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Contents

Summary

Standard 1. Intended learning outcomes

The profile and aims of the MSc Business Information Technology are fitting for an academic master's programme in this field. The aims of the programme have been translated into a well-formulated, up-to-date set of programme intended learning outcomes (PILOs), that are aligned with the requirements of the academic and professional field. The panel remarks that aspects of sustainability are not explicitly addressed in the PILOs. At least the ecological or environmental dimension of sustainability are critical in today's world; the panel therefore encourages the programme to explicitly consider (aspects of) sustainability when updating the PILOs in the future.

The panel concludes that the programme has an active External Advisory Board as a means to keep the PILOs connected to the requirements of the professional field.

Standard 2. Teaching-learning environment

The curriculum of the MSc Business Information Technology reflects the intended learning outcomes of the programme. The programme uses several activating and inspiring teaching methods. The involvement of industry (e.g. via projects or research internships) is also a positive aspect. Students are provided with good support and guidance, but report that they would enjoy more of a 'community feeling'. The panel encourages the programme to explore how to increase the sense of community and suggests that the introduction of a mentoring programme could contribute to that. In addition, the programme ideally streamlines its communication channels to avoid scattered information.

The panel finds that the programme offers students many different opportunities to build a (personal) profile. The programme could possibly be made more attractive to students by providing examples of study paths/tracks; the panel has the impression that the programme offers many more options than are currently published. For instance, not may students pursue a PhD after graduation. By showing students a study path that would prepare them for an academic career, students could become more inspired to choose this option.

The teaching staff is well-qualified, both in terms of academic activities and teaching qualifications. 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 and assignments. The Examination Board fulfils its legal duties.

The panel sees opportunities for the programme to optimize the thesis assessment. The panel expects the comments on the thesis assessment form to provide a motivation for why a particular grade in the rubric was chosen and/or provide more in-depth information on what the student did with respect to a specific point in the rubric. The panel recommends that the programme revisits the manner in which the assessment form is set up and used to ensure that it becomes clear why certain marks are given. In addition, the panel thinks that examiners tend to overgrade the master's theses, and strongly advises to recalibrate this. Finally, the traceability of the thesis assessment must be ensured by keeping the individual assessments on file in the future.

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Standard 4. Achieved learning outcomes

The theses show that students of the programme realize the intended learning outcomes of the programme. The panel finds that the theses are of high quality overall. The panel appreciates the great diversity of topics and overall variety it encountered. The panel argues, however, that these differences potentially relate to different learning goals, which is something that both the programme and the Examination Board should be clear about. The variety should at minimum be the result of an explicit choice, made by the programme. The panel therefore recommends that the programme evaluates the manner in which it guarantees that the thesis topics fit the scope of the M-BIT programme

Alumni are satisfied with their education and indicate that the programme helped them further shape their career.

Score table

The panel assesses the programme as follows:

M Business Information Technology

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   Linda te Marvelde
Chair   Secretary

Date: 6 April 2024

Introduction

Procedure

Assessment

On 6 and 7 December 2023, the master's programme Business Information Technology at the University of Twente was assessed by an independent peer review panel as part of the cluster assessment Information Science, together with the bachelor's programme Business Information Technology. 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 2021-2023. In consultation with the coordinator, the panel chair selected 15 theses, taking the diversity of final grades and examiners into account, as well as the various tracks and the dual degree with WWU Münster. 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. No consultation was requested. 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.

Report

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 irregularities. 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 University of Twente.

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's programme Business Information Technology at the University of Twente consisted of the following members:

- Prof. Olga De Troyer, emeritus professor of Computer Science, Vrije Universiteit Brussel – chair;
- Prof. Geert Poels, professor of Management Information Systems, Ghent University;
- 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.

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

Information on the programme

Name of the institution:	University of Twente
Status of the institution:	Publicly funded institution
Result institutional quality assurance assessment:	Positive

Programme name:	M Business Information Technology
CROHO number:	60025
Level:	Master
Orientation:	Academic
Number of credits:	120 EC

Specializations or tracks: IT Management and Enterprise Architecture
                                              Data Science and Business

Location: Enschede
Joint programme: Business Information Systems and Data Science
                                              – with Westfälische Wilhelms-Universität Münster
                                              (dual degree)

Mode(s) of study: Fulltime
Language of instruction: English
Submission date NVAO: 1 May 2024

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). The panel concludes that the recommendations have been 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 management of the master's (and bachelor's) programme Business Information Technology (M-BIT) is shared by the Faculty of Behavioural, Management and Social Sciences (BMS) and the Faculty of Electrical Engineering, Mathematics and Computer Science (EEMCS). To reinforce the balance between Business Administration and Information Technology, the BIT Programme Director is appointed alternately from EEMCS and BMS for a five-year term.

