SELF-EVALUATION 2023 MSc BUSINESS INFORMATION TECHNOLOGY

UNIVERSITY OF TWENTE.

Self-Evaluation MSc Business Information Technology

2023

University of Twente

Final version 2 October 2023

Please Note

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This document was prepared according to the guidelines given in the Assessment Framework for the higher education accreditation system of the Netherlands [9]. Passing the institutional audits [3], [4] allows the degree programmes to perform NVAO's limited programme assessment.

Administrative data

Administrative data of the programme	
Programme name	Business Information Technology
Orientation and level	Scientific education, Master of Science
Degree	Master of Science
Number of credits	120 EC
Specialisations	Data Science and Business Enterprise Architecture & IT Management
Location	Enschede
Mode	Full time
Language of instruction	English
CROHO registration number	60025
URL	https://www.utwente.nl/en/mbit/
Contact person	Dr. W. Corbo Ugulino (Programme Director) ☎ +31 53 489 3425 ✉ w.corbougulino@utwente.nl

Administrative data of the University	
Name	University of Twente
Status	Funded
Result of institutional audit	Positive (28 April 2020) [3] NVAO report (22 March 2020) [4]

Abbreviations and Acronyms

BA	Business Administration
BIT	Business & Information Technology programme
BKO	Basis Kwalificatie Onderwijs (University Teaching Qualification, UTQ)
BMS	Faculty of Behavioral, Management and Social Sciences
CEEP	Committee for Education Evaluation Panels
CELT	Centre of Expertise in Learning and Teaching
CES	Centre for Educational Support
CS	(Technical) Computer Science
DSB	Specialisation Data Science & Business
DSFR	Domain–Specific Frame of Reference
EAB	External Advisory Board
EB	Examination Board
EC	European Credit (1 study year is 60 ECs)
EEMCS	Faculty of Electrical Engineering, Mathematics and Computer Science
EER	Education and Examination Regulations
HBO	University of Applied Sciences (Dutch: Hoger Beroeps Onderwijs)
IELTS	International English Language Test System
ILO	Intended Learning Outcome
IMEA	Specialisation IT Management & Enterprise architecture
IT	Information Technology
MC	Marketing & Communication
NSE	Nationale Studenten Enquête (National Student Survey)
OHL	Onbezoldigd hoogleraar (Dutch for unpaid full professor)
OLD	Opleidingsdirecteur (Dutch for Programme Director)
PC	Programme Committee
PD	Programme Director
PDCA	Plan, Do, Check, Act
PILO	Programme Intended Learning Outcome
SEQ	Student Experience Questionnaire
SUTQ	Senior University Teaching Qualification
TCS	Technical Computer Science
UD	Universitair Docent / Assistant professor
UHD	Universitair Hoofd Docent / Associate professor
UT	University of Twente
UTQ	University Teaching Qualification (Dutch: BKO)

	Research Groups
SCS	Semantics, Cybersecurity, and Services
DMB	Data Management and Biometrics
IEBIS	Industrial Engineering and Business Information Systems

Preface

Text common for the BSc and MSc programmes is printed as dark blue text.

Business-based and IT-based competencies

Since its foundation in 1993, the BIT Programme at the University of Twente has acknowledged the distinctive profile necessary to work at the intersection of Business and Information Technology by offering a well-balanced division between *Business-based and IT-based competencies* with which the Programme forms its graduates. During these 30 years, the Business Administration and Computer Science areas have developed considerably, shaping the technologies and issues to be addressed in a programme dedicated to bridging the gap between these areas.

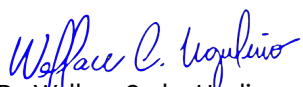
Emerging areas

Cyber security and Ethical aspects

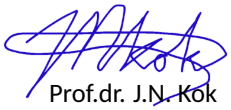
In the early years of this Programme, the issues to be addressed by the professionals and academics at the intersection of Business and Information Technology concerned the introduction of personal computers and computer networks to improve individual and group productivity. Nowadays, the scope of the challenge is much broader because of technological advancements that have broadened the concept of 'user' in Information Systems and the advancement in tools and techniques to understand, analyse, monitor, and deploy business processes. Among the technological advancements, the popularisation of Mobile and Cloud Computing, Artificial Intelligence and Big Data, and the Internet of Things stand out. These technologies expanded considerably the reach and the effects of newly devised IT solutions and business processes, requiring increased attention to *Cyber security* and the *Ethical aspects* of these newly designed business processes and IT solutions. To keep up with these changes, the BIT Programme has evolved accordingly, forming professionals and academics of whom we are proud.

In this report, we have done our best to present the Business Information Technology Programme openly and truthfully. Most of the actions that were identified after the previous visitation were implemented. Furthermore, writing this Self-evaluation has stimulated the fine-tuning of procedures and information for students.

This report's draft was sent to the whole BIT community, including lecturers, students, Programme Committee, Faculty Council, and Management Board. We are grateful for their valuable contributions. This report would not have been possible without the effort of many people, to whom we want to express our deepest gratitude.



Dr. Wallace Corbo Ugulino
Programme Director



Prof.dr. J.N. Kok
Dean EEMCS

Contents

1 Organisation of this report

Limited framework

This report contains the Standards 1-4 of the Assessment Framework for the higher education accreditation system of the Netherlands 2018 [9]. Because the UT passed the institutional audit [3], [4], we follow the *limited framework*.

The report starts in Standard 1 by describing the Programme's Intended Learning Outcomes. As an international Domain–Specific Frame of Reference, the 'MSIS 2016 report' is used. In addition to the recommendations of the 'MSIS 2016 report', we designed our curriculum to be compliant with the so-called 'Meijer's Criteria', which has been used as a reference for curriculum design in bachelor's and master's programmes of Dutch research universities (See Figure 1). We will show how these competencies map to the Programme's Intended Learning Outcomes (PILOs) and how the PILOs map to the programme's courses.

Domain–Specific Frame of Reference (DSFR)

The (Domain–Specific Frame of Reference (DSFR) chosen for the Information Systems cluster is the *MSIS2016* [10], which is the same used in the last evaluation. Hence, the updates presented in this document are the regular programme updates resulting from our PDCA process.

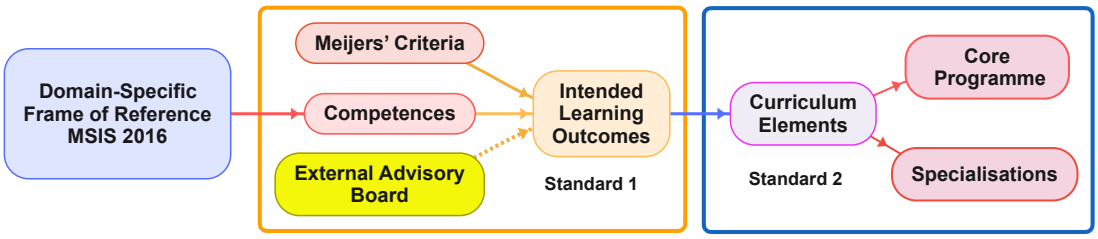


Figure 1
Relationship between the elements of the curriculum, the Intended Learning Outcomes and the Domain–Specific Frame of Reference.

External Advisory Board (EAB)

Additional input for the continuous update of the programme is given by the External Advisory Board (EAB) [12]. The PILOs described in Standard 1 of this document are related to the Consolidated Requirements in the DSFR (See Table 1.1). The learning goals of the mandatory core of the programme are based on the PILOs, and specialisations have been organised around its targeted professional profiles. This is described in Standard 2. The student assessment and achieved learning outcomes are discussed in Standards 3 and 4 respectively, followed by the Student Chapter.

2 Follow–up on the recommendations of the previous assessment

The actions we took as a direct result of the previous assessment are described in Appendix A at page 29.

3 The BIT programme at the UT

BMS
EEMCS

The programme management 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 5 years term. Details are shown in the organisation chart of Figure 2.

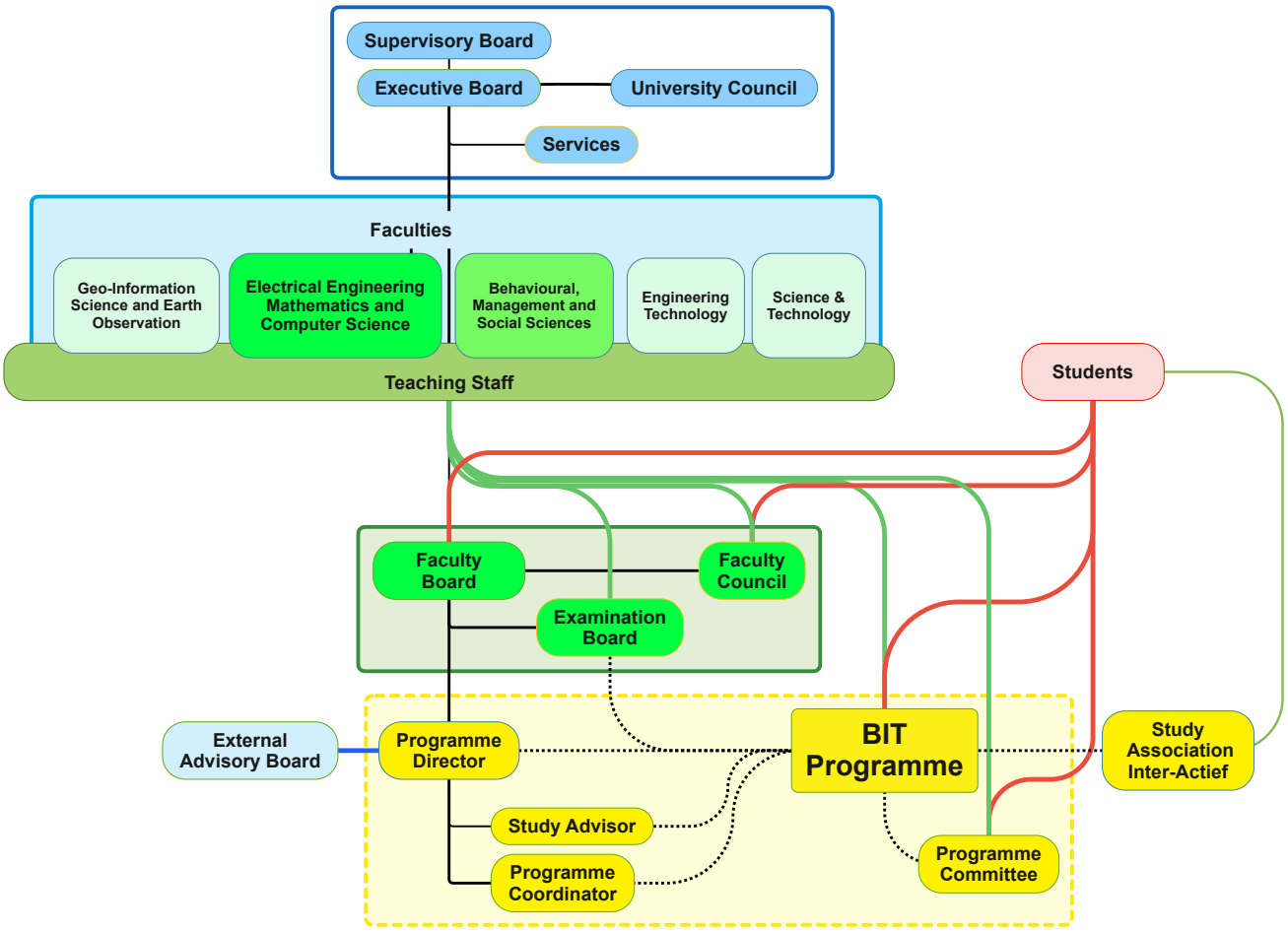


Figure 2 Organisation chart of the BIT programme in the UT

In Figure 2, the committees referred to as the Faculty Board, Examination Board, and the Faculty Council are those hosted and managed by the EEMCS Faculty.

