event Data of the Analytics for Information Systems group, Eindhoven University of Technology;
- Sven Goessens (student member), Student (Pre) Master Data Science & Society, Tilburg University.

Assisting staff

- Erik van der Spek MA, secretary
- Michèle Wera MA, NVAO policy advisor and process coordinator

Site visit

Delft, 8 November 2023

¹ European Credits

3 Outcome

The NVAO approved panel reaches a *positive* conclusion regarding the quality of the master's programme Data Science and Artificial Intelligence Technology (DSAIT) offered by TU Delft. The programme complies with each of the three standards of the limited NVAO framework.

The new master's programme DSAIT of TU Delft aims to train students to be technical professionals, who can responsibly engineer AI solutions. The programme has shown a specific and concrete focus on data-driven AI systems. It also shows a clear vision on intelligent software and on the needs of the professional field. The learning objectives are clearly described and show that the students acquire knowledge and competences at a master's level. The professional field has been closely involved in the development of the programme.

The panel has established that the programme has a clear and coherent curriculum. It consists of a core of five mandatory courses and an elective part where the students focus on two content areas (called DSAIT themes) in which they specialize. The panel approves of the freedom of choice this setup offers but warns about the logistical challenge that programming all possible combinations may cause. Real-life challenges are included in the programme; according to the panel, this is one of the strong points in the curriculum. These challenges offer opportunities to explore the contributions of data science and AI in solving actual problems; The programme culminates in an extensive (45 EC) research and thesis project, that may also be done at a company.

The teaching staff of the new programme stands out for their experience and expertise. TU Delft aims to improve diversity among the staff, for instance by offering high-profile tenure track positions to top female scientists. However, gender diversity in the student population is an issue. The panel established that gender is not properly addressed at the entry level. A communication strategy that is geared towards diversity issues might be helpful as well. The panel recommends the programme to get professional advice on how to tackle this issue.

The panel established that both the assessment framework and the assessment plans for the individual courses are satisfactory. The Individual Exam Programme allows for tailor-made assessment. Some improvement might be achieved in finetuning the rubrics and communicating them clearly to the staff and students.

Finally, the panel supports the choice of the programme for a duration of two years (120 EC). This duration is deemed necessary to achieve the intended learning outcomes. Also, the two-year duration aligns with most other technical master's programmes, both in The Netherlands and abroad.

Standard	Judgement
1. Intended learning outcomes	meets the standard
2. Teaching-learning environment	meets the standard
3. Student assessment	meets the standard
<i>Conclusion</i>	<i>positive</i>

4 Commendations

The programme is commended for the following features of good practice.

1. **Clear vision:** the programme has shown a specific and concrete focus on data-driven AI systems with a clear vision on intelligent software and on the needs of the professional field.
2. **Coherent curriculum:** the curriculum is well structured with both a solid base of core courses and a number of electives in which the students can follow their own interest.
3. **Detailed and clear assessment plans:** the assessment framework is detailed, the programme offers clear grading criteria, and the quality assurance of the student assessment is well designed.
4. **Involvement professional field:** the contributions of the Industrial Advisory Board and other representatives of the professional field have contributed to a programme that is closely aligned with the practical needs of companies and organizations in the field of AI and data science.
5. **Real-life challenges,** largely supplied by the professional field, allows students to discuss and evaluate real-world problems within the learning environment of the programme and to explore how data science and AI can contribute to solving these problems.
6. **Emphasis on ethics:** The programme is aware of the importance of ethics and responsibility when working with AI and gives these topics a firm place in the curriculum.

5 Recommendations

For further improvement to the programme, the panel recommends a number of follow-up actions:

1. **Gender diversity:** seek professional advice on how to better adhere to TU Delft's diversity policy, particularly in addressing the gender issue during the enrolment procedure.
2. **Logistical challenges:** address the logistical challenge of executing the programme with reference to scheduling all combinations of theme courses and aligning (anticipated) student interests in specialized subjects and graduation projects with available capacity.
3. **Deepening electives:** expand the offer of deepening electives, since in the current situations the options are somewhat limited (with only three courses listed explicitly).

6 Assessment

6.1 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.

Judgement

Meets the standard.

