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Summary

Standard 1. Intended learning outcomes

The profile and aims of the MSc Information Sciences are fitting for an academic master's programme in this field. The panel highly appreciates the programme's clear positioning, vision and ambition; topics as sustainability and digital transformation are innovative and timely topics. The aims of the programme have been translated into a clear, coherent and well-formulated set of exit qualifications, that are aligned with the requirements of the academic and professional field. The panel is satisfied that the programme has an active PAB as an important means to keep the exit qualifications (and curriculum) well connected to the requirements of the professional field.

Standard 2. Teaching-learning environment

The curriculum of the MSc Information Sciences reflects the intended learning outcomes of the programme. Students are enthusiastic about the programme and the opportunities it gives them to carve out their own study path. The panel applauds the introduction of the portfolio Digital Transition and Sustainability, which plays a key role in ensuring that students continuously reflect on sustainability issues throughout their studies.

The programme uses several activating and inspiring teaching methods. It also gives students opportunities to be involved in research. The involvement of industry (i.e. via case studies or internships) is also a positive aspect. Students have freedom to choose their own thesis topic and supervisor.

The teaching staff is well-qualified, both in terms of academic activities and teaching qualifications. Recruitment of (enough) teaching assistants remains a point of continuous attention. The panel finds that the programme deploys a good set of committees and initiatives to look after the quality and coherence of the programme. The programme is open to feedback and is willing to take measures to improve itself.

Standard 3. Student assessment

The programme has a reliable, valid and transparent system of assessment in place. There are adequate procedures for design and quality assurance of exams, assignments and the theses.

The panel sees opportunities to further streamline/formalize the input of external supervisors with regards to the master's thesis; the rubric that is used contains options for this (i.e. re: attitude/professional development). The assessors use good evaluation forms that contain guidelines to give marks and that use formula to calculate the final grade based on grades for attitude, research, thesis, and presentation. Motivations are largely provided for the different grades although not always to the same extent. The panel encourages the programme to ensure that motivations are always given to justify and motivate grades given.

The Examination Board fulfils its legal duties and has a proactive approach, for instance concerning the emergence of AI. The panel highly appreciates the EB's involvement and encourages them to follow up and adjust procedures, if necessary. With regards to the (re)introduction of dual theses, the panel recommends the EB to ensure that a solid evaluation process is in place for the assessment of this type of final product.

Standard 4. Achieved learning outcomes

The theses show that students of the programme realize the intended learning outcomes (exit qualifications) of the programme. The panel appreciates the diversity of topics it encountered in the theses. Nevertheless, it encourages the programme to be more specific about the scope (topics) of the master's project, and to introduce a mechanism to bring this more in line with the profile of the information sciences programme.

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Alumni are satisfied with their education, and indicate that the programme helped them further shape their career. The programme makes a great effort to connect with alumni and in doing so build a community of students, professionals and academic staff.

Score table

The panel assesses the programme as follows:

M Information Sciences

Standard 1: Intended learning outcomes	meets the standard
Standard 2: Teaching-learning environment	meets the standard
Standard 3: Student assessment	meets the standard
Standard 4: Achieved learning outcomes	meets the standard
General conclusion	positive

Prof. Olga De Troyer
Chair

Drs. Linda te Marvelde
Secretary

Date: 19 March 2024

Introduction

Procedure

Assessment

On 23 November 2023, the master's programme Information Sciences of the Vrije Universiteit Amsterdam was assessed by an independent peer review panel as part of the cluster assessment Information Science. The assessment cluster consisted of 8 programmes, offered by the Open Universiteit, Radboud University, University of Twente, Utrecht University and Vrije Universiteit Amsterdam. The assessment followed the procedure and standards of the NVAO Assessment Framework for the Higher Education Accreditation System of the Netherlands (September 2018).

Quality assurance agency Academion coordinated the assessment upon request of the cluster Information Science. Peter Hildering acted as both coordinator and secretary, and Anne-Lise Kamphuis and Linda te Marvelde acted as secretaries in the cluster assessment. They have been certified and registered by the NVAO.

Preparation

Academion composed the peer review panel in cooperation with the institutions and taking into account the expertise and independence of the members, as well as consistency within the cluster. On 20 July 2023, the NVAO approved the composition of the panel. The coordinator instructed the panel chair on her role in the site visit according to the Panel chair profile (NVAO 2016).

The programme composed a site visit schedule in consultation with the coordinator (see Appendix 3). The programme selected representative partners for the various interviews. It also determined that the development dialogue would be made part of the site visit. A separate development report was made based on this dialogue.

The programme provided the coordinator with a list of graduates over the period 2021-2022. In consultation with the coordinator, the panel chair selected 15 theses, taking the diversity of final grades and examiners into account. Prior to the site visit, the programme provided the panel with the theses and the accompanying assessment forms. It also provided the panel with the self evaluation report and additional materials (see Appendix 4).

The panel members studied the information and sent their findings to the secretary. The secretary collected the panel's questions and remarks in a document and shared this with the panel members. In a preliminary meeting, the panel discussed the initial findings on the self-evaluation report and the theses, as well as the division of tasks during the site visit. The panel was also informed on the assessment framework, the working method and the planning of the site visits and reports.