Standard 1. Intended learning outcomes

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

Findings

The two-year, English-taught master's programme Business Information Technology (M-BIT) prepares students to become academics and professionals who are capable of applying systematic approaches for generating scientific knowledge in the field of Information Systems and/or producing innovation that bridges Business & IT. The M-BIT programme offers students two specializations: IT Management & Enterprise Architecture (IMEA) and Data Science & Business (DSB), each of which focuses on developing the knowledge and skills related to their specifically supported professional profiles. The specializations were inspired by the typical professional roles that graduates play in professional life, namely IT (project) manager, business data analyst, and enterprise architect. In addition, these specializations match the research activities performed by the research groups involved in the programme. Particularly, Data Science applied to Business is an area currently getting much attention, both in research as well as in the future work environments of graduates.

Intended learning outcomes
The ambitions of the programme have been translated into a balanced set of Programme Intended Learning Outcomes (PILOs) (see Appendix A). The panel finds that the domain-specific PILOs are grouped as related to business-IT alignment, which was the 'integrative' set of PILOs of the bachelor's programme BIT (B-BIT). The PILOs of M-BIT thus logically follow upon, extend, and deepen those of B-BIT, which provides for a good fit and eases the transition from being a B-BIT student to an M-BIT student. The PILOs are nicely mapped onto and cover the domain-specific reference framework MIS 2016 and the Meijers' criteria. Also, the panel finds that the PILOs reflect a specific focus on Enterprise Architecture, Information Systems, and Data Science, which provides the programme with a unique flavour that matches well with what can be understood as Business Information Technology.

The panel concludes that the PILOs of the M-BIT programme reflect its vision of bridging business and IT, being able to apply scientific approaches, performing research and reporting about research results, solving

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complex problems, reflecting on professional practice, and having the ability to work in multidisciplinary teams, taking the social context into account. In addition, the panel appreciates that - in line with the entrepreneurial philosophy of the University of Twente - the programme also considers entrepreneurial skills. The panel observes that the intended learning outcomes include a PILO about ethical, social, cultural and societal aspects (i.e., PILO 4.1). Sustainability, however, is not addressed in the PILOs. At least the ecological or environmental dimension of sustainability seems to be missing, while it is critical in today's world. The panel therefore encourages the programme to explicitly consider sustainability when updating the PILOs in the future.

Professional field
The panel is satisfied with the manner in which the programme keeps the PILOs and the curriculum up-to-date. The External Advisory Board (EAB) plays a role in this process. The EAB has seven members representative of industry. Membership of the EAB is a personal position based on company/profile/link with BIT field. The board meets once or twice per year to give advice to the programme (director) based on (job) market perspective and needs. It also serves as a sounding board to discuss programme matters on a more strategic level.

The panel learnt that the programme has been updated since the last assessment in 2018. A significant change was the addition of an enterprise security course to the compulsory core together with the addition of PILO 1.7, due to the emergent need to digitally secure organizations in an increasingly connected landscape. Other updates focused on the specializations, including course improvements, content updates, and the launch of new courses on emergent areas like Smart Industry Systems and Applications of Artificial Intelligence in Business (elective), following the advice of the External Advisory Board and Programme Committee. The panel is satisfied that the programme evolves continually to ensure a connection with developments in the field.

Considerations

The profile and aims of the MSc Business Information Technology are fitting for an academic master's programme in this field. The aims of the programme have been translated into a well-formulated, up-to-date set of programme intended learning outcomes (PILOs), that are aligned with the requirements of the academic and professional field. The panel remarks that aspects of sustainability are not explicitly addressed in the PILOs. At least the ecological or environmental dimension of sustainability are critical in today's world; the panel therefore encourages the programme to explicitly consider (aspects of) sustainability when updating the PILOs in the future.

The panel concludes that the programme has an active External Advisory Board as a means to keep the PILOs 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

Intake and admission

M-BIT is a two-year, English-taught programme. The intake varies from year to year, ranging from 37 students (2020), to 64 students (2021), to 47 students in 2022. Admission to the programme is managed by an Admission Committee and is made based on a set of regulations described in the Education and Examination Regulations (EER) and the Admission guidelines Master BIT. In some cases, students may be required to follow a homologation course to ensure a suitable knowledge in Business Administration and/or Computer Science. A tailor-made pre-master programme of 15-30 EC is required from candidates with a degree that does not match the requirements for direct admission. Additionally, English language proficiency requirements apply to all candidates with a degree obtained in a foreign institution. The panel finds that the programme has a sound intake procedure in place and measures to ensure that any potential deficiencies are adequately detected and addressed.