4 Study and alumni association

Inter-Actief [13] is the BIT programme students' association, which also includes the students of the Computer Science Programme. The association is an important element within the study environment by organising social and networking events, symposia, excursions and study trips. Inter-Actief also maintains a database of old exams and sells textbooks at significant discounts. IAPC (Inter-Actief Personal Computing) has a shop where students can buy computer hardware.

The study association plays a complementary role in the quality control of the courses. The association keeps a website where students can send anonymous requests, complaints, and wishes to the Programme Management board. Finally, complementing the students' important role in maintaining the programme's quality, Inter-Actief awards the best teachers of each quartile and the best teacher of the year (the annual Inter-Actief Decentralised Educational Award, IDEA). For a lecturer, being the winner of this award is the condition for being nominated to the University-wide award competition (University of Twente Educational Award, UTEA).

ENIAC [14] is the alumni association for all computer science related programmes. They organise events, do matchmaking for BIT students with companies and hand out the ENIAC thesis prize.

BIT: the bridge between Business Administration and Computer Science

Standard 1: The intended learning outcomes tie in with the level and orientation of the programme. The intended learning outcomes are geared to the expectations of the professional field, the discipline, and international requirements.

1 Intended Learning Outcomes

The Master's Programme Business Information Technology at the University of Twente offers students a solid technical formation to equip them with the necessary knowledge and skills to be leaders in bridging IT & Business. On average, in the last three years (2020-2022), the programme received 50 students each year. In the M-BIT programme, students are offered two specialisations: 'IT Management & Enterprise Architecture' and 'Data Science & Business', with each specialisation focusing on developing the knowledge and skills related to their specifically supported professional profiles.

1.1 Objectives, Vision and Goal

The objectives of the programme and the Programme's Intended Learning Outcomes (PILOs) can be found in the Education and Examination Regulations (EER) [17] of the programme at pages 25-27. Alternatively, in this report, the PILOs are listed in Appendix B and they are discussed in Section 1.2.

Vision

Goal

Society strongly depends on people who know how organisations (businesses) work and how to make information and communication technology (ICT) useful for these organisations by bridging the gap between these two areas. The M-BIT programme 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.

1.2 Programme's Intended Learning Outcomes

Cybersecurity: new PILO 1.7

Since the last report, the Programme has had some updates. The most significant one was the addition of an enterprise security course to the compulsory core accompanied by the addition of PILO 1.7, due to the emergent need to digitally secure organisations in an increasingly connected landscape. Other updates focused on the specialisations, including course improvements, content updates, and the launch of new courses on emergent areas like Smart Industry Systems (202000028) and Applications of Artificial Intelligence in Business (202200345, elective), following the advice of our EAB and Programme Committee.

The PILOs reflect our mission of delivering academics who independently perform research on the gap between business and IT and reflective practitioners who actively bridge this gap. For students and staff, the most updated version of the PILOs can be found in the Education and Examination Regulations [17] of the current academic year. In addition, the PILOs version of the academic year 2022-2023 are also listed in Table B.1 (Appendix B, page 32) of this report.

The PILOs of the M-BIT programme properly reflect our vision of bridging business and IT, being able to apply scientific approaches, performing research and reporting about research results, solving complex problems, reflecting on professional practice, and having the ability to work in multidisciplinary teams, taking the social context into account. In addition, in line with the entrepreneurial philosophy of UT, we also consider entrepreneurial skills. The programme offers the students a choice between two specialisations, namely IT Management and Enterprise Architecture

(IMEA) and Data Science and Business (DSB). Table 1 shows the M-BIT PILOs, including the PILOs specific for each specialisation: PILOs 1.8.1 (IMEA) and 1.8.2 (DSB).

Specialisations IMEA and DSB

Professional roles expected for the M-BIT graduates

The specialisations IMEA and DSB were inspired by the typical professional roles we expect our M-BIT graduates to play in society, namely IT (project) manager, business data analyst and for the M-BIT graduates enterprise architect. In addition, these specialisations 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 our graduates.

1.3 Coverage of the Domain–Specific Frame of Reference

DSFR

Meijers' Criteria

This section shows how the Programme Intended Learning Outcomes (PILOs) of the M-BIT programme comply with the competencies of the Domain–Specific Frame of Reference (DSFR) [10] and the Meijers' Criteria [11], [15], which describe the general competencies of a graduated engineer in research universities.

Coverage of the 3 competency realms

The PILOs listed in Table 1.1 are distributed in 4 groups. Group 1 includes all intended learning outcomes to match the 'Information Systems' , while Groups 2–4 include the competency realms PILOs related to the 'Individual Foundational Competencies' realm and Meijer's criteria. Regarding the realm of 'Domain Competencies', the programme covers 'Business' as the domain competencies realm (PILOs 1.1–1.3). Our list of courses and approved electives includes courses on Human Resource Management technologies, e-Health, e-Law, and Industry 4.0 / 5.0.

Table 1.1 Relation between ILOs and competencies in the DSFR and Meijers' Criteria

	Programme Intended Learning Outcomes																	
Competencies of MIS2016	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8.1	1.8.2	2.1	2.2	2.3	2.4	2.5	3.1	3.2	3.3	4.1
Enterprise Architecture				●					●									
Ethics, Impacts and Sustainability																		●
Innovation, Organisational Change, and Entrepreneurship	●	●	●				●			●			●	●		●		
IS Strategy and Governance		●	●				●	●										
IT Infrastructure									●									
Systems Development and Deployment					●	●		●		●					●			
Meijers' Criteria	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8.1	1.8.2	2.1	2.2	2.3	2.4	2.5	3.1	3.2	3.3	4.1
1. is competent in one or more scientific disciplines	●	●	●	●	●	●	●	●	●	●	●	●	●	●				
2. is competent in doing research										●	●	●	●	●		●		
3. is competent in designing			●	●	●	●	●	●	●	●	●		●	●		●		
4. has a scientific approach				●	●	●				●	●	●		●	●			
5. possesses basic intellectual skills	●						●	●		●	●	●	●					
6. is competent in co-operating and communicating					●		●								●	●	●	●
7. takes account of the temporal and the social context															●			●

Meijers' Criteria

Dublin Descriptors

The Meijers' Criteria [11], [15] are an adaptation of the Dublin Descriptors [16] for engineering programmes and describe the general competencies of a graduated engineer at master level. Table 1.1 shows how Meijers' Criteria 1–7 are covered by the Intended Learning Outcomes of the BIT programme.

1.4 Keeping the PILOs up-to-date

Programme Committee
External Advisory Board

To keep the PILOs and the programme up-to-date, the BIT Programme Committee (BITOC) supports the Programme Management Team by playing the role of a content-expert board. Additionally, the External Advisory Board [12] plays a role in this process. The External Advisory Board:

- Gives advice to the programme (director) based on (job) market perspective and needs. Serves as sounding board to discuss programme matters on a more strategic level,
- Has 7 members representative of industry,
- Meets 1–2 times per year. Rotating between UT and companies as hosts,
- Members are appointed for 5 years, with an additional 5 year term as a possibility.

The membership of our EAB is a personal position based on company/profile/link with BIT field (contrary to some advisory boards that have a structure where the company has a seat, and the person attending can differ).

1.5 Strengths and action points

Strengths

✓ The BIT Programme counts on a well-functioning External Advisory Board and Programme Committee, who have supported the Programme Management Team in continuously updating the programme in the last years.

✓ Programme Intended Learning Outcomes have been updated continuously and properly cover the 3 competency realms as recommended in the DSFR.

Action Point

- Continue updating the programme to keep academic relevance, meet Dutch industry needs, and leverage the expertise of a fairly renewed team of faculty members contributing to the programme.

Drone and ’Rover’ in Smart Industry Systems project

Standard 2: The curriculum, the teaching–learning environment and the quality of the teaching staff enable the incoming students to achieve the intended learning outcomes.

2 Teaching–learning Environment

The M-BIT programme is a two-year programme comprised of 120 ECs. We offer a stimulating, student-driven teaching and learning environment to support our students' proper achievement of M-BIT's PILOs. In alignment with our Shaping 2030 Initiative [6], the M-BIT programme has redesigned some courses to use Challenge-Based Learning as the *pedagogical approach*, while Project-Based Learning is yet the most commonly used among the courses in this programme. The adoption of *Challenge-Based Learning*, still in a pilot phase, has helped us increase the offer of ill-defined real-world problems that increase the learners' engagement and strengthen our connection with the region's companies.

Pedagogical approach

Challenge-Based Learning

2.1 Study programme

The first five quarters consist of courses of typically 5 EC (80 ECs total), followed by three quarters for the research project definition (research topics, 10 ECs) and thesis (30 ECs). Courses of the M-BIT curriculum are either core courses, specialisation courses, or elective courses. For the M-BIT student, a proper study plan must comply with the following requirements:

Curriculum structure

- *Core courses*: these six courses are mandatory for all M-BIT students,
- *Specialisation courses*: minimum 4 (out 6 courses) of the chosen specialisation,
- *Elective courses*: free choice for any of the pre-approved electives [21] or any other elective approved by the EEMCS BIT Exam Board.

Core courses

Specialisation courses

Elective courses

The core courses have been defined to cover the main competencies in our PILOs. The M-BIT specialisations allow the students to deepen their knowledge in a specific area while giving them insight into a specific career field. Figure 2.1 gives an overview of the M-BIT curriculum:

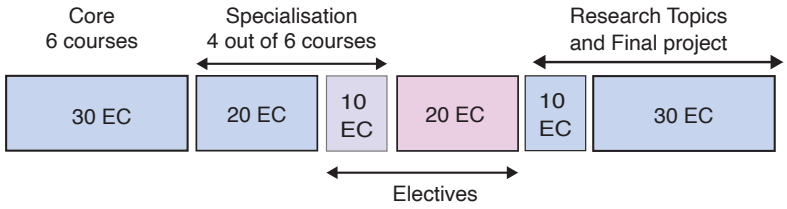


Figure 2.1 M-BIT curriculum overview

Although the minimum number of ECs to be completed is 120, students can graduate with more than 120 ECs. The academic programme is depicted in the next sections, showing the course code, course name, quartile and study load in EC. More details are available via OSIRIS and/or are made known in a timely manner by the examiner in accordance with the provisions of Article A4 of the EER. Additionally, students have the option to pursue the BIT's *dual degree programme* in collaboration with the Westfälische Wilhelms-Universität Münster (Germany). Students who graduate in the dual degree programme receive two diplomas: the Master of Science in Business & Information Technology (UT, 120 ECs) and the Master of Science in Information Systems (WWU, 120 ECs). Both programmes are accredited. This dual degree is described detail in Appendix D and on the BIT website [19].

Dual degree with WWU Münster

2.1.1 Compulsory core

The BIT master's degree has a compulsory core of 30 EC, consisting of the 6 courses listed in Table 2.1. The core is characterised by general skills and competencies and via courses such as Enterprise Architecture, Data Science and Business Case Development, students get insights in the job profiles further explored in the specialisations.

Table 2.1 Compulsory Courses

Term	Code	Name	EC
Q1	201400277	Enterprise Architecture	5
Q2	192376500	Business Process Integration Lab	5
Q2	202000027	Enterprise Security	5
Q2/Q3	201400174	Data Science	5
Q3	202000029	Empirical and Design Science Research	5
Q4	192376000	Business Case Development for IT Projects	5

The course codes refer to the course information system OSIRIS [20]

The core is designed to fully cover the PILOs (given in Table B.1 at page 32) as shown in Table 2.2.