Site visit

During the site visit, the panel interviewed various programme representatives (see Appendix 3). The panel also offered students and staff members an opportunity for confidential discussion during a consultation hour. The panel used the final part of the site visit to discuss its findings in an internal meeting. Afterwards, the panel chair publicly presented the preliminary findings.

The secretary wrote a draft report based on the panel's findings and submitted it to the coordinator for peer assessment. Subsequently, the secretary sent the report to the panel for feedback. After processing this feedback, the secretary sent the draft report to the programme in order to have it checked for factual inaccuracies. The secretary discussed the ensuing comments with the panel chair and changes were implemented accordingly. The panel then finalised the report, and the coordinator sent it to the VU.

Panel

The following panel members were involved in the cluster assessment:
- Prof. Olga De Troyer, emeritus professor of Computer Science, Vrije Universiteit Brussel – chair;
- Prof. Geert Poels, professor of Management Information Systems, Ghent University;
- Prof. Alessandro Bozzon, professor of Human Centered AI, Delft University of Technology;
- Prof. Jos van Hillegersberg, scientific director Jheronimus Academy of Data Science Den Bosch (TU/e and TiU), professor Design and Implementation of Information Systems, University of Twente.
- Prof. Jürgen Ziegler, professor of Interactive Systems, University of Duisburg-Essen;
- Prof. Barbara Pernici, professor of Computer Science and Engineering, Politecnico di Milano;
- Prof. Remco Dijkman, professor of Information Systems, Eindhoven University of Technology;
- Prof. Marijn Janssen, professor of ICT and Governance, Delft University of Technology;
- Kelly Kurowksi BSc, master student Business Informatics, Utrecht University – student member;
- Amber Pater BSc, master student Information Sciences, Radboud University – student member.

The panel assessing the master programme Information Sciences at the Vrije Universiteit consisted of the following members:
- Prof. Olga De Troyer, emeritus professor of Computer Science, Vrije Universiteit Brussel – chair;
- Prof. Alessandro Bozzon, professor of Human Centered AI, Delft University of Technology;
- Prof. Barbara Pernici, professor of Computer Science and Engineering, Politecnico di Milano;
- Kelly Kurowksi BSc, master student Business Informatics, Utrecht University – student member.

Drs. Linda te Marvelde acted as secretary for the site visit.

Information on the programme

Name of the institution:	Vrije Universiteit Amsterdam
Status of the institution:	Publicly funded institution
Result institutional quality assurance assessment:	Positive

Programme name:	M Information Sciences
CROHO number:	60255
Level:	Master
Orientation:	Academic
Number of credits:	60 EC
Location:	Amsterdam
Mode(s) of study:	Fulltime
Language of instruction:	English
Submission date NVAO:	1 May 2024

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Description of the assessment

Recommendations previous panels

The programme's documentation included an overview of how it followed up on the recommendations given by the previous accreditation panel (2018) and the panel that performed the latest internal midterm review (2021). The panel concludes that the recommendations have been seriously acted upon by the programme; the panel is satisfied with the improvement measures taken and sees that these have contributed to the improved quality of the programme. The follow-up of some recommendations is highlighted in this report under the applicable standards.

Organization

The master's programme Information Sciences (IS) is coordinated by the Computer Science Department of the Faculty of Science of the Vrije Universiteit Amsterdam (VU). From an organizational perspective, the programme is embedded in the faculty's Domain of Information Sciences.

The faculty is managed by the Faculty Board, consisting of the Dean, the Vice Dean for Education, and the Director of Operations. The Director of Valorisation serves as an advisory member to the Faculty Board. The Director of Education and the Vice Dean for Education are responsible for the portfolio of educational programmes and the educational agenda of the Faculty of Science. The Director of Education is responsible for the strategic planning and implementation of educational policies at the faculty level and acts as an intermediary between the Faculty Board and the different Programme Directors.

The Programme Director plays a vital role in the organization and quality assurance cycles of the master's programme Information Sciences. The Programme Director is supported by a Programme Coordinator who is central to the day-to-day organization of courses and other activities related to education, such as coordinating the teaching team meetings and providing advice to the Programme Director regarding the implementation of educational policies. Many organizational and logistical matters regarding education within the faculty are managed by the Education Office.

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

Profile

The one-year, English-taught master's programme Information Sciences (IS) is designed to offer students a solid basis for a career in the professional field at an academic level, prepare them for further education as a scientific researcher, and provide a comprehension of the position of IS in a broader social and scientific context. The programme aims to provide students with the knowledge, experience, and insights needed to autonomously carry out professional duties as information scientists who are comfortable working in interdisciplinary teams that must deliver (sustainability-aware) digital solutions in all sectors.

The aim is to educate students in the broad field of information sciences, while allowing them by means of personal choices to specialize in a direction related to technology, business, or sustainability. The

programme uses a modern definition of the field of information sciences as *socio-technical systems that meet the needs of people and organizations in an increasingly-digital society*. As such, the programme addresses both the more traditional notion of information systems within companies, and the broader notion of online communities and digital organizations. A new generation of IT professionals who know how to create socio-technical systems that support the needs of modern organizations that are increasingly digital is needed. At the same time, modern society is concerned with its sustainability footprint in terms of environmental, social, technical, and economic priorities, which require specific understanding. The panel appreciates the clarity of the programme's ambition and suggests that it would make it even clearer (for students) if some examples of socio-technical systems were given.