Findings, analysis and considerations

Profile

The DSAIT master's programme (120 EC, two years) is intended for students who want to design and build intelligent software systems for various application domains. These students are trained to be technical professionals, who can responsibly engineer AI solutions. The panel has established that the programme has a unique focus on both AI and data science. This focus includes data management, as AI components and systems are often data-driven. Technological challenges are considered from an interesting problem-solving perspective employing scientific and engineering methods in a responsible way.

The panel approves of the qualification framework underlying the programme. In designing the programme, TU Delft has employed several frames of reference related to data science and artificial intelligence technology:

1. Kunstmatige Intelligentie Opleidingen Nederland (KION)
2. ACM Data Science 2021
3. Sectorbeeld 2022 Fundament onder de Digitale Samenleving
4. ACM-IEEE-AAAI Computer Science Curriculum 2023 beta version

With the aid of these qualification frameworks the programme developers identified the distinctive competences students should develop and the matching theoretic concepts they need to master. The panel agrees with the theories on offer, which include Data Management and Engineering, Machine and Deep Learning, Software Engineering and Testing for AI Systems, Probabilistic AI and Reasoning, and Responsible Data Science and AI Engineering. These theories are adequately reflected in the common core of the programme. In addition to these theoretic concepts, ten subject areas are identified (for instance Bioinformatics and Human-centred AI), the so-called DSAIT themes. Students need to choose two of these themes and follow three courses in the two chosen areas (for more information, see Standard 2). The panel approves of these options that allow students to follow their personal interest.

Intended learning outcomes

The central aim of the programme is the following:

In the DSAIT master's programme, students acquire a scientific perspective to responsibly design, develop and analyse entire AI systems and data-driven and other AI algorithms. The programme equips students with sufficient knowledge, skills and understanding of DSAIT to carry out professional and scientific activities in this field independently at an academic level.

This aim is the basis for the intended learning outcomes (ILOs). In formulating these ILOs, the programme suitably follows the 4TU Criteria for Academic Bachelor and Master Curricula. These criteria are defined in terms of seven competence areas:

1. Competence in one or more scientific disciplines
2. Competence in conducting research
3. Competence in designing
4. Scientific approach
5. Basic intellectual skills
6. Competence in cooperating and communicating
7. Consideration of the temporal and societal context

As an example the second ILO, on research:

Graduates are expected to perform research within the DSAIT field independently. They should be able to plan, execute or replicate different phases of a research process (ILO2a) and be capable of assessing DSAIT research on its scientific values (ILO2b).

The panel has discussed the learning outcomes with the programme management and staff. The panel has established that these learning outcomes are fitting for a master's programme on data science and AI Technology. The ILOs are clearly defined (although in some cases a bit generic) and in line with Meijer's criteria (suitable for engineering) that are related to Dublin descriptors.

Since the students choose two themes (out of a list of ten) to deepen their knowledge, the question arises whether the learning outcomes are met under all circumstances. The panel discussed this question with the representatives of the programme. During this discussion, the panel learned that some learning outcomes are covered in the core courses, and a number are covered in the theme courses. However, it does not matter which themes the students choose, since they will obtain the same learning outcomes: the subject matter differs, but the learning outcomes are formulated at a higher level and are therefore independent of the theme contents. The panel finds this explanation satisfactory.

Benchmark

The programme has made a comparison with relevant programmes from eight universities, both in The Netherlands and abroad. In The Netherlands, two comparable programmes are offered: the MSc Data Science and Artificial Intelligence at Eindhoven University of Technology (TU/e), and the MSc Artificial Intelligence at University of Amsterdam. The programme that best aligns with the master DSAIT, is the one offered by the TU Eindhoven, which is focused on the mathematics and technology aspects of AI and Data Science. The panel discussed the relation between the DSAIT programme and the Eindhoven programme and learned that the main difference is that the TU/e programme has stronger roots in mathematics, while the DSAIT programme has a focus on software engineering.

Involvement professional field

The programme has clearly been developed in collaboration with representatives from the professional field. The Industrial Advisory Board has been involved from the start of the development of the DSAIT programme and engaged in regular discussions on developing the DSAIT curriculum. This collaboration has induced the programme to adopt a number of competencies that are deemed important for the DSAIT-students:

1. A Data Scientist or AI Engineer is expected to know how to apply artificial intelligence and data-driven algorithms.
2. On the labour market graduates may work in a team, so they also need to understand the perspective of multiple stakeholders.
3. In addition to applying techniques to real-world problems, graduates are also expected to be able to conduct research independently, e.g. to develop state-of-the-art algorithms.