Table 2.2 PILOs coverage by the compulsory core courses

	Compulsory Core Courses					
	EA	BPIL	Esec	DS	EDSR	BCD
PILOs	201400277	192376500	202000027	201400174	202000029	192376000
1.1						●
1.2			●			●
1.3			●			
1.4	●					
1.5		●		●		●
1.6	●	●	●		●	
1.7			●			●
1.8.1	●	●		●	●	●
1.8.2				●		
2.1	●				●	
2.2				●	●	●
2.3					●	●
2.4				●	●	
2.5				●	●	
3.1				●	●	●
3.2						●
3.3						●
4.1						●

EA = Enterprise Architecture
BPIL = Business Process Integration Lab
ESec = Enterprise Security
DS = Data Science
EDSR = Empirical and Design Science Research
BCD = Business Case Development for IT Projects

Regarding PILOs 1.8.1 and 1.8.2, the compulsory core courses give only 'foundational coverage'. The competencies related to these specialisation-specific PILOs are further developed in the courses of each specialisation. Compared to the previous report, the list of compulsory core courses was slightly changed: the course 'Computer Supported Cooperative Work' was discontinued (the topic is now a kind of overarching topic in various courses); the course 'Empirical and Design Science Research' (a merger of 'Information Systems Research' and 'Design Science Methodology' which presents design science in a wider context of different research approaches and methodologies) was added. The course 'E-Strategising' was moved to the IMEA specialisation and was renamed into 'Digital Strategy'; the course Enterprise Security was added. The course Enterprise Security aims to guarantee the coverage of PILO 1.7, added to support the development of competencies in cybersecurity. The decision to increase coverage in cybersecurity in our programme was based on the advice received by the External Advisory Board (as mentioned in the previous report). The Programme Committee reviewed (and ultimately approved) the course proposal.

2.1.2 Specialisation IT Management & Enterprise architecture (IMEA)

The courses in this specialisation aim to support the achievement of PILO 1.8.1, consolidate the knowledge, and develop the necessary skills for the graduate to perform the roles of IT (project) manager or Enterprise Architect. Table 2.3 lists the courses included in this specialisation.

Table 2.3 Courses in the IMEA specialisation

Term	Code	Name	EC
Q1	201900119	Digital Strategy	5
Q3	192340101	Implementation of IT in Organisation	5
Q3	192360021	ICT Management	5
Q4	192320111	Architecture of Information Systems	5
Q4	202000028	Smart Industry Systems	5
Q4	202001549	Low Code Application Development	5

The course codes refer to the course information system OSIRIS [20]

Professional profiles IMEA

A student in the IT Management & Enterprise Architecture specialisation needs to complete at least 4 out of 6 of the courses in Table 2.3. Therefore, as instructed by the DSFR and Meijer's Criteria, these 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.

2.1.3 Specialisation Data Science & Business (DSB)

The courses in this specialisation aim to develop skills in data analysis (including data pre-processing/cleaning, transformation, visualisation 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. Table 2.4 lists the courses that compose this specialisation.

Table 2.4 Courses in the DSB specialisation

Term	Code	Name	EC
Q1	191506103	Statistics and Probability	5
Q1	201600070	Machine Learning 1	5
Q1	191820210	Simulation	5
Q2	201200044	Managing Big Data	5
Q3	201100051	Information Services	5
Q4	202000028	Smart Industry Systems	5

The course codes refer to the course information system OSIRIS [20]

Professional profile DSB

Students in the Data Science and Business specialisation must complete at least 4 out of 6 of the courses in Table 2.4. Regarding the Programme's Intended Learning Outcomes, the courses in this specialisation support the achievement of PILO 1.8.2. Regarding professional profile, this specialisation focuses mainly on the 'Business Data Analyst' profile.

2.1.4 Elective courses

In addition to the 50 ECs determined by the core and the specialisation courses, the students can choose 30 ECs to be obtained through elective courses. The elective space can be used to tailor the programme to an individual preference, so that each student can get a unique BIT profile, while still fulfilling the qualifications required. In the electives students can extend their knowledge in the BIT domain by taking additional BIT, CS or BA courses, by completing more than the required 4 out of 6 specialisation courses, or by gaining more knowledge in an application domain.

2.1.5 Research Topics and Final Project

For more information, see the Final Project website [23].

The final part of the 2nd year encompasses the 'scientific phase' of the programme and it consists of two parts. Research topics is the first part and it usually includes an extensive literary review. The second part is the Final Project where the research is carried out, in which the thesis is written and is presented. See Table 2.5.

Table 2.5 Research Topics and Final Project

Term	Code	Name	EC
ALL YEAR	201300058	Research Topics BIT	10
ALL YEAR	192399979	Final Project BIT	30

The student's goal in the 'Final Project BIT' is to perform the research plan designed in the Research Topics course. Most projects include the design of an artefact and its evaluation. Still, it's also possible to evaluate existing artefacts or perform systematic empirical studies to develop artefacts specifically for the context of use (a company, for instance), using structured methodologies like Grounded Theory. Finally, following the supervisor's advice, other research alternatives are possible within the BIT realm, like exploratory research and ethnographic studies.

2.2 Programme entry

Admission to the M-BIT programme is managed by the 'Admission Committee' and is made based on a set of regulations described in Section B of the EER [17] (page 28). The committee only grants access to candidates with a bachelor's degree obtained in an accredited university (NUFFIC / UK NARIC), be it a Dutch or a foreign institution.

Direct Admission and Homologation

For candidates with a Dutch degree, the committee grants direct admission if the degree was obtained in a WO institution (research university), provided that the area of knowledge of said degree is relevant for the BIT Programme (a homologation course may be required to ensure a suitable knowledge in Business Administration and/or Computer Science). The bachelor's degrees eligible for direct admission are:

- Bachelor's degree in Business Information Technology obtained at the University of Twente;
  - A candidate with a WO Dutch degree in Information Systems may be eligible to direct admission, possibly requiring a homologation course depending on the verdict of the admission committee,
- Dutch WO Bachelor's degree in Computer Science (homologation course is required, options: 'Implementation of IT in Organisations' and 'ICT Management'),
- Dutch WO Bachelor's degree in Industrial Engineering & Management Science (homologation course 'Software Management' is required).

Tailor-made pre-master for candidates with a Dutch HBO degree

A *tailor-made* pre-master programme of 15-30 ECs is required from all candidates with a Dutch degree that does not match the aforementioned requirements for direct admission. For candidates with a Dutch degree obtained in an HBO institution (applied research university), the pre-master programme ensures the necessary knowledge in Mathematics (*Wiskunde B*), Business Administration and Computer Science.

Tailor-made pre-master for candidates with a foreign bachelor's degree

For all candidates with a bachelor's degree obtained in a foreign institution, the committee thoroughly checks the transcripts of the degrees obtained on accredited institutions to determine whether a pre-master is necessary and the composition of such a pre-master programme, ensuring suitable knowledge in Mathematics, Business Administration, and Computer Science.

Language requirements

Additionally, English language proficiency requirements apply for all candidates with a degree obtained in a foreign institution. The accepted English proficiency certifications are:

- IELTS (minimum overall band score: 6.5; a minimum score on each section of 6.0),

- TOEFL iBT (minimum overall score: 90; minimum score on each section: 21),
- Cambridge C1 Advanced (CAE) and Cambridge C2 Proficiency (CPE) (In both cases: tests from 2015; grade A, B, or C; minimum overall score: 176; minimum score per section: 169; online test is not accepted).

Although a pre-master programme is defined per applicant, the Admissions Committee follows a set of guidelines to define its composition. The guidelines can be checked at the Admission guidelines Master BIT document [18].

2.3 Study load

The programme consists of 120 EC spread over two years. We can divide the program in two parts: a first part of 80 EC and the thesis work of 40 EC. We discuss the two parts in turn:

- The first part covers the PILOs, equipping students with the knowledge and skills necessary for the professional profiles supported by the programme. Most master courses combine theory (typically two hours of lectures per week) with some form of practical exercises (also two hours per week). Project courses like Data Science have a different format, theory in the first week of the quarter followed by practicals under supervision. A proper study plan includes a study load of 15 EC per quarter, typically three courses of 5 EC each. The study load is checked through the students' feedback in the Student Experience Questionnaire (SEQ), an instrument used to help us ensure the courses' quality. In addition, at the end of each course, the lecturer is responsible for providing the reflection about various aspects of the course, including the feedback given by students through the SEQ.
- The thesis work of 40 EC is composed of two courses that must be followed in sequence Research Topics and Final Project BIT. Students must provide a timeline of their work as part of their report in Research Topics and the supervisors check the feasibility of the timeline.

NSE marks on study Load

The students provide us with an overall evaluation of the study load through the National Student Enquiry (NSE). The most recent report is from 2023 [39], and it shows significant improvement on the general mark (from 3.63 in 2022 to 3.97 in 2023). The detailed list of marks regarding study load (page 2 of the said report) shows that all grades improved, with a significant improvement in the criterion 'Distribution of study load over the academic year'. Another significant improvement is seen in the 'perceived study pressure' (table 'Content and Organisation of Teaching', page 2), which came from 53,49% (2022) of respondents considering the study pressure as 'exactly right' to 79,49% (2023). We feel that study pressure is connected to the study load and the results show that perceived study pressure has improved throughout the last three years.

2.4 Motivation of choice for teaching and programme title in English

What the rectors say on internationalisation

Graduates of the M-BIT programme will be active in a globally–oriented academic world. Therefore, we consider the international character of the programme and the student population as necessary. The internationalisation arguments given by the rectors of all Dutch universities [22] on this topic are fully valid for the Business Information Technology programme. Teaching the programme in English is inevitable for obtaining an international student population, and it contributes significantly to the development of competencies of our graduates to function in international academic and business environments. While the Dutch industry increasingly needs professionals in technical areas like BIT, the number of Dutch students following a VWO education (source DUO) shows a tendency to decrease, especially in the Overijssel region (the most affected), as shown in Figure 2.2:

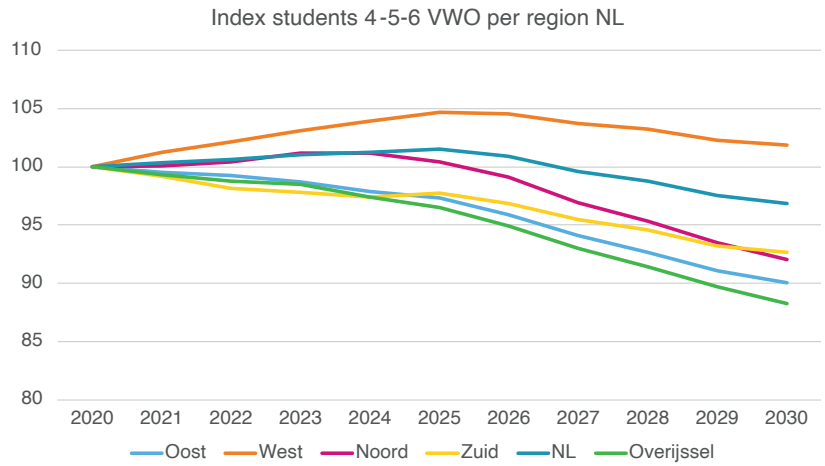


Figure 2.2 Students with VWO-profile per region. (2020 is 100).

The Dutch labour market also benefits from international students because the majority of them stay in the Netherlands (see Standard 4, Section 4.2). A programme taught in English naturally has an English title.

2.5 Facilities & Support

The UT offers an excellent study environment, as reflected in the scores of the Dutch annual Students' Survey (NSE) [39]. The UT is a campus university, and as such it is a place where living, leisure and study come together. Among its facilities are a high-speed network, extensive library, project rooms and state-of-the-art lecture rooms. Each M-BIT student must own a laptop for educational purposes, which can be bought at the UT with a discount. Students can work in the project rooms available in many buildings spread around the campus.

The Programme Coordinator offers programme-specific support and advice to the students. The Study Advisers assist and advise students concerning their study (choices, progress, process and planning). The Study Advisers also help and advise students about their academic skills and requests to the Examination Board. They also assist and advise students who are affected by personal circumstances, psychological problems, disability and illness, as well as pregnancy, student activism or top-level sports and arts. In addition to the support of Study Advisers, students who are (at risk of being) hampered in their progress as a result of personal circumstances are supported by the Student Affair Coaching and Counseling (SACC), such as Student Psychologist or Student Counselor. The university offers support and counselling in case of psychological problems and for career choices after the study. A variety of workshops and courses for personal development are available at the UT. Students who intend to go abroad or are looking for an in-company placement are supported by the EEMCS Mobility office.