The programme has recently been redesigned to explicitly focus on digitalization and sustainability. It teaches students how to creatively explore the challenges of digitalization and devise technical solutions that create value for businesses, individuals, and society at large (digital society). The panel learned that, although sustainability was already an important aspect of the programme, it is now presented as an unequivocal and unique perspective of the VU programme; it teaches students to analyse the sustainability footprint of different digital solutions with respect to society's environmental, social, technical, and economic priorities (digital sustainability). This focus is unique, compared to five related, one-year programmes in the Netherlands. As per a recommendation of the previous panel, a benchmark was performed by the programme which concludes that, overall, all programmes in other Dutch universities focus on a more consolidated notion of information systems in business organizations, while the programme at the VU both considers a broader notion of organizations (such as social communities and NGOs), and zooms into the sustainability dimensions and implications of information systems and related competencies. The panel appreciates the sustainability angle that the programme has chosen, as it deems it both interesting and timely.

To help students understand their options in the programme, three so-called *student journeys* (professional profiles) were designed: IT Consultant/Data Scientist (with a special focus on the business/economic aspects); Junior Digital Architect (providing T-shaped technical competencies); and Chief Sustainability Officer (adding knowledge in the environmental/societal footprint of IS). Via elective courses students can approach IS from the sustainability perspectives they are most interested in (see Standard 2). The panel finds that insight in possible professions after graduation contributes to a deeper understanding of the programme's practical applications and real-world implications. However, while the panel appreciates the student journeys, it suggests that more information could be given (on the website or via other means) to explain what the status and meaning of the three journeys are as – on paper - they seem rather distant from the research-oriented themes the programme mentions as well as the stated goal of forming information scientists.

Intended learning outcomes
The aims and objectives of the programme are translated into a series of intended learning outcomes (hereafter: exit qualifications, see Appendix A). The panel deems the exit qualifications to be in line with the aims of the programme and finds that they are very clear and formulated in sufficient detail and at master's level. In addition to the Dublin Descriptors, the exit qualifications are also aligned with the reference competencies reported in the MSIS 2016 Global Competency Model for Graduate Degree Programs in Information Systems. The exit qualifications are generic for the entire programme, but some qualifications state Technology, Business or Sustainability as domain competencies. These qualifications contribute to the specialized competences focusing on the Digital Society and/or Digital Sustainability, and depend on the specific electives chosen by the student. The programme evaluates the exit qualifications yearly, during the process of revising the Teaching and Examination Regulations.

Professional field

The programme validates that the exit qualifications and the curriculum match the needs and expectations of the professional field. The feedback provided by the Professional Advisory Board (PAB) is important in this and helps to shape the scope and vision of the programme and define the student journeys that prepare the students for their preferred professional profile (see Standard 2). The Professional Advisory Board meets once a year. Topics on the agenda include the connection between the curriculum and professional practices, roles and functions of graduates in the field, expectations of future developments, and different forms of collaboration between companies and the teaching organization.

The panel spoke with enthusiastic members of the PAB who stated that they are positively impressed with the way the programme prepares students for the labour market: it teaches students the skills and competences that are needed to successfully fulfil the current needs of the industry. The PAB confirmed that there are ample career opportunities for graduates. There is a large and growing demand for professionals with information sciences knowledge and skills. Many more people are needed to support the ongoing digitization of businesses and organisations. Sustainability is an issue that has gained importance and that will remain so. The PAB informed the panel that the labour market urgently needs people with the skills to work on a day-to-day basis with a holistic view of technology. New systems and advances become obsolete rapidly, and employers seek IT professionals who are proficient in technical and analytical abilities rather than specialized content. As a result, the PAB has advised the programme to consider including additional technical courses in the curriculum and/or incorporating a more technical component into the current courses.

Besides the annual meeting, the members of the PAB informed the panel that they also have many individual contacts with the programme, resulting in interesting and meaningful discussions between the programme and professionals, and actual changes to the curriculum to meet the demands of the rapidly changing professional field. The panel is satisfied that the programme has an active PAB as an important means to keep the exit qualifications (and curriculum) well connected to the requirements of the professional field. Furthermore, the panel concludes that the programme management proves to be adaptable and open to feedback.

Considerations

The profile and aims of the MSc Information Sciences are fitting for an academic master's programme in this field. The panel highly appreciates the programme's clear positioning, vision and ambition; topics as sustainability and digital transformation are innovative and timely topics. The aims of the programme have been translated into a clear, coherent and well-formulated set of exit qualifications, that are aligned with the requirements of the academic and professional field. The panel is satisfied that the programme has an active PAB as an important means to keep the exit qualifications (and curriculum) well connected to the requirements of the professional field.

Conclusion

The panel concludes that the programme meets standard 1.

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

Curriculum
The curriculum (60 EC) entails compulsory courses (30 EC), electives (12 EC) and the master's project (18 EC). The programme is relatively small, approximately 40-50 students enrol each year. Those who enter the programme should possess basic knowledge and skills about computer programming, software engineering in a broad sense, statistics, and general academic nature. The programme is geared towards extending and enhancing this knowledge by concentrating on the role of information sciences in digital society and sustainability.