The panel has met with a number of representatives from the professional field who are also members of the Industrial Advisory Board for the DSAIT programme. The panel is impressed with the involvement with these representatives, not only with the development, but also with the implementation of the programme. The representatives (and the companies they represent) have supplied real-world challenges to be used in the cases and are looking forward to welcome students that wish to do their master research project at one of these companies. The representatives affirm that the DSAIT programme as described meets the needs of the professional field.

A final issue is the name of the programme. TU Delft has opted for the name Data Science and Artificial Intelligence Technology, whereas the 'Technology' part is lacking in the name of the (comparable) programme offered by TU Eindhoven. For this reason, CDHO² has advised in its report on the macro efficiency check to employ the same name as the Eindhoven programme, so without the 'Technology'. However, during the site visit the panel has established that technology is an integral and important part of the DSAIT programme and curriculum. It helps distinguishing the DSAIT programme from less technically oriented programmes on data science and AI, and it is aligned with the need for engineers in the professional field. Therefore, the panel agrees with the TU Delft and advises to maintain the word *Technology* in the programme name.

In summary, the panel has established that the DSAIT programme meets the requirements of standard 1. The intended learning outcomes have been clearly described at a master's level and are based on appropriate frameworks. The close involvement of the professional field, mainly through the Industrial Advisory Board, guarantees that the new programme is well aligned with the demands of companies and organizations in the field.

6.2 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.

Judgement

Meets the standard.

Findings, analysis and considerations

Educational vision

The educational vision of the programme is based on TU Delft's Framework for Future Master's Education. This framework contains a number of principles that state that future engineers do not only have state-of-the-art disciplinary knowledge, but also societal awareness and ethical intelligence. Another aspect is that TU Delft's master's programmes aim to achieve a proper balance between theoretical learning and the application of theoretical knowledge.

The educational philosophy on which the programme is based is cognitive constructivism, which implies an active role of students in constructing their own knowledge. A concrete example in the DSAIT programme is working with real-world challenges. Another important feature is a 'can do', hands-on approach, in which the importance of the application of knowledge is emphasised. Classes generally get smaller as the programme proceeds: the core courses are mainly large-scale courses, whereas the theme courses and research courses are generally small scale, allowing for more interaction between students and staff. The panel learned that courses with an increased popularity (for instance within the popular theme 'Machine learning') will receive extra staffing to maintain the

² Commissie Doelmatigheid Hoger Onderwijs (Committee on Higher Education Effectiveness)

small-scale character. The panel agrees with the programme’s educational vision and with the way it is implemented into the curriculum.

Curriculum

The DSAIT master’s programme builds upon the common core. In the first quarter, students follow three core courses. In quarters 2-4, two DSAIT themes are scheduled (chosen among ten themes on offer, see below), next to two more core courses respectively a specialised research course. In quarter five, students have the freedom to either deepen or broaden their knowledge and skills through electives. The programme culminates in an extensive (45 EC) research and thesis project, educating students on conducting DSAIT research. This is shown in the following overview:

Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 5	Quarter 6	Quarter 7	Quarter 8
Data Management and Engineering	Software Engineering and Testing for AI Systems	Responsible Data Science and AI Engineering	Research course	Deepening/ broadening electives	Master Thesis		
Machine and Deep Learning	Theme 1	Theme 1	Theme 1				
Probabilistic AI and Reasoning	Theme 2	Theme 2	Theme 2				

The programme contains five core courses (blue in the schedule), each of 5 EC. The panel read a number of course outlines and finds these satisfactory. In each course outline the relevant learning goals are mentioned; the panel established that all learning goals are covered in the curriculum. The course content is clearly described and accessible for the students. The assessment is covered as well in broad lines. All course outlines will be available on Brightspace, the online student information system used at the TU Delft.

In most courses, real-life challenges will be employed. The panel heard several examples of these challenges, which are largely supplied by the professional field. In the core course Responsible Data Science and AI Engineering there will be nine sessions in which students will discuss real world problems, for instance the *Toeslagenaffaire*. In the theme course on Language and Speech Technology a real-world challenge will be the issue of bias in natural language models, and the way in which you can ‘de-bias’ a model. The panel sees the use of these real-life challenges as one of the strong points of the programme.