2.6 Supervision

Supervision Scheme: EEMCS & BMS faculties collaboration

In the M-BIT Programme, the master's thesis research (Final Project BIT, 30 ECs) work must be supervised by two examiners: one from EEMCS faculty and the other from BMS faculty. Both supervisors must be authorised examiners by the BIT Examination Board. Additionally, one of the supervisors must be an authorised Senior Examiner. The goal of such a supervision scheme is to guarantee the balance between Business and IT contributions of the thesis work, which is a distinctive characteristic of the BIT Programme at the University of Twente.

2.7 Staff of the programme

Information about the staff of the programme is given in Table 2.6. There is no lecturing staff dedicated to the BIT programme only; the overview in Table 2.6 concerns the relevant faculty of the

faculties of EEMCS and BMS. Information on how we calculated the figures in this table is provided in Appendix D.6

Table 2.6 Programme staff (Spring 2023)

	#	%	
Total staff (persons)	104	100%	HL: 8% , UHD: 15%, UD: 54%, docent: 17%, guest: 2%, researcher: 3%, OHL*: 1%
Female	33	32%	HL: 6%, UHD: 15%, UD: 58%, docent: 18%, OHL: 3%
Total staff (fte)	90,8		
Qualifications			
PhD	97	93%	4 Lecturers & 2 researchers are doing their PhD / 1 guest lecturer has an MSc. Degree
UTQ Completed	48	46%	
UTQ Started	28	27%	
Exemption	21	20%	Diploma equivalent to UTQ, decided by CES
UTQ no obligation	1	1%	Decided by dean, historically >20 years experience with teaching
Total UTQ	98	94%	
UTQ not started	6	6%	
English C1, C2 level	98	94%	
Docent	18	17%	Staff members with the main task of teaching

More detailed information about the staff is available for the committee on a password-protected web page.

Improved # of UTQ-certified lecturers (or ongoing)

In the previous Self-Evaluation Report, we were recommended to 'monitor the proportion of UTQ-certified lecturers'. In that report, the percentage of lecturers with UTQ certification or ongoing (completed + exemption + dispensation + started) was 74% (54% certified/exempt + 20% started). Currently, this percentage has improved from 74% to 94%. Both EEMCS and BMS faculties have consistently hired more lecturers for the programme, and all are required to obtain an UTQ. In practice, it might take some time to obtain the UTQ, and hence there might be a small percentage of the lecturers with UTQ 'ongoing' (status 'started'). Additionally, the percentage of lecturers with certification of English level C1 or C2 is 94%. Another difference from the previous report is the increased number of 'docents', which are staff members with the main task of teaching.

Teachers appreciation on NSE 2023

We are very proud of the teaching quality of our staff, and so are our students. For instance, in the most recent National Student Survey [39], M-BIT students indicated that they were satisfied with the teachers in their course programme (overall mark in 2023 is 3.88 out of 5, a slight improvement from 3.80 in 2022). In fact, despite an increased influx since 2017 (an increase from 58 in 2017 to 150 in 2022), the distance between lecturers and students remains short. Additionally, the collaboration between members of the BIT community (teachers, students, and admin staff) is intense, with students taking an important role. For instance, each module has two evaluation panels conducted by the CEEP, a committee formed by students that support the faculty in these panel evaluations (check Section 3.3 for details). Additionally, our students are active in the organisation of the Programme itself, and many of them take up tasks as teaching assistants and members of education committees. Therefore, we are proud to say that we have an engaged community of lecturers and students committed to fulfilling the Programme's educational goals.

Course evaluation performed by students

Student–staff ratio: 15.3

The *student–staff ratio* in the BIT Programme is 15.3, as demonstrated in the calculations listed in Appendix D, Section D.7. According to a recent report from 'Universiteit van Nederland' [38], the national average in the last ten years is approximately 19 students per faculty member. The universities in the Netherlands with the most favourable numbers have a ratio of approximately 15 students per faculty member (1 FTE). Although we consider our numbers satisfactory, we keep monitoring them to guarantee the proper capacity to deliver high-quality education.

2.8 Covid Pandemic

The Covid–19 pandemic influenced our education in three academic years, 2019/2020, 2020/2021 and 2021/2022.

2019/2020

After the lockdown started on March 12, 2020, the BIT students were informed and asked to follow the UT Covid Policy. Furthermore, students staying abroad were asked to return to the Netherlands. The Programme Management team kept track of all issues and provided students with support as needed. The PM team and the lecturers concluded that all upcoming courses in that academic year could switch to online mode, including the practicals. Online lecturing was (and still is) based on a mix of Canvas Learning environment, Microsoft Teams, and Zoom. During this time, the theses colloquia were performed online. Students and the broader community were informed about the open colloquia sessions and provided with a link to join the sessions. This was done to promote similar (adapted) conditions to the on-campus colloquia. We did not perceive any issue or impact on the quality of the sessions. On the contrary, the online sessions made it possible for representatives of companies, company supervisors, students, and other faculty members to attend the sessions.

2020/2021

During large parts of the academic year 2020–2021, Covid–19 measures were still in place. Activities that could take place on campus were exams and practicals, although it was encouraged to have as many activities online as possible. At the beginning of this academic year, also tutorials were allowed on campus. The theses colloquia were held online during this academic year because it proved to be the best option to increase attendance and because of the uncertainty of whether restrictions would be in place at the time of the colloquia, which are planned no less than 1 month in advance.

2021/2022

During a large part of the academic year 2021/2022, there were basically no restrictions concerning educational activities for groups with less than 75 students. This required students to be split into two rooms, which did not present any problems on any course (especially because the master courses usually have fewer students in comparison with bachelor courses). In general, education was executed as planned. However, in the second quarter, the COVID–19 related measures became stricter, and lectures had to be given online (practicals were still allowed on campus). The theses colloquia were also held online. In general, this transition from on–campus to online lectures did not cause major issues.

In general, the programme was already somewhat prepared before the pandemic. The programme was in transition to digital testing via Remindo and Canvas and most assessments require a combination of an exam with (individual) assignments and project work and hence are less vulnerable to fraud compared to a single (digital) test.

The pandemic also had some positive effects on our teaching and learning environment: most courses now have for example micro lectures and information is not only communicated during the lectures. Digital platforms are used in the communication around projects. The pandemic forced us to take a closer look at assessment and safeguarding of tests.

2.8.1 Internship and Research Project

Individual agreements

During the COVID–19 pandemic, *individual agreements* have been made with students concerning their internship and the final project. For internships, company policy concerning on–site presence for employees was followed by students. Consequently, most of the students did their internship remotely during the COVID–19 pandemic. Although these students miss the experience of daily presence at the premises of a company, they still learn the way of working within a company (routines concerning meetings, status updates, supervision, and company standards), which makes the internship a valuable experience.

Theses colloquia online

The theses colloquia were mostly held online as long as the presence on campus and within a company was not allowed. Supervision meetings were online. For both students and supervisors, this quickly became a standard way of working and became a legacy from this period to the current days, where we often offer the students the possibility of meeting on-campus or online depending on their needs and considering the quality of the discussion, depending on the topic.

2.8.2 Bachelor before master

The bachelor–before–master rule was lifted for students (a.k.a., smooth transition) that had 30 EC or less to complete for their bachelor's programme (6 EC in case of pre–master students). They were allowed to start attending courses of the master's programme while still completing parts of the bachelor's (pre–master) programme. The student had to apply for this, based on unavoidable delay due to Covid, by submitting a realistic study plan.

2.9 Strengths, weaknesses, and action points

Strengths

- ✓ Small scale, short distance between the students and the lecturers (as indicated in the student–staff ratio), so that problems can be identified and solved quickly.
- ✓ Students have a reasonable freedom to choose elective courses and design their learning journey.

Weaknesses

- ✗ The scientific phase of the programme feels rather short (although it matches a benchmark with other programmes in the Netherlands) and starts long after the course 'Empirical and Design Science Research', which may be affecting the scientific output of our students (i.e. scientific publications).
- ✗ The freedom students have to choose electives and design their learning journey, combined with the increased cohort size seen in this last cycle, point to the need for an academic mentorship preceding the thesis' supervision, similar to what is done in other programmes at the Faculty (EEMCS).

Action Point

- Review the organisation of the curriculum to ensure students have courses in the same learning line offered in convenient schedules (for instance, shortening the distance between the course Empirical and Design Science Research and the pair Research Topics + Final Project BIT, possibly redesigning the former to improve support to the latter).

Standard 3: The programme has an adequate system of student assessment in place.

3 Student Assessment

In the BIT programme, we perform various quality assessment activities to ensure that the PILOs are achieved in each module. Students, lecturers, and the Examination Board are central to the quality assurance schema. The EEMCS Quality Assurance Team also supports the Programme Management and the Examination Board in safeguarding the quality of education and examination. This chapter presents the processes for safeguarding the quality of examination (and education) and the stakeholders' roles and contributions.

3.1 Assessment Policy

The University of Twente has obtained the institutional accreditation [4], which ensures that there is a quality assurance system in place at the university level. The BIT programme follows the guidelines of the Quality Assurance Framework for Student Assessment UT [5] as well as the EEMCS faculty assessment policy [7]. The quality rests on the following three pillars:

Examination Board (EB)

1. A well–functioning *Examination Board (EB)* monitors the assessment system and intervenes if necessary,

Examiners

2. The appointed *examiners* for components of the programme are well–trained and qualified to teach and assess (see Standard 2),

Rules and procedures

3. Detailed *rules and procedures* are in place to ensure a high–quality assessment system and to prevent fraud.

In accordance with the Higher Education and Research Act [26], the EEMCS faculty at the University has also defined in detail the responsibilities of each committee related to the Study Programme, namely the Study Programme Management, Examination Board, and Programme Committee. These specifications are described in the EEMCS Faculty Regulations document [27].

3.2 Examination Board

The EB is an independent body that has as a legal task [26] to safeguard the fulfilment of the PILOs and the quality of the assessment system of the programme(s) for which it is held responsible. It:

- determines whether a student has fulfilled the conditions regarding knowledge, insight and skills as stated in the Education and Examination Regulations [17] of the programme for which it is responsible, in order to receive the degree of the corresponding programme,
- treats requests for exceptions to the rules for students, such as exemptions, flexible degree programmes and additional exam- or test opportunities. Exemptions are made after careful analysis of the curriculum of a student's previous educational programme,
- judges cases of academic misconduct (fraud/plagiarism and free–riding) and determines the sanctions,
- appoints (senior) examiners for administering and grading tests and exams,
- safeguards the quality of the assessment of theses and monitors the quality of assessment throughout the programme.

The EB is organised at the level of the faculty EEMCS. Since the BIT Programme is offered in conjunction by the two faculties (EEMCS and BMS), we chose to delegate the BIT Programme's Examination Board responsibilities EEMCS Examination Board. Responsibilities are mandated to subcommittees and only members of the EB can participate in a subcommittee. For more details, see the overview of the subcommittees [8].

Faculty–wide affairs are mandated to the subcommittee for General Affairs, all other committees are dedicated to different educational programmes of the EEMCS faculty. The chairs of the subcommittees are also a member of the EEMCS General Affairs EB. The main subcommittee's responsibility is to perform the Examination Board role on the courses organised by its related programmes, although the EEMCS EB as a whole has the final responsibility. For courses taken outside the faculty, the EB of the offered course is responsible for performing the EB duties. In case of a fraud suspicion, the EB of the offered course determines whether fraud has occurred and the EB-BIT determines the measures to be taken.

SUEQ/SKE trajectory

The dean appoints the members of the EB. The appointed EB members are active contributors to the BIT Programme and have obtained their UTQ and Language Proficiency certifications. Additionally, they are offered a seat in the course Senior University Examination Qualification [36] (SUEQ; or in Dutch: 'Senior Kwalificatie Examinering': SKE) in the first year of their term in the Examination Board. If such a course is not available at the moment of their appointment, they are offered a seat in the next edition of such a course.

3.3 Students' role in the BIT quality assessment scheme

Several procedures are involved to guarantee quality during a course's (or module's) lifetime. To initiate a new course (or redesign a module), 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 the Programme Committee approves, 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 relevant role in providing lecturers, the Programme Committee (BITOC), and the Programme Management with a comprehensive report at the end of each course. This document is sent to the lecturers, Programme Committee, and Programme Management. Students' contribution is illustrated in Figure 3.1.