The panel studied the curriculum and concluded that it is well-structured and enables students to achieve the exit qualifications while facilitating the students' personal interests by offering elective space to make personal choices. The compulsory courses connect well to the focus of the programme; they provide the fundamental concepts of digital sustainability and digital society, as well as the role and complexity played by digital solutions, data and social communities. The courses in the first period (Knowledge Organization and Digitalization and Sustainability respectively), are designed to provide the students with the foundation of information organization and knowledge-intensive processes, as well as the digital transformation of business-, human- and organizational processes, and their sustainability implications. The courses in the second period (The Social Web and Digital Architecture), in turn, zoom into the collection and analysis of social-web data, and the architecture design of multi-stakeholder software-intensive systems. In the third period, students are taught a variety of research methods in the compulsory course Research Methodology and Thesis Design, where they also apply what they have learned to the design of their proposal for the topic selected for the Master Project Information Sciences (in the second semester).

The entire first semester is dedicated to the compulsory courses, thus ensuring that students have enough time to work on the foundational competencies, and reflect on and understand what types of further competencies they would like to acquire via which electives. In the second semester, the suggested, pre-approved electives (12 EC in total) provide students with a choice of courses that add technology-oriented, business-oriented, or sustainability-oriented competencies. The panel is positive that the three student journeys (see Standard 1) prepare students for a particular profession or direction in the future. During information days and the welcome event for the new students, the Programme Director explains the possible directions that the students can choose with the pre-approved electives. However, it is also possible for students to consider other electives (at the VU or other universities); in which case they must discuss their proposed study plan with the Programme Director so that feasibility is ensured. This process is facilitated by the Academic Advisor, who serves as the first point of contact for questions regarding study plans. Students informed the panel that they would appreciate more pre-approved electives to choose from. They reported some overlap in the current pre-approved electives and suggested that more electives with an explicit sustainability perspective would be most welcome. The panel encourages the programme to investigate whether it is possible to meet the students' wishes.

Students conclude the programme with the Master Project Information Sciences (thesis). They may choose their thesis topic from an extensive list of options that is made available to them, or choose their own topic. The thesis may be combined with an internship. The programme management indicates that the thesis

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supervisors are involved in different departments and that the programme does not build strict walls around the discipline of information sciences. As a result, students come up with a wide variety of thesis topics. Theses topics are not screened or greenlit explicitly, but rather the thesis supervisor decides whether a topic is within the boundaries of the IS programme. As a result, the panel encountered a great diversity in thesis topics, not always clearly related to the IS master's programme, which is further discussed under Standard 4. Students may choose and approach a supervisor themselves. The panel learned that the programme uses an allocation model to ensure that the supervision load is reasonable. To further optimize the workload for supervisors, the programme recently introduced so-called dual projects, where students work together on a research topic. This is further discussed under Standard 3. The panel recommends that the programme actively monitors the effectiveness of a dual thesis.

In the academic year 2021-2022, the Portfolio Digital Transition and Sustainability (Portfolio DTS) has been introduced. Throughout the year, at the end of each period, students are presented with critical reflection questions about the possible digitalization and sustainability aspects pertaining to the courses they have just followed. Their personal reflection is used to build a portfolio, which is typically a digital catalogue (e.g. a personal website) summarizing for each course, the personal DTS perspective on the acquired competencies. The panel deems the introduction of the portfolio a good initiative, to ensure that the sustainability perspective has a firm presence, especially as - according to the students - not all courses seem to directly address sustainability. The panel is positive that the Portfolio DTS will be integrated into the Master Project Information Sciences. Currently, students reported that the coordination of (onsite) portfolio group meetings is somewhat challenging, leading to unclear deadlines and short-term communications. As the group meetings are important for the success of the Portfolio DTS, the panel supports any measures to ensure that the coordination of these groups is improved upon.

The panel is positive about the teaching-learning environment. Lecturers involve and activate students in many things (weekly small research groups, interesting teaching methods). Case studies to activate deeper knowledge about sustainability (extensively). Practical assignments and industry-inspired projects allow students to put the theory into practice, work in teams, and question and discuss each other's results and hence start developing critical thinking. Students do some group work, which they seem satisfied with in terms of collaboration with fellow students, giving and receiving feedback, grading and avoiding freeriding. The panel suggests, however, that students should not always make their own groups. It could enhance the learning experience if students occasionally have to work with fellow students they would not naturally choose. Finally, the programme makes a real effort to involve students in research. Educational activities like master's theses are connected to current research projects (and topics); in addition, lecturers appear to be open to involving students in their own research, either as assistants or as co-authors of scientific publications.

The panel finds that the programme deploys a good set of committees and initiatives to look after the quality and coherence of the programme. The Programme Director and the teaching team meet every other month to discuss both operational and strategic matters (incl. changes and coherence) pertaining to the programme. In addition, the Programme Committee may help identify overlaps and gaps within the programme. Any suggested changes are checked against the aims of the programme and exit qualifications by the Programme Director. Despite these efforts, students report that coherence of the curriculum could be improved upon. They mention that it is not always clear to them how the compulsory courses relate to each other and that they experience some overlap between the elective courses. The programme management is aware of the students' observations and indicates that it is working on solutions to further improve coherence.