Curriculum

The first five quarters of the programme consist of courses of typically 5 EC (80 EC total), followed by three quarters for a research project (Research Topics, 10 EC) and Final Project (30 EC). Each study plan must comply with set requirements:

- six core courses that are mandatory for all M-BIT students,
- a minimum of four of six courses of the chosen specialisation,
- free choice for any of the pre-approved electives (30 EC total) or any other elective approved by the EEMCS BIT Exam Board. This elective space provides students with the opportunity to work on their own BIT profile.

The panel studied the curriculum and concluded that it enables students to achieve the PILOs. The core courses cover the main competencies and general skills in the PILOs. The courses in the specialization *IT Management & Enterprise architecture (IMEA)* aim for graduates to perform the roles of IT (project) manager or Enterprise Architect. IMEA courses provide students with a solid formation in the implementation and management of IT in organisations and systems architecture, business processes acumen, 'systems thinking', architecture frameworks (such as TOGAF - the Open Group Architecture Framework), communication and collaboration, change management, emerging technologies, and ethical considerations. These knowledge and skills are further developed and assessed during the 'research phase' of the M-BIT programme. The courses in the specialization *Data Science & Business (DSB)* aim to develop skills in data analysis (including data pre-processing/cleaning, transformation, visualization and statistical analysis), statistical and quantitative skills, data mining/machine learning, data management, use of data from (and to support the development of) emerging technologies, simulation, data governance and ethics, and collaboration and teamwork.

In recent years, the programme has redesigned some courses to use Challenge-Based Learning (CBL) as the pedagogical approach, while Project-Based Learning (PBL) is yet the most commonly used among the courses in this programme. Challenge-Based Learning, still in a pilot phase, aims to use (ill-defined) real-world problems to increase the learners' engagement and strengthen the connection with the region's companies. The panel discussed the experiences with CBL and PBL with students and learned that CBL is a

method in which students together are challenged to find their own problem to solve (within a company); whereas PBL presents defined problems to students. The panel finds CBL a fitting approach for a master's programme as it requires initiative and independence.

The final part of the second year is dedicated to the 'scientific phase' of the programme. The student's goal in the Final Project BIT (30 EC) is to execute the research plan that was designed in the Research Topics course (10 EC). Most projects include the design of an artefact and its evaluation. Still, it is also permitted to evaluate existing artefacts or to perform systematic empirical studies to develop artefacts specifically for the context of use (a company, for instance), using structured methodologies like Grounded Theory. Students always have two supervisors (one from each contributing faculty) as a means to guarantee the balance between business and IT contributions in the thesis. The panel was informed that there are no strict requirements concerning the research (i.e. thesis) topics that students choose. M-BIT offers introductory sessions in which students receive information on the thesis process (e.g. possible topics, companies to work with, finding a supervisor). Students are guided by their supervisors in choosing a topic and a greenlight meeting is part of the topic selection process. The panel encountered a variety of different thesis topics, which it will discuss in Standard 4.

The panel concludes that the programme offers students many different opportunities to build a (personal) profile. It finds that the programme could be made more attractive to students by providing examples of study paths/tracks (using the elective space, for instance) as it has the impression that the programme offers many more options than are currently published. For instance, not may students pursue a PhD after graduation (see Standard 4). By offering students a study path that would prepare them for an academic career, students could be more inspired to choose this option.

Dual degree
Students have the option to pursue a dual degree programme in collaboration with the Westfälische Wilhelms-Universität Muenster (Germany). Students who graduate in the dual degree programme receive two accredited diplomas: the Master of Science in Business & Information Technology (UT, 120 EC) and the Master of Science in Information Systems (WWU, 120 EC). Students who start in Twente, will cover almost all core courses (bar two) and additionally specialize with analytics, data science and business courses. Halfway through the second semester, they will transfer to Muenster. Twente students follow 50 EC of courses at WWU. In the final semester students work on their graduation assignment, which culminates in the master's thesis.

The panel appreciates the opportunity M-BIT offers with the dual degree, but was informed that not many students take the opportunity and that the collaboration is up for evaluation soon. For the time being both universities work well together and the Examination Board adequately guarantees the quality of the dual degree programme (see Standard 3).