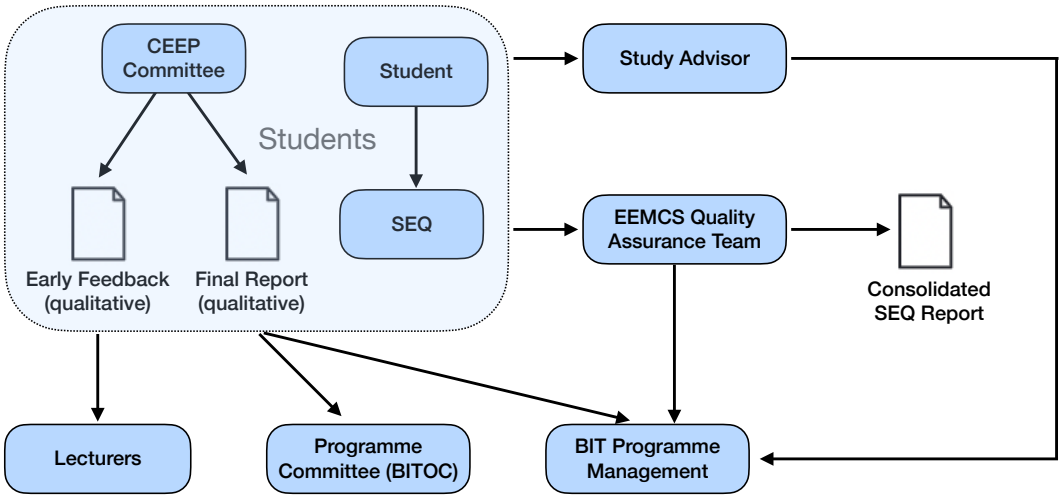


Figure 3.1 Student's role in the BIT Quality Assurance Scheme

CEEP

In-depth feedback

The *CEEP* (Committee for Education Evaluation Panels) is an independent committee formed by students. CEEP supports lecturers and Programme Management with an in–depth evaluation of various educational aspects at the end of a course. This final report (in–depth) is sent to the Programme Committee (BITOC), Programme Management, and the lecturers. It is worth mentioning that attendance to such panels has increased significantly in the last three years.

Quality Control: Student Experience Questionnaire (SEQ)

At the end of a course, each student is asked to fill in the *Student Experience Questionnaire (SEQ)*, providing feedback on content, teaching (since the COVID–19 pandemic, it included questions about online and hybrid education), knowledge and skills gained and study load. The questionnaire also allows for general feedback. 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.

This document is available for the committee on the password–protected website.

An overview and the evaluations of recent SEQ results are described in the report '*Quality Control Business Information Technology*'. Of the 17 master's courses (core + specialisations), 14 have satisfactory or good overall marks. The coordinators of the remaining 3 courses have been contacted, and a redesign cycle was initiated.

3.4 Safeguarding quality of education

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, illustrated in Figure 3.2.

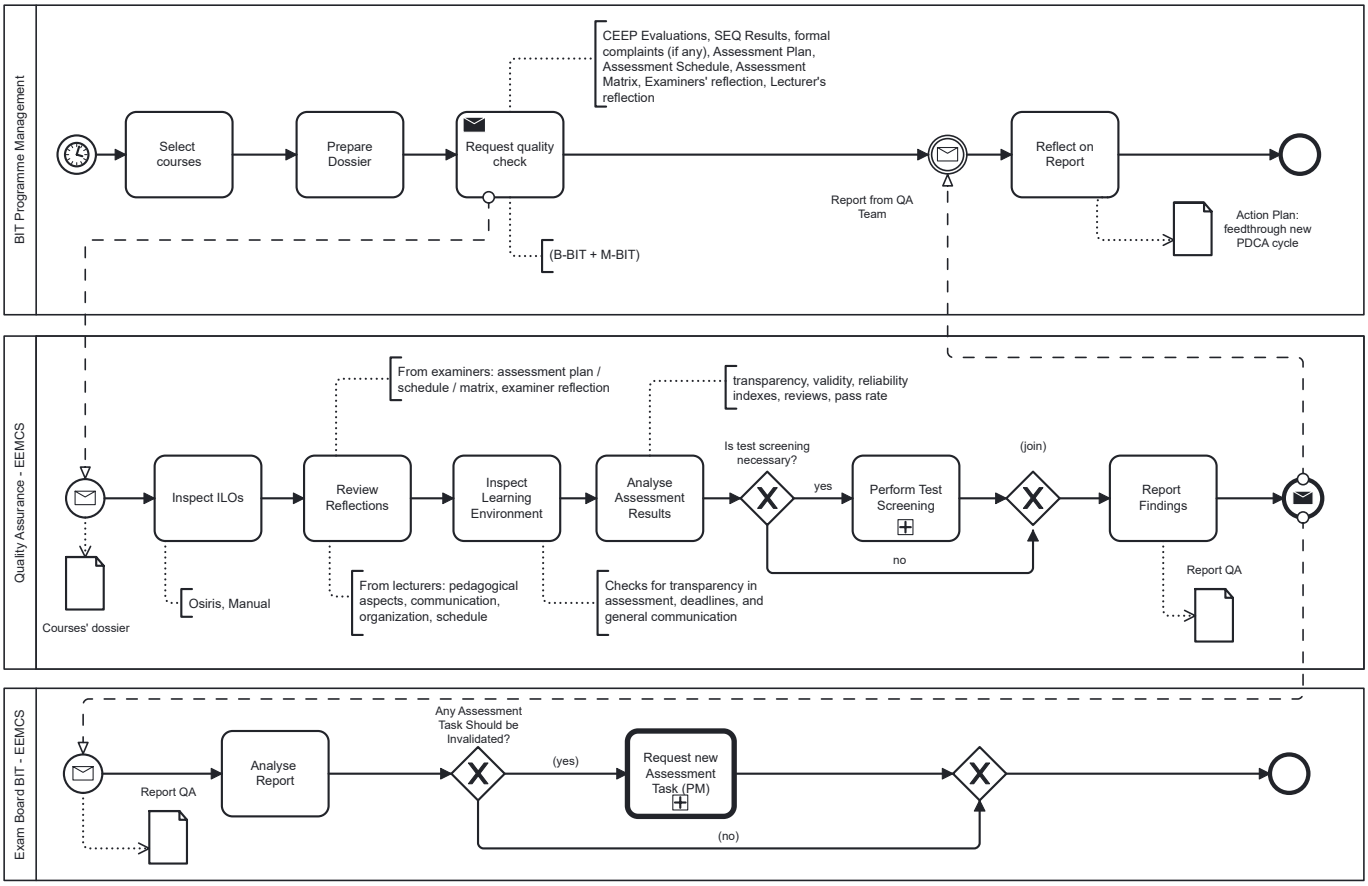


Figure 3.2 BIT Quality Assurance Workflow
Also available as a single pdf [35]

In the workflow illustrated in Figure 3.2, at the end of each quartile, the Programme Management prepares a dossier about the selected courses, including all relevant information for quality assessment, namely CEEP Reports, SEQ results, formal complaints (if any), Assessment Plan/Schedule/Matrix, Examiners' reflections and lecturers' reflections. The dossier comprises

documents related to one bachelor's module (including multiple study units) and two master's courses. This ensures that all bachelor modules are checked at least every three years.

Thorough evaluation

The EEMCS QA Team starts by checking the quality of the course ILOs (language, clarity, and the matching Course and Programme ILOs), the reflections of lecturers and examiners, the learning environment, and the assessment results. The evaluation includes pedagogical aspects, communication, organisation of the module, and assessment (transparency, validity, reliability, and success rate). Based on this assessment, the QA Team decides if a complete screening is necessary. Finally, the QA Team prepares a report about the evaluation and sends it to the lecturers, the Programme Management, and the Examination Board.

Upon receiving the report from the evaluated courses, the Programme Management reflects on the results and prepares an Action Plan. The Examination Board, however, checks whether any Assessment Task (test, project, etc.) must be deemed invalid. Should any assessment task be considered invalid, the Examination Board requests the Programme Management to prepare a replacement assessment task.

Follow-up assessment: redesign cycle

Whenever a course receives improvement requests from any contributing committee (Quality Assurance Team, Examination Board, Programme Committee), it starts the 'redesign cycle.' Courses in the redesign cycle are followed closely by the Programme Educational Coordinator in the following years until a satisfactory result is received. The cycle starts with a meeting involving the Programme Management (director and coordinator), the responsible lecturer and examiners. In this meeting, the lecturers and examiners share their reflections on the received feedback and present an action plan (as part of their PDCA cycle). This action plan is then followed closely in future editions until improvements are satisfactory.

3.4.1 Assessment validity, transparency, and reliability

Assessment scheme in Osiris

Assessment plan on Canvas

The *assessment scheme* is published in the Osiris [20] course information system at least two months before the start of the course so that students are informed about the assessment well in time. A detailed *assessment plan* (including the schedule) for each course 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. Regulations about assessment transparency and what constitutes a 'representative practice test' (or equivalent) are described in the EER [17].

Peer review

Written tests are *peer-reviewed* to assure the assessment quality. The peer review is done preferably by another lecturer with the necessary content expertise. Alternatively, a senior PhD student can play this role, or can help the lecturer with a simulation of the test (for instance, to check for the feasibility of completion within the allotted time for the test). The aspects checked in the peer review include validity (the complete evaluation of ILOs according to the assessment matrix), reliability (questions' quality and language), and difficulty level.

In the case of oral exams, there are either two assessors (preferred situation), or the exam is recorded in video. In case project reports or presentations are distributed for grading over multiple examiners, they discuss the grading criteria and interpretation to ensure consistency.

3.4.2 Appointment of examiners for courses and internships

University Teaching Qualification (UTQ)

Examiners are appointed by the EB explicitly for the courses they are involved in. All UT lecturers and examiners are required to have the University Teaching Qualification (UTQ) [28]. The trajectory starts when a lecturer is appointed and should be finalised within 3 years. The UTQ certificate is a prerequisite for further career development. As described in Chapter 2, almost all of the lecturers involved in the Business Information Technology programme have already obtained or are in the process of obtaining their UTQ certification. This guarantees that they are competent to assess students in a transparent, reliable, and valid manner. The EB appoints staff members as examiners if they have UTQ and (English) Language Proficiency certification. By exception, staff members working towards the UTQ are allowed to assess students.

3.4.3 Appointment of examiners for the assessment of master's theses

Assessment committee

An *assessment committee* for a Final Project consists of at least two members:

Committee chair

- The *committee chair* (a Senior examiner) is responsible for the assessment procedure and performs the communication with the outside world (Education Office, EB, Programme Committee, etc.). The committee chair is an examiner from the BMS or EEMCS faculties,

Examiners from both faculties

- At least one *examiner from EEMCs or BMS faculties*, depending on the affiliation of the committee chair. The rule is that the committee must feature one examiner from each faculty, both approved examiners, and one of them must be an approved senior examiner (the committee chair). This arrangement helped us keep a good balance between Business and IT in the thesis assessment. The presence of a Senior examiner also helped us maintain consistent assessment, especially when new examiners joined the programme in the recent increase in capacity observed in both faculties (EEMCS and BMS).

Other members of the graduation committee act as advisors for the examiners. On the aforementioned list of examiners for master's theses, the EB selects the 'senior' examiners who are allowed to act as committee chairs. A senior examiner is a lecturer, assistant, associate, or full professor who is a senior researcher and has enough experience as a member of an assessment committee to be able to lead the committee.

Assessment form

Before the final presentation, the committee chair receives the Assessment form [29] with assessment criteria (Scientific Quality, Organisation–Planning–Collaboration, and Communication) and Rubrics to support a consistent grading further. The Assessment form is also available on the website [30] so students know what is considered in the grading of the final project.