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Guidance and mentoring

There are several ways in which students are supported throughout the programme. As of 2022, students are invited to join a mentoring programme, which is open to all master's students at the Department of Computer Science. Students are assigned a peer mentor at the start of the academic year. Mentors may help with a wide variety of things, including course registration and study tips. In addition, the mentors organize several educational and recreational activities to create a sense of social cohesion and help their peers find their way around, especially during the first semester. The peer mentors are higher-year students from different master's programmes offered at the Department of Computer Science.

There is a full-time certified Academic Advisor dedicated to the master's programme Information Sciences. The academic advisor is available to discuss any personal problems that may affect the students' academic performance, granting exceptions and discussing study plans. Information is made available through the programme's Canvas community. Further, the Academic Advisor proactively reaches out to the students through Canvas to remind them of important deadlines, such as course registration or graduation. The panel concludes that the programme offers appropriate means of support to students.

Some students feel that they could do with more guidance concerning the thesis; they suggest the exploration of alternatives to provide some additional supervision. In addition, some find it difficult to approach (potential) supervisors, because they have only had very limited contact with each other before the start of the thesis. For this reason, students suggest that supervisors set up a more casual meeting/activity at the start of the thesis process where they can get to know the supervisors better. The panel supports the students' ideas and encourages the programme to engage with students to come to a solution that is acceptable and feasible for all.

English-taught programme

The panel finds that the choice of English as the language of instruction is logical and justified. The discipline of information sciences is evolving at a rapid pace, most scientific literature is exclusively available in English and the majority of new developments are published in English too. Furthermore, the programme wants students to be fully prepared for the global employment market. Therefore, offering the programme in English is fitting, considering the international scope of the scientific field of information sciences and the job market in which graduates will end up working.

Teaching staff

The panel is impressed with the expertise of the teaching staff who are mainly associated with three research groups in the domain Sustainable Digital Society of the Computer Science Department:

- The Software and Sustainability (S2) group, which carries out research in software engineering and software architecture and their socio-technical and environmental sustainability;
- The User Centric Data Science (UCDS) group, which researches how various users interact with systems and consume and produce data, with a focus on the technological and socio-economic challenges related to a sustainable, inclusive and fair Digital Society;
- The Decentralized Information Society Engineering (DISE) group, which carries out research on how to design such decentralized eco-systems, and the corresponding information technology.

In addition, a few PhD students and postdocs, as well as several teaching assistants (TA), help out with the practical assignments in the courses. Finding enough qualified teaching assistants is a challenge by design, as students should have successfully completed a course before serving as a TA for it. Since IS is a one-year programme, many of them are no longer enrolled by the time the course is offered again the following year. The panel spoke with the programme about this issue, and concurs that it is not an easy problem to fix.

Continuous attention for this issue will be necessary. Finally, there are two Junior Teachers that support the course coordinators with the organization and execution of the courses. Except for Junior Teachers and teaching assistants, all staff members are actively involved in current research, typically for 40% of their time. Most faculty members also teach in other bachelor's or master's programmes. The programme uses a co-teaching format (two teachers for a course), which the panel is positive about.

All teaching staff members (including tenure track and junior teachers) are expected to acquire a University Teaching Qualification (UTQ). For existing staff, the department offers two tailor-made programmes based on educational experience to create a low-threshold opportunity for senior staff members to obtain their UTQ. This works well and at this time almost everybody has obtained or is in the process of obtaining the UTQ. Finally, all teaching staff members hold English language qualifications or are in the process of obtaining them.

The panel appreciates that each member of the staff attends multiple educational meetings. The Computer Science department hosts a bimonthly 'horizontal' teacher team meeting for all degree programmes' teaching staff. The primary goal is to discuss themes that are relevant to all programmes and to find common answers to shared problems. Furthermore, the whole teaching staff of the Master Information Sciences meets bi-monthly in a so-called 'vertical' teacher team meeting. Potential changes in the curriculum, educational regulations, and substantial changes within courses are discussed here.

Considerations

The curriculum of the MSc Information Sciences reflects the intended learning outcomes of the programme. Students are enthusiastic about the programme and the opportunities it gives them to carve out their own study path. The panel applauds the introduction of the portfolio Digital Transition and Sustainability, which plays a key role in ensuring that students continuously reflect on sustainability issues throughout their studies.

The programme uses several activating and inspiring teaching methods. It also gives students opportunities to be involved in research. The involvement of industry (i.e. via case studies or internships) is also a positive aspect. Students have freedom to choose their own thesis topic and supervisor.

The teaching staff is well-qualified, both in terms of academic activities and teaching qualifications. Recruitment of (enough) teaching assistants remains a point of continuous attention. The panel finds that the programme deploys a good set of committees and initiatives to look after the quality and coherence of the programme. The programme is open to feedback and is willing to take measures to improve itself.

Conclusion

The panel concludes that the programme meets standard 2.

Standard 3. Student assessment

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

Findings

The programme refers to various documents for its assessment policies and practices. The Faculty of Science has compiled an Assessment Policy, which includes thorough instructions on how to set up reliable examinations and assessments. These instructions were utilized as input by the Examination Board (EB) of

the faculty in developing its EB Rules and Guidelines. A detailed explanation of the specific assessment policy for the master's programme IS is laid down in its Assessment Plan.