In the second quarter, students choose two topics (DSAIT themes) in which they specialize; they follow three 5 EC courses on both topics. The programme offers a choice from the following ten topics:

1. Advanced Machine Learning
2. Bioinformatics
3. Data Information Management
4. Human-centred AI
5. Interactive Data Science
6. Language and Speech Technology
7. Probabilistic Decision Making
8. Optimisation and Reasoning:
9. Software Engineering for Data Science and AI
10. Visual Computing

On the one hand, the panel feels that the freedom of choice that the programme offers students is very attractive. The themes are interesting, relevant and cover a number of important areas within the field of data science and AI. On the other hand, programming all possible combinations (which amounts to 45 possibilities) may offer a logistical challenge. The panel discussed this challenge with representatives of the programme. During this discussion the programme staff maintained that they can guarantee that all the theme courses are programmed without overlap and that all combinations are possible. The staff even told the panel that they have an expansion policy that allows for new themes, to accommodate upcoming subject areas. These new themes would then be tried out first in the elective space, and if they are successful, they will be added to the list.

The panel commends the programme on its ambition but is of the opinion that it underestimates the practical difficulties in programming all combinations of theme courses. It therefore advises to do the programming exercise at an early stage, so there is still an option to simplify the curriculum if necessary. In addition, the panel advises to be careful with the introduction of additional themes: the best thing would be to replace fewer interesting themes with newly relevant ones, instead of adding them to the list.

Since the choice of the two DSAIT-themes is an important decision for the students, proper guidance is essential. The panel learned that the programme intends to communicate the different options at an early stage before the students make their choice. For student guidance, several mechanisms will be in place. One is the mentoring programme, where (new) students will be mentored regularly in a classroom setting by second year master students, who will firstly receive a training by academic counsellors. Another is the quarterly Master Information Meetings (MIMs), in which students will receive relevant programme information during lunch. In the first quarter the focus will be on the themes. However, the panel learned that these MIMs are not mandatory. The panel advises to make these meetings mandatory to make sure all students will receive the information that is important for them.

In the second year, the students follow a number of deepening or broadening electives (three courses with a total of 15 EC) or do an interdisciplinary project. For the electives they can follow courses from other engineering master's programmes as well. The panel has established that the options for deepening electives are somewhat limited, since there are only three courses explicitly listed. If possible, the panel would like to see a more extensive choice of deepening electives.

The last three quarters of the second year are spent on the research project and thesis. The programme offers a number of thesis topics that are connected to the DSAIT themes. The students can also opt for a research project to be carried out in a company or organization. Students are guided by a staff member from the Software Technology (ST) or Intelligent Systems (INSY) departments; if the student opts for a company research project, a co-supervisor from that company is added to the team.

The panel has established that the thesis project is well-structured. The thesis project is concluded with a formal thesis defence in front of an audience and a thesis committee.

The fact that the research project can be done with an external company raises the question if there are other options for a traineeship or internship; this would be very attractive for international students. The panel learned that this is not the case. The main reason is that the programme management wants the supervisor to be in the lead when it comes to designing the research project. Also, since the research project is already quite extensive, the programme management feels that this project offers ample opportunity for students who want to work with a company. The Industrial Advisory Board agrees with this choice, as does the panel.

The chance that some themes may be more popular than others may also have implications for the workload of the supervisors. The representatives of the programme acknowledge this possibility but are confident that they can manage student numbers by communicating alternatives. For instance, many students will want to learn about machine learning, but the programme maintains this can be done within different themes, such as Language and Speech Technology. Be that as it may, the panel believes that a substantial number of students will base their decision on the label, the name of the theme. It therefore advises the programme to develop solutions to avoid an overload of work for supervisors that are connected to popular themes.

Student admission and enrolment

Admission to the DSAIT master's programme is primarily based on academic background. Students need to have sufficient knowledge on a number of key subjects, such as Mathematics and Modelling, Software Development Fundamentals and Computer Systems. Students with the following backgrounds are eligible for the programme:

1. Students with a Computer Science (Engineering) bachelor's degree from a Dutch research university (WO);
2. International students with a non-Dutch Computer Science bachelor's degree from a research university.