3.4.4 Safeguarding quality of theses

Thesis carousel every 3 years

In the M-BIT Programme, the quality of the theses assessment is monitored through two main measures: the presence of at least two examiners in the thesis evaluation committee and the 'theses 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 the new 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 last theses carousel took place in the last semester of the academic year 2022-2023. The *Theses Carousel Report* is available for the committee on the accompanying website. The next internal carousel is planned to take place in 2026.

This document is available for the committee on the password–protected website.

3.5 Academic Misconduct

Rules and guidelines

The EEMCS faculty has specified the rules and guidelines for the EB in Rules and Guidelines 2021–2022, EEMCS [31]. This document describes measures that guarantee the orderly conduct of the examination processes. With respect to academic misconduct, the document specifies:

- Scientific integrity and academic misconduct, preventive measures and consequences of academic misconduct
- Rules of order during on–campus written tests
- Rules of order for remote exams and oral exams
- Rules in the event of emergencies
- A procedure for suspected academic misconduct

The examination board recently made a website on fraud [37].

Plagiarism, free riding, generative AI

One of the examiners' duties is to monitor examinations and check for academic misconduct. In case of suspicion, the examiner informs the student and the BIT subcommittee of the EB. One of the duties of the BIT subcommittee is to assess the case and determine consequences. Tools are available for examiners to detect plagiarism [32]. On the Final Project evaluation form, a box has to be checked explicitly to confirm that the thesis has been checked for plagiarism. In the first meeting

between students and the Programme Management (called 'Kick-In'), the Programme Management discusses the expected academic conduct, what constitutes academic misconduct, and presents the Netherlands Code of Conduct for Research Integrity [33]. Among the topics discussed in this meeting are plagiarism, free-riding, and the use of generative AI services like the Open AI ChatGPT.

3.6 Impact of the Covid–19 pandemic

Oral tests

Immediately after the first lockdown in the Spring of 2020, teachers had to adapt not only the mode of education but also the mode of assessment. In most cases, written tests were held onsite (or delayed as a last resource). Oral tests could be held online. Working this way, the risks of fraud were limited because of the immediate two–directional interaction between examiner and student.

Written tests

Thesis colloquium online

Regarding written tests , the UT issued guidelines for those held online aiming at mitigating the risk of fraud by students. A procedure was developed for the online theses colloquia using a Canvas Conference or Microsoft Teams.

Positive effects

The pandemic also had some *positive effects* on our teaching and learning environment: most courses now have for example micro lectures and information is not only communicated during the lectures. Digital platforms are used in the communication around projects. The pandemic forced us to take a closer look at assessment and safeguarding of tests.

3.7 Strengths, weaknesses, and action points

Strengths

✓ The distance between students, lecturers, and the Programme Management is short, with students participating in many committees and contributing substantially to improving the programme.

✓ The addition of a Senior examiner to the theses assessment was effective to ensure examiners are applying the assessment form coherently and consistently, especially if we consider we had a relevant renewal of our faculty members.

Weakness

✗ The measures taken to improve the grading of master's theses were effective in guaranteeing the coherence and homogeneity of grading (as shown by our internal theses carousel). Improvements are still possible in the assessment form to prevent a drift towards higher grades.

Action Points

- Review the Assessment Form to improve its auditability, separating the grade for the process and student attitudes (non-auditable) from the grade given to the research work presented in the document. This way, the theses carousel and the evaluation panel can focus on the auditable part.
- Review the Assessment Form to induce an improvement in the scientific output of the programme, possibly learning from the experience of other programmes at UT and, especially, on a benchmark between assessment forms of similar programmes in the Netherlands.

Standard 4: The programme demonstrates that the intended learning outcomes are achieved.

4 Achieved Learning Outcomes

The M-BIT programme delivers qualified professionals and academics in the Information Systems field. The vast majority of our alumni successfully transit to the labour market. The intense focus of this programme on business innovation has supported the surge of important companies in the Dutch industry. The areas of professional practice taken by our alumni match the professional profiles and the competencies they develop in the M-BIT Programme. The entrepreneurship vocation of our alumni, their successful spin-offs, and the alignment of their placement in the labour market with the competencies developed in the programme are discussed in Section 4.3. The scientific productivity of our students and alumni is addressed in Section 4.4.

4.1 Student satisfaction

According to the National Alumni Survey (NAE 2021) [40], BIT alumni are satisfied with their programme choice and career. The BIT programme saw an increase over the past years in the percentage of alumni who would choose the BIT programme again. Our BIT alumni do well in terms of salary, and it does not take long to find a job. Cohesion and theoretical depth have somewhat lower scores; one reason could be the programme's multidisciplinary nature compared to other programmes like mathematics and physics. We have provided better connections between the courses and introduced more specialised and advanced electives for students looking for more depth.

Some of our alumni consider their current job level below the level of their study programme. One of the reasons could be that larger companies where our alumni often work have starting job profiles that require an HBO or WO background. In contrast, a WO background has a better prospect for growing towards a higher and more managerial position. The above-average salary level of our BIT alumni supports this.

In the NSE 2023 [39] fact sheet, all our scores are higher or equal to the national group average. We recognise this as an improvement compared to the scores obtained in the NSE 2017, in which M-BIT scored slightly below the average in four indicators. Comparing the scores obtained in 2023 with the previous year, we observed a significant improvement in 5 scores, as listed in Table 4.1:

Table 4.1 NSE Results: Comparison 2022 & 2023 (maximum score: 5)

NSE Indicator	2022	2023
I experience the study pressure as 'Exactly right' (%)	53,49%	79,49% ▲
The opportunities for receiving guidance/counselling	3,90	4,25 ▲
How the examination and assessment matches the content of the programme	3,60	3,95 ▲
The clarity of the criteria on which you are assessed	3,60	3,97 ▲
The distribution of the study load over the course of the academic year	3,43	3,95 ▲
The level of encouragement to learn about other cultures	3,45	3,81 ▲

It is worth mentioning that some scores oscillated downwards, but none presented a significantly lower score when compared to the NSE 2022. From the scores that presented significant improvement, we would like to highlight the ones related to the study load. We have worked on increasing the study load as one of the action points for the recommendations of the last panel visitation. Students have shown a positive opinion about that, encouraging us to continue applying

the redesign principles that led to the current study load. These efforts consist mainly in increasing the use of ill-defined real–world problems provided by companies (this was also a recommendation of the last panel evaluation). In general, we see that the recommendations of the last panel evaluation have helped us improve the programme.

Since the questions change from one year to the next, the comparison with the results obtained in the year of the last panel evaluation (2017) is limited. From the common questions between the 2017 and 2023 NSE results, we would like to highlight the results listed in Table 4.2:

Table 4.2
NSE Results: Comparison 2017 & 2023 (maximum score: 5)

NSE Indicator	2017*	2023*
The content and organisation of teaching	3,68	3,89
The teachers in your course programme	3,64	3,92
Scientific Skills	3,86	3,97
Guidance/Counselling	3,60	4,18
Study Load	3,61	3,97
The course programme in general	3,93	4,10

** These results were not tested for statistical significance.*

The results of Table 4.2 indicate that our efforts in improving guidance/counselling and correcting the study load have been successful. The general appreciation of the programme has also improved consistently (2017: 3,93; 2022: 4,04; 2023: 4,10). The redesign of the courses is (still) an ongoing process since we had to adapt during the period of social distancing measures (due to the COVID–19 pandemic). Therefore, we expect the scores to further improve in the upcoming years. Finally, although the students' opinion on the 'Scientific Skills' has been positive, we are not yet happy with the results (Section 4.4 provides a discussion on scientific productivity). In the upcoming years, we plan a series of curriculum and research workshops to discuss internally how we can improve the participation of our students in the research projects of the two faculties.

4.2 Internationalisation

Source: LinkedIn, as of September 2023

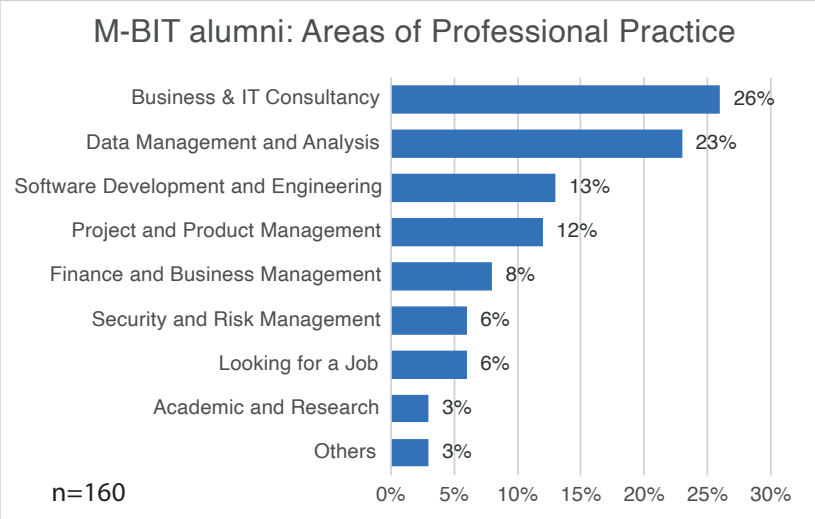
58% of internationals remain in the Netherlands

As part of our alumni monitoring activities, we track their professional trajectory, and we recently started to check if international students stay or leave the Netherlands after they finish their studies. Since the discussion about internationalisation has intensified in Dutch society, we analysed a significant sample of our alumni (160). From our 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%).

4.3 Alumni areas of professional practice

One of the indicators we monitor continuously is the performance of our alumni in the Dutch labour market. We are proud of the professionals and academics we form in the BIT Programmes. Among the entrepreneurs, some alumni have had outstanding success, like Mathilde Oude Velthuis, CEO of OVSoftware, and David Lamers, chief visionary, co-founder and CTO of Datakeeper. These are some examples of alumni who are quite successful innovators and entrepreneurs. Other BIT alumni work in businesses in different domains as consultants, developers, designers, etc. Figure 4.1 presents the most common job positions taken by our alumni (graduates from jan/2017 to may/2023, n=160) after graduating. The areas of professional practice group professional roles that share a common set of skills (according to the DSFR MS2016) required to work on said professional roles.

Figure 4.1
M-BIT Alumni: areas of professional practice



The most common areas of professional practice chosen by our alumni are 'Business & IT Consultancy' (26%) and 'Data Management and Analysis' (23%). Among the professional profiles grouped in these areas, the most frequently performed by our 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 specialisations of M-BIT. We have observed an increased interest of both B-BIT and M-BIT students to work on research related to Cybersecurity, which will be considered during our curriculum workshops.

4.4 Scientific production of our students

The M-BIT Programme values both industrial innovation and scientific contributions. Historically, this programme has formed many important players in the Dutch Information Systems sector. Companies like 'Thuisbezorgd', 'Datakeeper', and 'Clairify' are some outstanding examples we are proud of. Our multi-annual plan for the M-BIT programme, however, is to increase the scientific productivity and the participation of our students and alumni in the main venues for the publication of scientific research relevant to the Information Systems field.

Papers written by students

In the period from Jan/2017 to May/2023, our students have published 25 papers [41], from which 19 were published in scientific peer-reviewed conferences and 6 journal papers. The involvement of researchers of both faculties is well-balanced, and in almost all cases, researchers from both faculties co-author the same paper with a student. We are very glad about the collaboration between the two faculties. It's worth mentioning that this is due to our efforts to increase the participation of EEMCS researchers in the BIT research. Increasing EEMCS research contribution to the programme is one of the recommendations of the last panel evaluation. The distribution of papers between the specialisations is uneven: Enterprise Architecture students published 16 papers, Data Science & Business students published 7, and IT Management students published 2 papers. In 2018, we merged the specialisations EA and ITM (currently known as IMEA). However, checking the specific area of the paper helps us understand which parts of the programme have more room for improvement.

4.5 Strengths, weaknesses, and action points

Strengths

- ✓ The BIT Programmes produce outstanding successful entrepreneurs, and their companies help shape the Dutch economy.
- ✓ The BIT Alumni often takes leadership positions in the Dutch labour market, showcasing the qualities of our programme.