Course assessment
The panel finds that the programme has an adequate system of assessment. The programme monitors and improves the quality of assessments via several means, such as the application of the four-eyes principle for each course, the compilation of assessment files (that include the assessment matrices and answer models with grading schemes), and the use of guidelines for formative and summative evaluations. Most courses use a good range of (formative and summative) assessment methods to encourage students to participate actively in the learning process; most courses include group work and oral presentations.

Thesis (master project) assessment
The panel is positive about the assessment of the theses. Theses are always subject to two assessments, by the supervisor and a second assessor. The panel generally agreed with the grades given by the supervisors, but noted that the theses were sometimes graded slightly on the high side. External supervisors (in case of internships connected to the thesis) have an advisory role when assessing a student. The Examination Board remarked that external supervisors give 'informal input' and tend to be very (sometimes too) positive in their feedback. The panel sees opportunities to further streamline/formalize the input of external supervisors; the rubric that is used contains options for this (i.e. re: attitude/professional development). The assessors use good evaluation forms that contain guidelines to give marks and that use formula to calculate the final grade based on grades for attitude, research, thesis, and presentation. Motivations are largely provided for the different grades although not always to the same extent. The panel encourages the programme to ensure that motivations are always given to justify and motivate grades given.

Examination Board
The panel spoke with a pro-active Examination Board (EB) that fulfils its legal duties. The Faculty of Sciences has two EB's: the EB for Natural Sciences and Mathematics (NSM-IS) and the EB for Life Sciences and Earth, Ecological and Environmental Sciences (HLS-EEE). Both have several subcommittees to ensure that each programme in the faculty is given ample attention. NSM-IS includes the subcommittee for Information Sciences (IS), which is responsible for the programmes offered at the Computer Science Department. The IS subcommittee consists of four senior staff members with distinct roles and responsibilities.

The EB has established an Assessment Committee to oversee the implementation of the examination guidelines. All the EB's subcommittees are represented in the Assessment Committee. Every year, a sample of courses are selected for review. Pass rates (courses with a pass rate of less than 50% are always reviewed), information from previous years, student course evaluations, requests from the Programme Director or Programme Committee, and other signals are used to choose the samples of courses. Each course is reviewed every three to four years. A representative sample of students' theses is selected for review as well, making sure that a variety of grades are part of the sample. The EB is tasked with ensuring that students are assessed on individual merit; this becomes more pressing as the programme has recently introduced the dual thesis as the default option. The EB informed the panel that the guidelines for individual assessment are in place, as dual theses have been written before. Examples of measures taken are that students declare authorship of their contribution to the end result and individual presentations are given to assess whether each student has achieved the intended learning outcomes. The panel encourages the EB to keep paying explicit attention to the quality of assessment of dual theses in its evaluation processes.

The outcomes of the EB's reviews are reported to the Programme Director who is responsible for acting in case of issues. The EB has not flagged any issues recently with regards to the assessment and examination of the courses or the theses of the master's programme Information Sciences.

Finally, the Examination Board regularly provides ad-hoc guidelines and advice for dealing with specific issues that may have an impact on the quality of assessment. One recent example is the rise of generative AI tools, such as ChatGPT. The EB informed the panel they have seen an increase in the prevalence of fraud (linked to the use of ChatGPT), which has led the EB to inform staff and students on the rules and regulations concerning fraud to make sure that all stakeholders are aware of the EB's strict stance and possible measures taken when fraud is detected. Following up on the EB's recent advice, all courses of the master's programme Information Sciences now include an individual component which tests all learning objectives of the course that is tested summatively in a controlled environment. At the same time, the EB discusses what the emergence of generative AI tools could mean for education in the future. The panel applauds the EB on its pro-active stance concerning these kinds of new developments.

Considerations

The programme has a reliable, valid and transparent system of assessment in place. There are adequate procedures for design and quality assurance of exams, assignments and the theses.

The panel sees opportunities to further streamline/formalize the input of external supervisors with regards to the master's thesis; the rubric that is used contains options for this (i.e. re: attitude/professional development). The assessors use good evaluation forms that contain guidelines to give marks and that use formula to calculate the final grade based on grades for attitude, research, thesis, and presentation. Motivations are largely provided for the different grades although not always to the same extent. The panel encourages the programme to ensure that motivations are always given to justify and motivate grades given.

The Examination Board fulfils its legal duties and has a proactive approach, for instance concerning the emergence of AI. The panel highly appreciates the EB's involvement and encourages them to follow up and adjust procedures, if necessary. With regards to the (re)introduction of dual theses, the panel recommends the EB to ensure that a solid evaluation process is in place for the assessment of this type of final product.

Conclusion

The panel concludes that that the programme meets standard 3.

Standard 4. Achieved learning outcomes

> The programme demonstrates that the intended learning outcomes are achieved.

Findings

Theses
Prior to the site visit, the panel studied a selection of 15 MSc theses. It concludes that thesis quality is good. Research questions, related work, and research methods are always addressed; discussion given and most of the times also limitations. Often there is also a practical component (experiment, survey, interviews etc.), although a literature study was also encountered. When the focus is on data analysis, it is dealt with adequate competence.