Student feedback
The panel found that students have several means to give feedback to the programme. The CEEP (Committee for Education Evaluation Panels) - an independent student committee- supports lecturers and Programme Management with an in–depth evaluation of various educational aspects at the end of a course. Their final report is sent to the Programme Committee (BITOC), Programme Management, and the lecturers. At the end of a course, each student is also asked to fill in the Student Experience Questionnaire (SEQ), providing feedback on content, teaching, knowledge and skills gained and study load. The EEMCS Quality Assurance Team consolidates the results of the SEQ and then sends it to the Programme Director and Programme Committee. The Programme Management shares the results with the responsible lecturers and

asks for a reflection from the responsible lecturer, including an action plan to address relevant issues. The BIT Programme Committee (BITOC) also receives the consolidated SEQ and analyses it together with the report provided by the CEEP. The BIT Programme Committee, based on the outcomes, provides the Programme Management with a set of recommendations to improve the course whenever applicable. Students informed the panel that meetings are a particularly useful way to give feedback, but they should preferably not be scheduled in busy periods. The panel concludes that the programme provides students with ample opportunities to provide feedback and it agrees with students that it would be an improvement if updates on what was done with the feedback given would be provided in a systematic manner.

Guidance
The panel finds that students receive regular feedback on their progress via intermediate testing, diagnostic testing, peer feedback. Students report that some courses, however, are affected by organizational issues, leading to information offered too late or too scattered and diffuse communication lines. The panel supports the students who recommend that the programme ideally streamlines its communication channels, prevents the use of many different platforms next to Canvas, and has a backup system in place in case teachers fall ill.

Master's students told the panel that the 'community feeling' could be improved. Teaching staff indicated that they do not recognize a lack of community in the master's programme and told the panel that the BIT programme students' association (Inter-Actief), is an important community-building element within the study environment by organising social and networking events, symposia, excursions and study trips. Also, the type of learning (group work) offers many ways for students to bond. Nevertheless, the panel encourages the programme to see whether the community feeling that master's students desire could be increased. M-BIT currently does not have a mentoring programme. The panel suggests that the programme look into starting such a programme as it could increase the sense of community and mentors could function as role models for students. The successful mentor programme of B-BIT could serve as a great example for this.

English-taught programme
The panel finds that the choice of English as the language of instruction is logical and justified. The domain of business information technology 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 business information technology and the job market in which graduates will end up working.

Staff
The panel is positive about the quality of lecturing staff in the M-BIT programme, who hail from research groups in the Faculty of Behavioural, Management and Social Sciences (BMS) and the Faculty of Electrical Engineering, Mathematics and Computer Science (EEMCS). Recently new staff members were hired, which has led to new courses (e.g. data modelling), that are currently part of the elective offerings in the M-BIT programme. The panel thinks that these are very good additions to the programme, and encourages the programme to investigate how to further strengthen the link between the research groups and the M-BIT programme, for instance by incorporating such (new) electives into the core curriculum.

Students are content with the lecturers, who they describe as motivating, enthusiastic and knowledgeable; they challenge the students to excel. The programme made a very good and clear step in ensuring that lecturers obtain a UTQ. The number of lecturers with a UTQ (or are in the process of obtaining certification) increased to 94%. In addition, 94% of the lecturers have a certification showing English-language proficiency

at level C1 or C2. The teaching staff is highly qualified with almost all having a PhD. However, the panel noted that the involvement of full professors in the programme is somewhat limited. The panel suggests that the programme would benefit from their increased involvement and should ideally make an effort in the future to attract (more) full professors from the BIT domain.

Considerations

The curriculum of the MSc Business Information Technology reflects the intended learning outcomes of the programme. The programme uses several activating and inspiring teaching methods. The involvement of industry (e.g. via projects or research internships) is also a positive aspect. Students are provided with good support and guidance, but report that they would enjoy more of a 'community feeling'. The panel encourages the programme to explore how to increase the sense of community and suggests that the introduction of a mentoring programme could contribute to that. In addition, the programme ideally streamlines its communication channels to avoid scattered information.

The panel finds that the programme offers students many different opportunities to build a (personal) profile. The programme could possibly be made more attractive to students by providing examples of study paths/tracks; the panel has the impression that the programme offers many more options than are currently published. For instance, not may students pursue a PhD after graduation. By showing students a study path that would prepare them for an academic career, students could become more inspired to choose this option.

The teaching staff is well-qualified, both in terms of academic activities and teaching qualifications. 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 M-BIT programme follows the guidelines of the Quality Assurance Framework for Student Assessment UT as well as the EEMCS faculty assessment policy. The quality policy rests on three pillars:

1. A well–functioning Examination Board (EB) monitors the assessment system and intervenes, if necessary.
2. The appointed examiners for components of the programme are well–trained and qualified to teach and assess (see Standard 2).
3. Detailed rules and procedures that are in place to ensure a high–quality assessment system and to prevent fraud.