Weaknesses

- ✗ The percentage of alumni that progress to higher degrees (EngD or PhD) is lower than desired.
- ✗ The scientific productivity (publication of scientific papers) of our students is lower than desired, showing an imbalance between the attention to entrepreneurship and scientific productivity.

Action Points

- Design and apply measures to improve the scientific productivity within the programme.
- Increase the participation of M-BIT students in research labs to try and inspire them in the conduction of their research work and, possibly, inspire some of them to pursue higher academic degrees (EngD or PhD).

Student Chapter

This chapter was written by a workgroup of students from different cohorts of the Bachelor and Master BIT programmes. Supported by an Educational consultant, a workshop was organised to collect student views on the BIT programmes. These views were subsequently compiled into this text by the students. Four main themes were defined that helped students focus their views and guide them into the feedback formation process for the Programme Management.

Content of the programmes (Standard 1)

We appreciate the scope of both programmes. The programmes teach us to be critical professionals and to search for new solutions for business. We value the broad array of topics offered in both programmes, preparing us for a role as 'Jacks of all trades' within companies. Furthermore, both the bachelor's and the master's programmes help us connect technical research developments to management and business control. The scope of the BSc programme is very broad as it is designed for students to find out which specific topic suits them best. Every module focuses on a different field of expertise, allowing us to take on different roles and see where our interests lie. During the bachelor's program, students gain a broad understanding of various aspects of modern business technology. This includes learning how to adapt and maintain these technologies effectively, providing us with a concise and satisfying overview of these subjects. Furthermore, by providing broad and diverse topics, we are encouraged to freely observe and interact with real-world problems and situations. The expressiveness of the BIT Programme serves as a guiding light to everyone undergoing their student journey, providing them with an incredible pool of opportunities to freely explore their interests within inter-business and technology relationships. This makes it easier to shape our future, whether it is for choosing a master's or for pursuing a job opportunity. For the master's programme, we are allowed to choose and specialise in one of the two tracks available. Alongside courses which are common, creating a solid knowledge base for every student, the opportunities to broaden our interests are given with the help of track courses and electives (students are free to choose). We like how even though the choice of courses is quite diverse, they all link together and create a whole when you zoom out. It is very satisfying when the knowledge you achieved in another course can be used as an aid in new assignments and projects. Most of the courses offered in both the BSc and MSc programmes go beyond teaching just theory. We are supported to apply the learned knowledge in practical contexts. This is usually done via projects which are either set up in organisations or based on real-life company examples. This approach to learning is highly appreciated. Furthermore, offering us these opportunities promotes metacognition, thus helping with an active approach to learning. The set-up of the programme is generally appreciated, where all modules in the BSc are shared with other degree programmes; however, we see room for improvement. We would like to see a more specific BIT-focused module in year 2, possibly in the form of two electives based on the tracks of the MSc. Some students feel this could improve the density of content in year 2 (which is less full than year 1) and offer them the opportunity to prepare for their MSc whilst also focusing on topics very specific to BIT. Another improvement for the Bachelor is seen in the courses on Research Methodology. These are often seen as the least interesting topics, while they are such an important base for all the research to come. Making the theory more applicable and showing how it is used in a real-life setting (e.g., for the BSc Thesis) would make it more engaging. For example, having an enthusiastic and motivated teacher and/or a clear overview of the course and its use may already improve students' experience.

Teaching and Organisation (Standard 2)

The teaching and support staff of the BIT programmes is perceived as motivating and enthusiastic. They are approachable and willing to help individual students. Teachers are overall knowledgeable and challenge students to excel. Exemplary of that is a Bachelor teacher who made visible improvements since his arrival at the university. By adding a mentoring approach, in which older students could assist newer students with both studying and personal issues (e.g., having bi-weekly meetings to discuss progress, being a first point of contact in case something was going wrong), students became more engaged. This also created the feeling of a community in which BIT students

can learn and grow with each other. Furthermore, there are also teachers who are extremely attentive, organised and involved in their courses. By having such teachers who strive for the best in both the BSc and the MSc, we feel grateful and are influenced in a positive manner to do our best. For example, having a comprehensive overview of which papers/chapters to read in which week and when all assignments are due helps us to create a proper planning. Some modules and courses, however, are affected by organisational issues. We sometimes feel that the workload of some teachers influences their organisation of courses and course materials. This results in information offered too late or too scattered and diffuse communication lines. Students would highly recommend the programmes to streamline communication channels, prevent the use of many different platforms next to Canvas, and have a backup system in place in case teachers fall ill.

Student evaluation (Standard 3)

Overall, we feel that there is a good balance between group projects and individual assignments and tests. Both in BSc and MSc, we appreciate that group work is always accompanied by individual grades, minimising possible negative effects of group dynamics. For master students, managing multiple groups at the same time is challenging. Usually, an MSc quartile is composed of 3 courses (however, some students can do more or less). Most of the time, a course has a project group, of which we do not always choose the composition. This can sometimes lead to difficulties in group communication, dynamics, or work ethics. Managing multiple different project groups at the same time is very challenging. Especially when you do multiple courses together with the same people, it is convenient to be able to work together. A suggestion for improving the group formation process is for the teachers to let us choose group members and provide us with pointers on the project. Based on them, we can choose appropriately. Generally, we are well prepared for the offered exams, which are transparent and fair. Rules and regulations are clear, so we are aware of what to expect and what is expected of us in return. Open book exams are highly appreciated, as we see this as a fitting assessment form for the topics that are usually covered. Especially for the MSc courses, we prefer the approach of open-book exams as a course covers a lot of information, and the teachers always explain the importance of “knowing where to look” instead of memorising every detail (as this is seen in a work setting as well). Also, example practice exam material is offered to prepare us well, but grading (especially for projects) is sometimes late. Intermediate feedback is often given in modules and coursework and helps students to guide their learning. We do feel the examiners could improve the offering of feedback for final assignments. This is often left out, but we do not learn anything from just a grade or some points. Receiving feedback on a project (or another final assignment) helps the learning process and can even be of aid for related future work.

Evaluation of Education (Quality Control)

For the evaluation of education, several activities are organised. For example, panel meetings and questionnaires for feedback on modules and courses, and ad-hoc evaluations of teachers. However, for many courses and modules, the questionnaires are barely filled in. Some teachers have solved this problem by dedicating time during a lecture to fill in the evaluation or by asking us to write some tips and tops on paper. Both approaches lead to a higher engagement in the evaluation process. The panel meetings are very much appreciated, but the timing can sometimes be better. These are often scheduled in busy times (e.g., an exam week), which results in low attendance. Considering the feedback moments, normally, at the end of each module, feedback forms are sent out to students. A visible trend is for students to have suggestions or points of improvement to fill these forms in. Discussing with the students in the course, a consensus has been seen on why not everybody is completing the forms. Most of the time, students lack an update on the feedback they sent, so “What happened with the feedback?”, “Any visible changes?” etc. Given this issue, some teachers are nicely creating interactive sessions at the end of their course in which they can discuss with students. Based on the feedback, they also explain how potential changes will be implemented, and later they mention the changes to the new students in the following year. This is a great addition for the students as their concerns will be considered and then they will help reshape the course.

Final Remarks

Based on our combined views and thoughts we hope that the numerous positive aspects of the programme can be maintained and possibly enriched in the next period of time. Building from the strong aspects of both programmes, we see great potential to improve them further. With our feedback, we hope to have made a meaningful contribution to the future development of the quality of the programmes.

Appendices

A

Comments Previous Assessment

This appendix presents the follow-up on the recommendations of the previous assessment. In the previous evaluation, the panel made the following additional recommendations, which we addressed as follows:

Recommendation 1	To adapt the scoring forms for the Master Final Projects, as these forms may induce too high grades.
Initial response:	To act on the drift to higher grades, we introduced a new assessment form for the Research Topics to help in the grading process, and we introduced the combination of a senior examiner and an external supervisor. A senior examiner can better compare and align the scores with other projects. It helps in avoiding the inflation of grades by an external supervisor. We also introduced half-point grades, which made it possible for our assessment committees to be more specific in the grading.
Current status:	The initial measures we took were effective in guaranteeing the coherence and homogeneity of grading (as shown by our internal theses carousel). Improvements are still possible in the assessment form to prevent a drift towards higher grades. Our next step consists of reviewing this form to improve its auditability, which will support the next steps in the reviewing process.

Recommendation 2	To present the curriculum more clearly.
Initial response:	Our first response consisted of merging the two specialisations (EA and ITMI) into one (currently, IMEA–IT Management and Enterprise Architecture). By merging the EA and ITMI, the specialisations obtained more distinguished profiles with apparent differences between them. We spend more time explaining the choices and topics in the curriculum during the introductions for starting students. We communicate the curriculum next to an example study plan to show the programme. We provide more information in the graduation semester as the list of electives has been expanded. We have introduced a Master BIT Canvas for student communication and a lecturer BIT Canvas for lecturers.
Current status:	Recently, we improved our presentations in the Open Days to add a reasonable time to discuss the professional profiles and help students decide on whether to register for the BIT course and to which specialisation based on their aspirations for future jobs.

Recommendation 3	To make the business administration subjects and assignments in the programme more attractive for students by presenting, among others, ill-defined problems.
Initial response:	We addressed this action point by prioritising courses within the BA area that were under–performing in terms of their score on the students' experience evaluation (SEQ) and courses that were in need of content updates. Initially, we offered students ill-defined problems in a Project–Based Learning approach. For the courses ICT Management and E-strategising, the approach led to clear improvements in the overall SEQ results.
Current status:	Recently, we expanded the approach to new courses and to courses undergoing a redesign. In these courses, we adopted pedagogical approaches like PBL and CBL because of the intrinsic ill-defined nature of the challenges/projects, and the enhanced student engagement characteristic of CBL.

Recommendation 4	To strengthen the research efforts in information science within the Faculty of Electrical Engineering, Mathematics and Computer Science.
Initial response:	There has been a sharp increase in the number of faculty members and their involvement with BIT, also made possible by the sector plans, and this has strengthened the research within Information Systems. For example, within the SCS department, newly hired Prof. Giancarlo Guizzardi and his already large group are now working on *Conceptual Modeling*, *Ontologies* and *Enterprise Semantics*. Within the Human Media Interaction department, new positions have been created in *Language and Multimedia: Analysis, Retrieval and Interaction* and in *Conversational and Interactive Agents* (Assistant Professors Lorenzo Gatti and Shenghui Wang, Associate Professors Birna van Riemsdijk and Khiet Thruong, respectively). Our students published 25+ papers in scientific conferences and journals from 2017 to 2022.
Current status:	To benefit from the expertise of new colleagues and the added capacity of our groups to perform research within the Information Systems field, we planned a series of curriculum and research workshops that will take place starting the following year. Our goals include strengthening the connection between education and research and, leveraging the expertise of our new colleagues to update the BIT curriculum, opening new research lines within the programme. It's worth noticing that this added capacity also happened within BMS faculty, which adds even more opportunities but also creates the need to update the *Identity of the BIT Programme* to one that increases the sense of belonging and benefits from the newly added research and education capacity.

Recommendation 5	To increase the study load, stimulating students to spend a minimum of 40 hours per week on their studies.
Initial response:	The actions we took to address Recommendation 2 intrinsically increased the study load. Now, students must run a quick round of investigation to define better the problems (or challenges) they will investigate. In the case of CBL courses, this increase is quite sharp.
Current status:	In addition to the presentation of 'ill-defined problems', we invested in a series of agreements with companies operating on Dutch soil (preferably in the Twente region) to offer our students 'real challenges' faced by these companies. In the 2022-2023 academic year, this agreement targeted the courses Architecture of Information Systems (currently PBL) and Smart Industry Systems (already CBL). In these courses, companies and students must meet at least 4 times, being the last meeting reserved for the final presentations. The first meeting aims to better define the problem. This first meeting takes place on the companies' premises (hybrid mode for students who prefer not to go), and the other three moments happen in our project sessions. In these meetings, companies' representatives attend our project sessions and discuss the progress with our students. We are very excited about this incipient approach. We are still analysing its feasibility, and the students' feedback this year will provide us with key input for the next steps. We are making small - but safe - steps to make learning meaningful, connected to reality, and engaging for our students. Finally, it's worth noticing that the two NSE 2023 scores related to 'study load' had significant improvement when compared to the previous year, which shows a positive opinion of the students about the study load.