The panel enjoyed that the theses cover a great variety of topics, that are related to the focus of the programme. However, it is not clear to the panel what the scope of the thesis topics ultimately is. For instance, two theses addressed a pure social aspect of IT. But as it is the programme's aim to educate students in the broad field of social-technical information systems, the panel would expect some technical component in these theses. Also, there seems to be no common thesis format in the selection that the panel was presented with; multiple formats (e.g. manuscript, scientific article) seem to have been accepted. The programme management informed the panel that a paper is the current template for the thesis. In short, the panel is positive about the quality of the theses and think that these show that students reach the required exit level, but encourages the programme to be more explicit in what the scope and format of the thesis/master project is. The panel spoke with the EB about the great variety of thesis topics it encountered. The EB mentioned that their samples showed that the topics are traceable to the overarching goal of the programme and link to the exit qualifications well. Nevertheless, the panel recommends the programme to introduce a mechanism to better align the topics (thesis projects) with the scope of the programme and make the information sciences profile more recognizable in the topics.

Alumni
Alumni from the programme work in a wide range of companies and public institutions, both inside and outside the ICT sector. Positions include consultants, junior architects, product owners, data analysts, data managers/stewards, ethics specialists, sustainability specialists (e.g. for eco-procurement, data centres), project management officers and researchers.

The positive feedback provided by the Professional Advisory Board regarding the skills and competences that graduates bring to the job market is backed by the results of a questionnaire sent to July 2023. 84,6 % of graduates indicate to be satisfied or very satisfied with how the master's programme IS prepared them for their professional career (15,4% to a great extent, 69,2% to a good extent). The results also indicate that the job prospects are very good, as 76,9 % of the alumni found a job in less than three months after their graduation (in line with the results of the NSE). Further, 96,2% indicate that they are satisfied with their current work and career perspectives.

The panel is positive about the many ways in which the programme stays in contact with alumni, for instance via LinkedIn-groups, newsletters, and informal Alumni-in-the-Spotlight meetings every two or three months since 2019. Such meetings consist of a presentation by an alumnus/a of one of the programmes of the Department of Computer Science, followed by a networking session. The programme also organizes an annual internship fair to which alumni are invited from relevant companies and put in touch with students to discuss possible internship opportunities and do networking.

Considerations
The theses show that students of the programme realize the intended learning outcomes (exit qualifications) of the programme. The panel appreciates the diversity of topics it encountered in the theses. Nevertheless, it encourages the programme to be more specific about the scope (topics) of the master's project, and to introduce a mechanism to bring this more in line with the profile of the information sciences programme.

Alumni are satisfied with their education, and indicate that the programme helped them further shape their career. The programme makes a great effort to connect with alumni and in doing so build a community of students, professionals and academic staff.

Conclusion
The panel concludes that the programme meets standard 4.

General conclusion

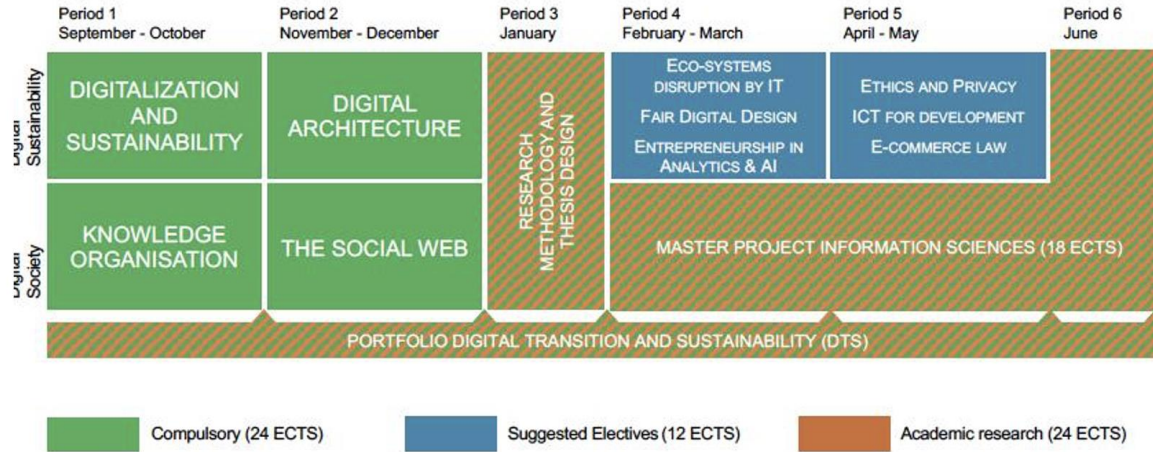The panel's assessment of the MSc Information Sciences is positive.

Development points

1. The panel appreciates the diversity of topics that it encountered in the theses, but does recommend that a mechanism is put in place to ensure that the topics (thesis projects) better align with the scope of the programme and make the information sciences profile more recognizable.

2. With regards to the (re)introduction of the dual thesis, the panel recommends that:
   a. the programme actively monitors its effectiveness;
   b. the EB ensures that a solid evaluation process is in place for the assessment of this type of thesis.

3. The panel encourages the programme to ensure that motivations are always given to justify and motivate grades given on the assessment forms.

Appendix 1. Intended learning outcomes

Knowledge and understanding in the field of Information Sciences. The graduate:

1. has knowledge and understanding of the role of IS in supporting and facilitating the digitalization, digital transformation and sustainability of various domains;
2. has knowledge and understanding of why and how knowledge and (user) data can be organised in various application domains and usage contexts;
3. has knowledge and understanding of relevant scientific methods in the field of Information Sciences;
4. understands the drivers and trade-offs behind, and principles for, the design of digital architectures in complex application domains and usage contexts.