Furthermore, students with a bachelor's degree similar in computer science from a Dutch research university, or with a bachelor's degree Computer Science and Engineering (Technische Informatica) from a Dutch university of applied sciences (hbo) can be admitted after following a bridging programme.

The programme expects an enrolment of about 180 students yearly. The panel understood that most students are expected to come from TU Delft own bachelor's programmes: these are students that formerly would have followed the master Computer Science. This raises the question how the programme will facilitate the enrolment at the start of the programme, which is set at September 2024. The panel has learned that the programme management will not communicate anything about the new programme until approval is certain. The panel appreciates this but notes that timelines may become short to implement an orderly enrolment process. The panel stresses that students should have sufficient time to make an informed decision. Therefore, the panel expects the programme to work out a plan for a smooth enrolment procedure.

Staff

All lecturers are active researchers who will integrate their current research in the lectures and assignments. The panel has met with a selection of staff and established if the lecturers have the expertise and experience that is necessary for executing the programme. Of the 57 staff members that are active in the first year of the DSAIT programme, 98% has obtained their UTQ or is in the process of doing so. The lecturers may be assisted by teaching assistants, which support lecturers during self-guided study, labs and grading exams. In addition, the programme will employ second-year master students for mentoring and student guidance, as mentioned above. These students are already employed in the master Computer Science and the experience so far has been satisfactory.

The percentage of women in the team is 28%. TU Delft aims to improve diversity among the staff, for instance by offering high-profile tenure track positions to top female scientists. However, gender diversity in the student population is an issue. The representatives of the programme state that they would like to have a more diverse group of students. The focus is currently on inclusion: the programme wants to make all students feel at home, irrespective of gender or nationality. Furthermore, a number of the female staff members are role models and reach out through social

media. The programme furthermore expects that the topics that are covered in the DSAIT programme, with a stronger focus on for instance sustainability, will attract a more diverse group of students.

The panel feels that the issues with diversity (especially on gender) deserve a more structural approach. The panel established that a clear diversity policy at programme level appears to be lacking and that gender is not properly addressed at the entry level. A communication strategy that is geared towards diversity issues might be helpful as well. The panel recommends the programme to get professional advice on how to tackle this issue and to adhere to TU Delft's diversity policy.

Diversity is related to the language of instruction as well. The programme is taught entirely in English. This aligns with the programme's aims to prepare students for a career in an international community. This need has been confirmed by the Industrial Advisory Board, since in the professional field English generally is the language of communication. Within the programme, the international classroom and the international staff both require an English language approach. The panel agrees with the choice for English as language of instruction.

In summary, the panel has established that the programme meets the requirements of standard 2. The panel has seen a well-designed and balanced curriculum that offers students a lot of choice to follow their own interest. The panel established that the curriculum allows the students to obtain the intended learning outcomes. The involvement of the professional field is a strong point, as is the option to do a research project with a company. The programme is supported by a substantial and knowledgeable staff, with a very collaborative atmosphere. A point of attention is the implementation of the programme, which might pose challenges, especially when it comes to programming the theme courses and balancing student interests of particular topics with teacher and supervision capacity. Finally, the issue of gender diversity requires not only attention, but more importantly concrete action.

6.3 Standard 3: Student assessment

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

Judgement

Meets the standard.

Findings, analysis and considerations

Student assessment within the DSAIT programme will be based on the Delft Assessment Framework 2023-2028, which is currently under development. A more detailed and specific framework is formed by the DSAIT Assessment Programme, which includes an overview of the assessment throughout the curriculum. The panel has read this document and finds it to be clear and complete. The guiding principles focus on formative assessment, repair possibilities, and developing a clear assessment plan for each course. The programme gives an overview of the methods of assessment. It also contains a table that shows how the intended learning outcomes are covered in the individual courses.

In addition to the general assessment programme, each course has a course assessment plan, which specifies the learning objectives, assessment methods and grade calculation for each course. Where possible the courses vary in the method of assessment used. Students can find information on assessment in the digital study guide for each course. The panel advises to add the assessment plans, which contain more information than the digital study guide, to Brightspace.

Since the programme offers a lot of choice, each student composes an Individual Exam Programme (IEP), with the aid of an online tool (My Study Planning). The students list their chosen themes, research course and electives. The IEP is checked by the master coordinator and sent for approval to

the Board of Examiners. The panel learned that this procedure is already in place for the master Computer Science, and since the total number of students is not expected to increase, this will not cause major problems. The panel furthermore learned that My Study Planning will be extended to cover the special requirements of DSAIT.