Recommendation 6	To implement the peer review procedure for all of the examinations.
Initial response:	As described in Standard 3, we devised a totally new workflow for safeguarding the quality of education with a special focus on examination. The first aspect addressed was the peer review of the assessment material —it can be made in multiple ways and the examiner is asked to describe the procedure used to review the assessment material before launching it. To support this new workflow, we developed a new system (SESHAT) that works as a central repository of assessment plans, schedules, and assessment matrices, and reflections from lectures and coordinators. This system features a questionnaire that is —per se— a reflection on each assessment task (a test, its resit, project, etc.) and prompts examiners to tell us how they reviewed their assessment material. Regarding the reflections, examiners are prompted to reflect on the assessment task two weeks after they take place, while the responsible lecturer and the module coordinators must upload the reflection on other aspects of the provided education. Their responses to this questionnaire serve as a starting point for the course's next PDCA cycle (and input for the Programme's PDCA cycle). The Exam Board and the Quality Assurance team have access to the material on this system and they use it in their screening scheme.
Current status:	Currently in pilot mode, including B-BIT and M-BIT programmes

Recommendation 7	To intensify the carousel meetings to discuss and calibrate Master Final Projects' assessments and grades.
Initial response:	Internal carousel performed in the current academic year (2022-2023). Next carousel planned for the 2025-2026 academic year.
Current status:	Our first internal carousel round showed no significant deviation between the grades given by the actual examiners and the examiners selected for the carousel.

This appendix contains the Intended Learning Outcomes (ILOs) of the programme. In the margin the short versions, used in the tables.

B

Intended Learning Outcomes

Table B.1 Intended Learning Outcomes

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.

C

Overview of Courses and Themes

Table C.1
Compulsory Courses

Term	Code	Name	EC
Q1	201400277	Enterprise Architecture	5
Q2	192376500	Business Process Integration Lab	5
Q2	202000027	Enterprise Security	5
Q2/Q3	201400174	Data Science	5
Q3	202000029	Empirical and Design Science Research	5
Q4	192376000	Business Case Development for IT Projects	5

The course codes refer to the course information system OSIRIS [20]

Table C.2
Courses in the IMEA specialisation

Term	Code	Name	EC
Q1	201900119	Digital Strategy	5
Q3	192340101	Implementation of IT in Organisation	5
Q3	192360021	ICT Management	5
Q4	192320111	Architecture of Information Systems	5
Q4	202000028	Smart Industry Systems	5
Q4	202001549	Low Code Application Development	5

The course codes refer to the course information system OSIRIS [20]

Table C.3
Courses in the DSB specialisation

Term	Code	Name	EC
Q1	191506103	Statistics and Probability	5
Q1	201600070	Machine Learning 1	5
Q1	191820210	Simulation	5
Q2	201200044	Managing Big Data	5
Q3	201100051	Information Services	5
Q4	202000028	Smart Industry Systems	5

The course codes refer to the course information system OSIRIS [20]

D

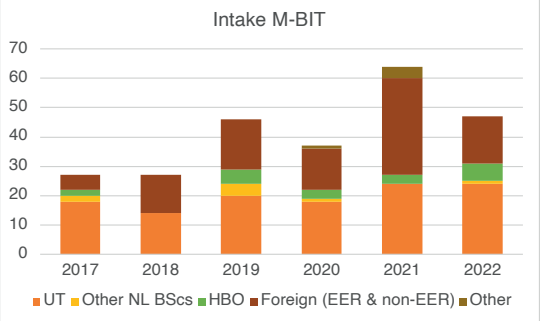
Other Appendices

D.1 Intake of students

Table D.1
Intake of students

	2017	2018	2019	2020	2021	2022
	2017	2018	2019	2020	2021	2022
Own university	18	14	20	18	24	24
Other NL universities	2	0	4	1	0	1
HBO	2	0	5	3	3	6
Foreign	5	13	17	14	33	16
Other	0	0	0	1	4	0
Total	27	27	46	37	64	47

Figure D.1
Graph of Table D.1



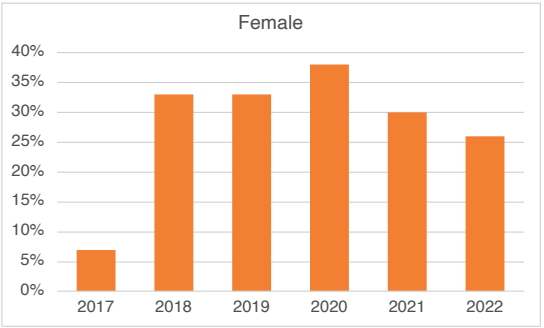
We think it is vital to have international students; they enrich our student population. BIT is international not only because the technology is meant to breach borders but also because the economy and businesses take place globally with global actors and innovations.

D.2 Intake of female students

Table D.2
Intake of Female students

	2017	2018	2019	2020	2021	2022
Female	7%	33%	33%	38%	30%	26%
Numbers	2	9	15	14	19	12

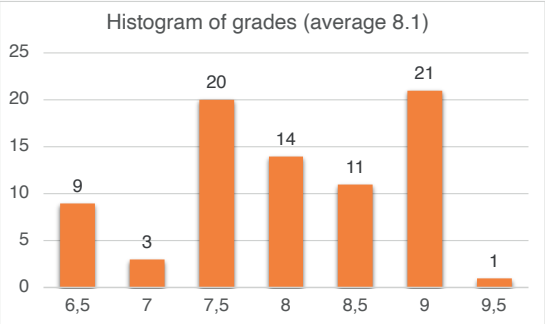
Figure D.2
Graph of Table D.2



D.3 Grades Master Theses

Figure D.3 shows the Master Theses' grade distribution in the last two years (2021-2022), the same period used for the panel members' appreciation. The average reduced from 8.3 (previous report) to 8.1 (current), as we expected after the initial measures to address the last report's action points. While we still see room for improvement, we feel confident we are steering the programme in the desired direction.

Figure D.3
Grades of MSc theses



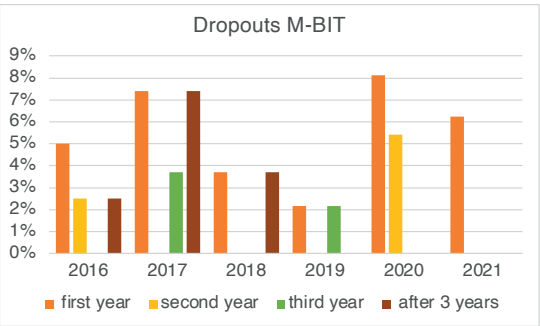
D.4 Dropouts

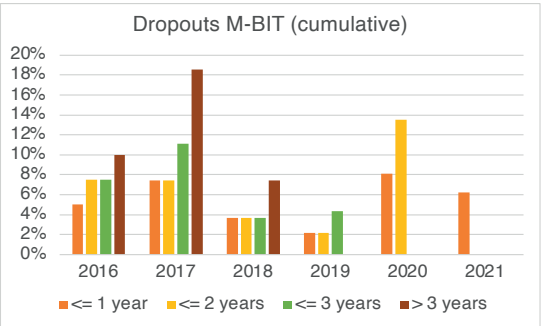
Table D.4
Dropouts (left) and Cumulative Dropouts (right)

cohort:	2016	2017	2018	2019	2020	2021
≤ first year	5%	7%	4%	2%	8%	6%
≤ second year	3%	0%	0%	0%	5%	2%
≤ third year	0%	4%	0%	2%	0%	
> 3 years	3%	7%	4%	2%		

cohort:	2016	2017	2018	2019	2020	2021
≤ year	5%	7%	4%	2%	8%	6%
≤ years	8%	7%	4%	2%	14%	8%
≤ years	8%	11%	4%	4%	14%	
> 3 years	10%	19%	7%	7%		

Figure D.4
Dropouts (left) and Cumulative Dropouts (right)



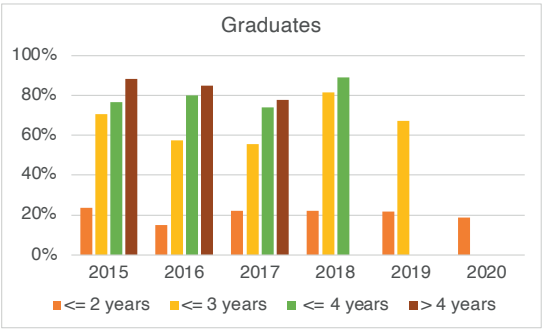


D.5 Graduated students

Table D.5
Number of graduated students (cumulative)

cohort:	2015	2016	2017	2018	2019	2020
≤ 2 years	24%	15%	22%	22%	22%	19%
≤ 3 years	71%	58%	56%	81%	67%	38%
≤ 4 years	76%	80%	74%	89%	70%	
> 4 years	88%	85%	78%	89%		
Currently active	6%	5%	4%	4%	24%	49%
Drop out	6%	10%	19%	7%	7%	14%

Figure D.5
Number of graduated students (cumulative)



D.6 External Advisory Board

Table D.6
External Advisory Board.
See for more details the info at the www [12]

Name	Company
Dick Pauw (Chair)	Self-employed
Mathilde Stelloo-Oude Velthuis	OV Software
Rik Goslinga	Paypal
Ton van Rhijn	CZ
Jan-Laurens Lasonder	University of Twente
Floor de Jong	Shell
Hans Lesscher	Odin Group

D.6 Staff of the programme

Information about the programme staff is given in Table D.7. The majority of the lecturing staff is dedicated to two programmes, therefore their teaching time should be considered as half the usual (50/2=25%). The overview in Table D.7 concerns the BIT contributors of both EEMCS and BMS faculties.

Table D.7
Programme staff (Spring 2023)

	#	%	
Total staff (persons)	104	100%	HL: 8% , UHD: 15%, UD: 54%, docent: 17%, guest: 2%, researcher: 3%, OHL*: 1%
Female	33	32%	HL: 6%, UHD: 15%, UD: 58%, docent: 18%, OHL: 3%
Total staff (fte)	90,8		
Qualifications			
PhD	97	93%	4 Lecturers & 2 researchers are doing their PhD / 1 guest lecturer has an MSc. Degree
UTQ Completed	48	46%	
UTQ Started	28	27%	
Exemption	21	20%	Diploma equivalent to UTQ, decided by CES
UTQ no obligation	1	1%	Decided by dean, historically >20 years experience with teaching
Total UTQ	98	94%	
UTQ not started	6	6%	
English C1, C2 level	98	94%	
Docent	18	17%	Staff members with the main task of teaching

More detailed information about the staff is available for the committee on a password-protected web page.

D.7 Student-staff ratio

The basic assumption in calculating the student/staff ratio is that the teaching time of each lecturer is shared with another programme. While the lecturers of EEMCS often teach also at the Computer Science Programme, the lecturers of BMS faculty often teach at the Industrial Engineering & Management Programme. Therefore, considering our faculty members should dedicate at least 50% of their time to teaching activities, we apply a default rate of 25% of the FTE's of each faculty member in a professorship role (Assistant, Associate, or Full Professors). For the lecturerships (docent), it is expected a greater proportion of their time (70%) to be dedicated to teaching activities. Therefore, for the faculty members following a lecturership career, we consider the dedication to BIT as half their dedication to teaching, hence 35%.

Based on the data of Table D.7 we computed the student/staff ratio as follows:

- The adjusted FTEs dedicated to teaching in the BIT Programme is 25,83
  - this number is based on the data of Table D.7, in which the total FTEs of our programme's staff is 90.8. The same table shows a 25% rate for the professorship faculty members' FTEs and 35% of lecturership members', which results in an adjusted FTE of 25,83.
- The number of active students (B-BIT + M-BIT) is 395.
- The student–staff ratio is: 395/25,8 = 15,3

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