Course assessment

The panel finds that the programme has an adequate system of assessment. An assessment plan (including the schedule) is published on Canvas two weeks before the start of a course. Generally, at least one representative practice test is available for students to prepare for the examination. Written tests are peer-

reviewed to assure their quality. The aspects checked in the peer review include validity, reliability, and level. In the case of oral exams, there are either two assessors, or the exam is video-recorded. In case project reports or presentations are distributed for grading over multiple examiners, they discuss the grading criteria and interpretation to ensure consistency. The panel appreciates the variety of assessment methods that tie in well with the learning objectives of the courses.

Thesis assessment
The panel finds that the programme has set up a conscientious thesis assessment process. Each thesis is assessed by means of an assessment committee consisting of at least two members. The committee chair (a senior examiner) is responsible for the assessment procedure and communication with stakeholders, such as the Education Office, Examination Board (EB), Programme Committee, etc. The EB selects the senior examiners who are allowed to act as committee chairs. As a rule, the assessment committee must feature one examiner from each faculty (BMS/EEMCS). This arrangement is to safeguard a balance between Business and IT in the thesis assessment. Any other members of the graduation committee may act as advisors for the examiners.

The examiners use evaluation forms that, according to the panel, contain good criteria and descriptions for the different possible marks. The rubric is extensive and provides good guidance for grading and for that reason potentially helps with uniformity in grading and knowledge transfer to new teaching staff. Students are aware of the rubric, which makes it transparent. The panel did suggest that for the more practice-oriented theses, arguably a category could be included in the rubric that covers the practical result for the case study company.

Upon reviewing the use of the assessment form for the thesis, the panel made some observations. The panel noted that only one evaluation form was present for each thesis. The panel was informed that examiners do independently carry out an individual assessment, before a single (final) assessment form is produced. However, these individual assessments are not kept on file. The panel finds that this undermines the traceability of the assessment process; it sees added value in knowing first the evaluation of the two examiners independently from each other, and next their consensus opinion. The panel therefore recommends that the individual assessments are kept on file in the future.

In addition, there is no space on the assessment form for a qualitative justification of each criterion in the rubric. Only at the bottom of the form the option for a general comment of a few lines is given. The panel describes the comments given as rather brief and, to an extent, they simply restate what can already be read in the rubric. The panel expects the comments to provide a motivation for why a particular grade in the rubric was chosen and/or provide more in-depth information on what the student did with respect to a specific point in the rubric. Also, the comments do not always justify the mark and/or are inconsistent with a score given on a criterion. Finally, it is not clear how the final mark is calculated based on the marks given for the different criteria. In conclusion the panel recommends that the programme revisits the manner in which the assessment form is set up and used to ensure that it becomes clear why marks are given.

The panel furthermore concluded that the thesis marks given are relatively high. The panel noted that, although the quality of the theses was generally high (see standard 4), the grades given to students tend to be higher than what the panel would expect based on their own assessment and experience. In addition, the panel concluded that the distribution of grades differs from other programmes, as the current cum laude rate (31%) deviates significantly from what is typical at similar programmes at other universities, and from the unofficial guideline that the University of Twente itself uses (10%).

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The panel discussed the high thesis grades and the high cum laude percentage with the programme's stakeholders and the Examination Board and learned that this is a topic that the programme has worked on in the past years. The programme management is aware that examiners tend to overgrade, and has already worked on addressing the issue via internal thesis carousel (calibration) meetings and changes to the assessment form (as per the recommendation of the previous panel). However, both the panel and Examination Board conclude that these interventions have not (yet) led to significant changes in grading practices. The panel therefore recommends that the programme takes additional measures, for instance via systematic (external) calibration of thesis assessments and/or a recalibration of the rubric itself.

One thing that the panel noted is that the programme is at risk of creating its own grading bias due to certain choices it has made with regards to cum laude rules. For instance, a cum laude is given based on an *average grade* of 8 and the programme allows students to retake exams to improve their marks. The panel encourages that programme to identify and reconsider practices that encourage students' strategic behaviour in pursuing a cum laude distinction and/or put undue pressure on examiners to give grades on the higher end of the scale.

Students in the dual degree with Muenster write their thesis either in Twente or in Muenster. During this process, they are supported by a UT and a WWU lecturer; one has to have a business background, and the other a computer science background. The supervisors are also the examiners of the master's thesis, and ensure that the theses are assessed according to the criteria and intended learning outcomes of each university. The panel finds that the programme sufficiently guarantees the quality of the thesis process and assessment of the dual degree.