The ability to **apply knowledge and** understanding in the field of Information Sciences. The graduate is able to:

5. reason about the technology- and domain-related concerns for digitalization and sustainability, and apply such reasoning to concrete situations to propose digital solutions;
6. select and apply knowledge organisation methods to concrete problems;
7. plan, perform, evaluate, and write up a scientific study (and the related results) in the Information Sciences, including the formulation of sound research questions, the selection and application of the appropriate research methods, and the data collection and analysis;
8. systematically assess the architecture and (data and human) components of digital architectures of non-trivial solutions, and compare the needs and concerns of their stakeholders;
9. apply the acquired theoretical knowledge in practical assignments;
10. incorporate an element of originality or creativity into their research;
11. evaluate the ethical implications of IS applications in various domains and uphold a well-defined ethical and moral standard when it comes to research.

The ability to **critically judge** Information Sciences research. The graduate is able to:

12. critically evaluate socio-technical, environmental, methodological and ethical limitations and consequences of (multi- and interdisciplinary) Information Sciences research;
13. reflect critically on what is learned, its impact in society, and express own motivated opinions;
14. judge the scientific, societal and practical relevance of research within the discipline, and of relevant decisions proposed by themselves and by others;
15. reflect on social and ethical responsibilities linked to the application of the acquired knowledge;
16. judge and engage in critical discussion about the digitalization and sustainability of society in various domains.

The ability to **communicate** about work to a variety of stakeholders in the field of Information Sciences. The graduate is able to:

17. report orally and in writing on research results and insights in English, individually or in teamwork.

Learning skills and lifelong learning. The graduate is able to:

18. learn new analytical methods and scientific/professional skills independently.

Appendix 2. Programme curriculum

	Period 1 September - October	Period 2 November - December	Period 3 January	Period 4 February - March	Period 5 April - May	Period 6 June
Digital Sustainability	DIGITALIZATION AND SUSTAINABILITY	DIGITAL ARCHITECTURE	RESEARCH METHODOLOGY AND THESIS DESIGN	ECO-SYSTEMS DISRUPTION BY IT / FAIR DIGITAL DESIGN / ENTREPRENEURSHIP IN ANALYTICS & AI	ETHICS AND PRIVACY / ICT FOR DEVELOPMENT / E-COMMERCE LAW	
Digital Society	KNOWLEDGE ORGANISATION	THE SOCIAL WEB		MASTER PROJECT INFORMATION SCIENCES (18 ECTS)		

PORTFOLIO DIGITAL TRANSITION AND SUSTAINABILITY (DTS)

- Compulsory (24 ECTS)
- Suggested Electives (12 ECTS)
- Academic research (24 ECTS)

Appendix 3. Programme of the site visit

<u>Wednesday 22 November 2023</u>

16.00 - 17.30	Panel preparations (incl. open hour)
17.30 - 18.00	**Interview professional advisory board (online)**

<u>Thursday 23 November 2023</u>

08.45 - 09.00	Arrival and welcome
09.00 - 09.45	**Interview programme management**
10.00 - 10.45	**Interview students and recent alumni**
10.45 - 11.15	Break
11.15 - 12.00	**Interview teaching staff**
12.15 - 12.45	**Interview Examination Board**
12.45 - 13.15	Lunch
13.15 - 13.45	Internal consultation panel
13.45 - 14.15	**Final interview programme management**
14.15 - 15.45	Internal panel meeting: findings
15.45 - 16.15	**Feedback findings**
16.15 - 17.00	**Development dialogue**

academion

Appendix 4. Materials

Prior to the site visit, the panel studied 15 theses. Information on the theses is available from Academion upon request. The panel also studied other materials, which included:

1. Self-evaluation report
2. Appendices to the self-evaluation report:
   - A Professional Advisory Board Report
   - B Master Project Pre-assessment form First supervisor
   - C Master Project Pre-assessment form Second supervisor
   - D Final Master Project Assessment form
   - E Students Journeys
   - F Staff members overview
   - G Teaching and Examination Regulations & Study Guide 2023-2024
   - H Educational Vision VU Amsterdam
   - I Exit qualifications overview
   - J Simple mapping between courses and Exit qualifications
   - K MSIS 2016 Global Competency Model for Graduate Degree Programs in IS
   - L Matrix | Competencies in accordance with MSIS2016 classification
   - M Assessment Plan
   - N Year schedule
   - Programme-level Assessment Matrix | Exit qualifications according to Dublin Descriptors
   - P Matrix | Course-level Learning Outcomes mapping to Exit Qualifications
   - Q Matrix | Courses in relation to form of tuition and type of assessment
   - R Matrix | Courses in relation to weighting of exams
   - S Students overview
   - T Report VU Onderwijsdata
   - U Faculty of Science Assessment Policy
   - V Examination Board Rules and Guidelines
   - W Overview of recent Master Projects
   - X NSE Results
   - Ya Alumni survey
   - Yb Alumni survey detailed results
   - Z National Alumni Survey results

3. Course files
   - Knowledge Organization
   - The Social Web
   - Digitalization and Sustainability

4. Annual Reports
   - Jaarverslag Examencommissie 2021-2022
   - Jaarverslag Opleidingscommissie 2021-2022