The panel scrutinized a number of assignments, including assessment forms and rubrics. The panel has seen that these assignments reflect the learning outcomes, and that most forms and rubrics are sufficiently worked out. The panel has established that the assignments show enough variation and that information for students is clear and sufficient.

The thesis project is assessed in a number of stages: the assessment consists of two formative feedback meetings and a summative assessment. The thesis is assessed by a thesis committee, which consists of two or three members, one of whom is a full or associate professor and chairs the committee. If a student has done a thesis project with a company, an external member from this company may be added. This company member has no role in the assessment, but his or her feedback is taken into account. The core members, appointed by the Board of Examiners, determine the grade using the assessment rubrics.

The panel has discussed the thesis rubrics with the representatives of the programme. It has established that not all learning outcomes are assessed in the research project. Regarding the outcomes 7a and 7b, the aspect of 'impact on society' is not explicitly addressed in the rubric. If it is felt that including this would make the rubric too unwieldy, this could be resolved by formulating instructions on how to apply the rubric for different types of projects. Another issue is that currently only the grades 6, 8 and 10 are worked out, although the thesis committee can of course grade from 1 to 10. The panel concludes that this rubric still needs some attention. The panel recommends developing clear guidelines on the application of these rubrics, and to make sure that all staff are aware of the specific requirements of this programme concerning ethics.

Board of Examiners

The Board of Examiners (BoE) at EEMCS is a board at faculty level with four subcommittees that are responsible for one or several study programmes. The DSAIT programme will be governed by the subcommittee that is also responsible for the bachelor Computer Science and Engineering and the master Computer Science. This subcommittee will have dedicated members appointed for the DSAIT programme. The Teaching and Examination Regulations are set at Faculty level, the relevant subcommittee monitors the correct application of these regulations. Each year the BoE of the faculty appoints examiners for all courses in the curriculum.

The subcommittee is responsible for measuring assessment quality within the DSAIT programme. This includes reviewing the course assessment plans, monitoring the Individual Exam Programs, monitoring student assessment surveys, doing assessment reviews on specific courses, and reviewing samples of MSc theses. The panel met with a number of representatives from the BoE and an assessment expert. The panel established that the involvement of this Board has been substantial and that 'lessons learned' during the assessment of the master Computer Science are applied in the new master as well.

An issue that merits special attention in the new DSAIT master is fraud since the students will be experts in the use of AI. The representatives of the BoE concede that this is a challenge for every teacher, but especially for the new master. Currently there is a task force at work at university level to tackle AI challenges. The lecturers in the programme will run checks and if fraud is suspected, the BoE will be involved. Furthermore, the summative assessment of every course will contain elements to check for inappropriate use of generative AI; e.g., through an oral or written exam (under controlled conditions) or an oral interview on the project report. Since during the courses the focus is on responsible AI, the aim is that students will develop a conscious and responsible attitude towards this

issue. However, AI can have benefits as well, a number of assignments can be made by employing AI, with proper references. The panel agrees with this view.

The panel concludes that the DSAIT programme meets the requirements of standard 3. Both the assessment framework and the assessment plans for the individual courses are satisfactory. The Individual Exam Program allows for a tailor-made assessment. Some improvement might be achieved in finetuning the rubrics and communicating them clearly to the staff and students. The Board of Examiners is strongly involved with the programme and has a clear view on its tasks and responsibilities.

6.4 Degree and field of study

The panel advises awarding the following degree to the new programme: Master of Science
The panel supports the programme's preference for the following field of study: Technology

6.5 Extension of Study Load

The panel supports the choice of the programme for a duration of two years (120 EC). This duration follows from the intended learning outcomes. These not only include in-depth knowledge in data science and AI, but also research and engineering competencies and the responsible application of this knowledge. The extensive research project, where students work on a complex DSAIT problem, is only feasible within a two-year programme as well. Furthermore, the two-year duration aligns with most other technical master's programmes, not only those of TU Delft, but also those of other technical universities, both in The Netherlands and abroad.

The full report was written at the request of NVAO and is the outcome of the peer review of the new programme Data Science and Artificial Intelligence Technology, TU Delft

Application no: AV-2129



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