Examination Board
The Examination Board (EB) is organised at the level of the faculty EEMCS. Responsibilities are mandated to subcommittees, in which only members of the EB can participate. The BIT subcommittee is responsible for both the bachelor's and master's programme Business Information Technology (EB-BIT). Faculty–wide affairs are mandated to the subcommittee for General Affairs.

Several procedures are in place to guarantee quality during a course's lifetime, which the panel is positive about. To initiate a new course, the lecturer provides a document describing the topics, learning objectives, teaching methods, planning, teaching material and assessment scheme. The Programme Committee assesses this document, after which the Examination Board reviews the assessment and the Programme Management authorises the course to be registered and started. While a course is running, the BIT quality-assessment cycle takes place. Students play a role in providing lecturers, the Programme Committee (BIT-OC), and the Programme Management with a comprehensive report at the end of each course.

In 2023, the BIT Programme sealed an agreement with the BIT EB subcommittee and the EEMCS Quality Assurance Team on a new workflow for continuous improvement, which ensures that all master's courses are checked at least every three years. The results of this new working method cannot yet be assessed by the panel, but it finds that it looks promising and adequately involves all important stakeholders.

The panel is satisfied with the quality of the theses assessment, which is monitored through two main measures: the presence of at least two examiners in the thesis evaluation committee and the 'thesis carousel' - organised by the Programme Management with the support of the EEMCS Examination Board (in particular, the BIT EB subcommittee). The former measure was added as a first response to the previous evaluation panel recommendation, and the latter measure was added to the programme's routine as part of an agreement between Programme Management and Examination Board to safeguard the quality of

examination (and other educational aspects, with the help of the Quality Assurance Team). The theses written as part of the dual degree are also covered by the thesis carousel.

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 and assignments. The Examination Board fulfils its legal duties.

The panel sees opportunities for the programme to optimize the thesis assessment. The panel expects the comments on the thesis assessment form to provide a motivation for why a particular grade in the rubric was chosen and/or provide more in-depth information on what the student did with respect to a specific point in the rubric. The panel recommends that the programme revisits the manner in which the assessment form is set up and used to ensure that it becomes clear why certain marks are given. In addition, the panel thinks that examiners tend to overgrade the master's theses, and strongly advises to recalibrate this. Finally, the traceability of the thesis assessment must be ensured by keeping the individual assessments on file in the future.

Conclusion

The panel concludes that the programme meets standard 3.

Standard 4. Achieved learning outcomes

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

Findings

Prior to the site visit, the panel studied a selection of 15 theses. It concludes that the quality of the theses is high and impressive. The amount of work done, the ambition level, and the extent and size of the theses are in line with what is normally expected from a workload corresponding to 40 EC. The theses are well-elaborated and have a clear scientific structure: problem statement, research questions, research methodology, literature review (often systematic literature review), a discussion, limitations of the work, future work, also always an evaluation. Most theses concern the design of an artefact (for a company), which is very appropriate for an engineering programme. All in all, the panel concludes that the theses are very well done; some have a level of quality that could lead to a publication. In the period from January 2017 to May 2023, M-BIT students have published 25 papers; 19 were published in scientific peer-reviewed conferences and 6 journal papers.

Upon reviewing the theses, the panel encountered a great variety of topics. The panel enjoyed this variety, but still recommends that the programme evaluates the manner in which it guarantees that the thesis topics fit the scope of the M-BIT programme which is, according to the objectives, vision and goal, about "know how organizations (businesses) work and how make information and communication technology (ICT) useful for these organizations by bridging the gap between these two areas". Some theses that the panel studied were executed in the context of external organizations, but focused prominently on the ICT part without explicitly discussing the interplay with the organizational part, which the panel thinks is a missed opportunity. The variety in thesis topics can be very attractive, but the panel finds that the programme has to be more explicit in communicating which topics are suitable for the field of business information technology specifically.

The panel also note that some theses could have been more condensed. For instance, quite some theses explain at length the details of a methodology for Design Science that could be considered background information which can be assumed common knowledge for the M-BIT programme. Also, the theses differ quite a bit in their setup. Some are clearly about the design of an artefact while others are about the evaluation/comparison of existing artefacts. The panel also encountered qualitative explorative studies, although arguably these also have design elements. Some are formatted as a scientific paper, while the others have the form of a scientific report. Theses may be performed at a company or not. These differences in setup might - to an extent - also satisfy different learning goals, which is something that both the programme and the Examination Board should be clear about. At least the variety should be the result of an explicit choice, made by the programme.

Alumni
As part of the alumni monitoring activities, M-BIT tracks their professional trajectory, and recently started to check if international students stay or leave the Netherlands after they finish their studies. From a sample of 160 alumni, 52 are foreign nationals, and 30 (58%) of them have found jobs in the Netherlands and contributed to the Dutch economy. The percentage of M-BIT alumni who remain in the Netherlands and join the local labour market is similar to that of the B-BIT alumni (60%). The most common areas of professional practice chosen by alumni are 'Business & IT Consultancy' and 'Data Management and Analysis'. Among the professional profiles grouped in these areas, the most frequently performed by alumni are Business Consultant and IT Consultant, Business (Intelligence) Analyst, and Data Analyst, followed by AI or Data Science Consultant. These professional profiles match with the two current specializations of M-BIT. The programme observed an increased interest of M-BIT students to work on research related to Cybersecurity, which will be considered during curriculum workshops.

Considerations
The theses show that students of the programme realize the intended learning outcomes of the programme. The panel finds that the theses are of high quality overall. The panel appreciates the great diversity of topics and overall variety it encountered. The panel argues, however, that these differences potentially relate to different learning goals, which is something that both the programme and the Examination Board should be clear about. The variety should at minimum be the result of an explicit choice, made by the programme. The panel therefore recommends that the programme evaluates the manner in which it guarantees that the thesis topics fit the scope of the M-BIT programme

Alumni are satisfied with their education and indicate that the programme helped them further shape their career.

Conclusion
The panel concludes that the programme meets standard 4.

General conclusion
The panel's assessment of the MSc Business Information Technology is positive.
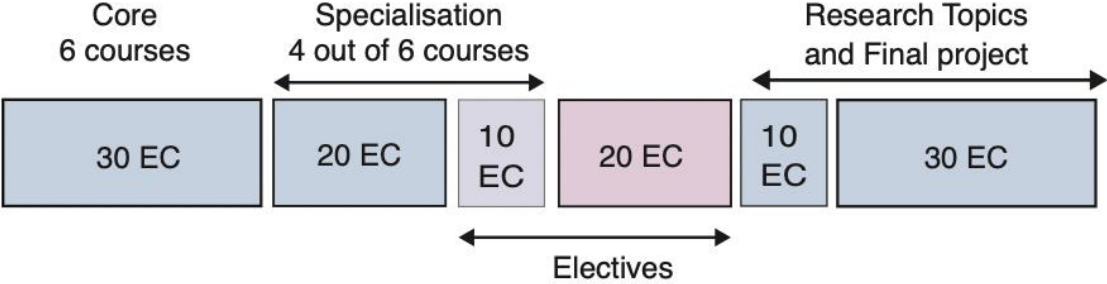
Development points

1. The panel encourages the programme to explicitly consider (aspects of) sustainability, including ecological and environmental aspects, when updating the PILOs in the future.

2. The panel recommends that the programme considers providing examples of study paths/tracks to show what possibilities the programme offers. For instance, not may students pursue a PhD after graduation; a 'research track' could show students how to prepare students for a career in academia.

3. The panel recommends the programme streamlines its communication channels to avoid scattered and diffuse communication lines.

4. The panel recommends to investigate how to strengthen the link between the research groups and the M-BIT programme.

5. With regards to the thesis (assessments), the panel recommends that:
   a. the individual thesis assessments are kept on file;
   b. the programme revisits the manner in which the assessment form is set up and used to ensure that it becomes clear why certain marks are given and how the final mark is calculated;
   c. the programme takes concrete measures to achieve a normal distribution of final grades;
   d. the programme evaluates the manner in which it guarantees that the thesis topics fit the scope of the M-BIT programme.

Appendix 1. Intended learning outcomes

After completion of the M-BIT programme, the graduate:

1	Business-IT alignment knowledge and skills
1.1	Understands, and can act upon, the concept of business innovation, including the interaction between IT innovations and innovations in business processes and business organisation.
1.2	Understands and is able to assess the short and long–term impact of the business strategies on both the effectiveness and the efficiency of IT.
1.3	Is capable of developing business strategies and business information system strategies, and operationalising them in an architectural framework.
1.4	Can apply the conceptual framework of Enterprise Architecture to improve business-IT alignment.
1.5	Knows how to apply methods and techniques for the integrated development of business processes and business information systems, by making a reasoned selection, by communicating the principles and by contributing to their further development.
1.6	Knows how to apply information systems methods and techniques like requirements analysis, resource management & planning, architectural design, implementation and administration for alignment and life cycle management of information systems.
1.7	Understands the fundamentals of digitally securing an organisation and can apply the standards, frameworks and risk assessment techniques for managing and developing enterprise information security strategies and concerns.
1.8.1	(IMEA) Can apply IT in projects in organisations to improve business performance and can design IT systems to support business processes, strategy and mission effectively.
1.8.2	(DSB) Can analyse and interpret large amounts of data to make business decisions, such as reconfiguration of organisations and their IT infrastructure.
2	Scientific approach
2.1	Can independently and systematically apply the design cycle (analysis, design, implementation, evaluation and reflection) to complex IT and business problems, by selecting and applying methods, techniques and theories from different disciplines if necessary.
2.2	Can independently and systematically design and execute a research plan (literature research, problem analysis, formulating hypothesis, design and execution research plan, data analysis, report, conclude) crossing different disciplines or fields if necessary and contribute to scientific research.
2.3	Can independently apply research methodology and research ethics, in the areas of both social science research and design research.
2.4	Can apply creative and critical thinking, reflection and argumentation.
2.5	Is capable of independently acquiring new knowledge and skills from different disciplines.
3	Professional skills
3.1	Can co–operate, discuss and report in written and verbal ways, in English, in both a professional and a research setting, and is aware of the differences between these settings.
3.2	Is capable of working as part of a (multi-disciplinary) team in different roles, as member or leader, in terms of sharing responsibilities, applying time management, and planning resources and reporting, and is aware of group dynamics in development projects.
3.3	Is capable of functioning as a professional in and between different disciplines/fields.
4	Taking account of Social and Temporal context
4.1	Is capable of analysing and discussing ethical, social, cultural and societal aspects of problems, solutions and developments and their consequences in the field.

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Appendix 2. Programme curriculum

Core 6 courses	Specialisation 4 out of 6 courses			Research Topics and Final project	
30 EC	20 EC	10 EC	20 EC	10 EC	30 EC

Electives

Appendix 3. Programme of the site visit

Wednesday 6 December 2023

12.00 - 12.15	Welcome
12.15 - 14.00	Panel preparation (incl. lunch)
14.00 - 15.00	**Interview programme management**
15.15 - 16.00	**Interview BSc students and recent BSc alumni**
16.00 - 16.30	Break
16.30 - 17.15	**Interview BSc teaching staff**
17.15 - 17.30	Internal panel meeting

Thursday 7 December 2023

08.45 - 09.15	Panel preparation
09.15 - 10.00	**Interview MSc students and recent alumni**
10.15 - 11.00	**Interview MSc teaching staff**
11.00 - 11.30	Break
11.30 - 12.00	**Interview Board of Examiners**
12.00 - 13.00	Internal panel session (incl. lunch)
13.00 - 13.30	**Concluding session programme management**
13.30 - 15.00	Concluding session panel
15.00 - 15.30	**Oral feedback panel**
15.30 - 16.15	**Development dialogue**

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:

Appendices
- Comments Previous Assessment & Actions at the University of Twente
- Intended Learning Outcomes
- Overview of Modules and Courses
- Intake of students B-BIT
- Intake of female students
- Grades
- Dropouts
- Graduated students
- External Advisory Board
- Staff of the programme
- Student–staff ratio BIT

Online references
- Self-Evaluation report
- Positive audit UT (28 April 2020)
- NVAO report UT (22 March 2020)
- Quality Assurance Framework for Student Assessment UT
- EEMCS faculty assessment policy
- Domain-Specific Frame of Reference
- External Advisory Board (EAB)
- Inter-Actief
- ENIAC
- Education and Examination Regulations (EER)
- Osiris
- Criteria for Academic Bachelor's and Master's Curricula, also known as the Meijer's criteria
- Summary of the Meijer's criteria
- Dublin Descriptors
- Entry requirements UT website
- Information for prospective students
- Statement of the rectors of all Dutch universities
- Twente Educational Model
- Online Teaching
- Mobility–Online
- EEMCS Faculty Regulations document
- BIT Quality Control
- Senior University Examination Qualification
- Overview of the subcommittees
- University Teaching Qualification (UTQ)
- EEMCS Rules & Guidelines
- Plagiarism
- Netherlands Code of Conduct for Research Integrity

- Questionnaire to check for potential issues due to Corona
- Netherlands Code of Conduct for Research Quality Assurance Workflow
- National Student Enquiry (NSE2023)
- Fraud
- Twente Student Conference on IT