OPERATIONS MANAGEMENT AND LOGISTICS

DEPARTMENT OF INDUSTRIAL ENGINEERING AND INNOVATION SCIENCES

EINDHOVEN UNIVERSITY OF TECHNOLOGY

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CONTENTS

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REPORT ON THE MASTER'S PROGRAMME OPERATIONS MANAGEMENT AND LOGISTICS OF EINDHOVEN UNIVERSITY OF TECHNOLOGY

This report takes the NVAO's Assessment Framework for Limited Programme Assessments as a starting point (19 December 2014).

ADMINISTRATIVE DATA REGARDING THE PROGRAMME

Master's programme Operations Management And Logistics

Name of the programme:	Operations Management And Logistics
CROHO number:	66340
Level of the programme:	master's
Orientation of the programme:	academic
Number of credits:	120 EC
Specialisations or tracks:	Healthcare; Capital goods; Consumer goods; Service operations; Transportation; Free track
Location(s):	Eindhoven
Mode(s) of study:	full time
Language of instruction:	English
Expiration of accreditation:	01/12/2017

The visit of the assessment panel Industrial Engineering and Management to the Department of Engineering and Innovation Sciences of Eindhoven University of Technology took place on on 18-19 January and 20 February 2017.

ADMINISTRATIVE DATA REGARDING THE INSTITUTION

Name of the institution:	Eindhoven University of Technology
Status of the institution:	publicly funded institution
Result institutional quality assurance assessment:	positive

COMPOSITION OF THE ASSESSMENT PANEL

The panel that assessed the master's programme Operations Management and Logistics consisted of:

- Prof.dr.ir. R.E.C.M. (Rob) van der Heijden, Radboud University Nijmegen [chair];
- Prof.dr. H.M.C. (Harrie) Eijkelhof, Utrecht University;
- Prof.dr. E. (Erik) Demeulemeester, University of Leuven;
- Prof.dr. J. (Jan) Kratzer, Technische Universität Berlin;
- S. (Sofie) Vreriks BSc, University of Twente [student member].

The panel was supported by dr. E. (Els) Schröder, who acted as secretary. Appendix 1 contains the curricula vitae of the panel members.

WORKING METHOD OF THE ASSESSMENT PANEL

Cluster

The master's programme Operations Management and Logistics at Eindhoven University of Technology (hereafter: TU/e) was assessed as part of the cluster Industrial Engineering and Management and Systems Engineering, Policy Analysis & Management. The cluster Industrial Engineering and Management and Systems Engineering, Policy Analysis & Management encompasses eleven programmes at four universities: Delft University of Technology (hereafter: TU Delft), University of Groningen, University of Twente and TU/e. TU Delft served as first point of contact and secretary on behalf of all four universities. Dr. E. Schröder, project manager at QANU, assisted the cluster in organisational and practical matters.

The project manager approached independent panel members based on the programmes' recommendations, taking into account specialised tracks at the four institutions. The NVAO approved the panel composition on 10 October 2016. The cluster panel consisted of the following members:

- Prof.dr. ir. Rob van der Heijden, Radboud University Nijmegen [chair];
- Prof.dr. Harrie Eijkelhof, Utrecht University;
- Prof.dr. Erik Demeulemeester, KU Leuven, Belgium;
- Prof.dr. Jan Kratzer, Technische Universität Berlin, Germany;
- Prof.dr. Arthur Petersen, University College London, United Kingdom;
- Prof.dr. Marcel Veenswijk, VU University Amsterdam;
- Dr. Hens Runhaar, Wageningen University;
- Prof.dr. Emmo Meijer, Eindhoven University of Technology;
- Dr. Margriet Nip, Tata Steel;
- Dr. Hector Ramirez Estay, Université de Franche-Comté, France;
- Maarten van Ruitenbeek BSc, University of Groningen [student member];
- Sofie Vreriks BSc, University of Twente [student member];

Prof.dr.ir. Rob van der Heijden acted as panel chair during all four site visits. Additionally, prof.dr. Harrie Eijkelhof, an education expert with a long-standing academic career in the teaching of science, agreed to partake in all four assessments. Two QANU secretaries were appointed to assist the panel during site visits: QANU project manager dr. Els Schröder and dr. Barbara van Balen, independent NVAO-certified secretary. Calibration meetings took place on 15 December 2016 and 22 March 2017 between prof.dr.ir. Van der Heijden, prof.dr. Eijkelhof and both secretaries to attune the panels' findings to further assure consistency of assessment within the cluster.

Site visit TU/e

Preparation
The master's programme Operations Management and Logistics was assessed alongside two other programmes: the bachelor's programme Technische bedrijfskunde and the master's programme Innovation Management. These three programmes share a management, Board of Examiners and Programme Committee. Prior to the site visit, the panel asked the programmes to select representative interview partners. The panel met during the site visit with the programme management, current students, staff, alumni, members of the examination board and members of the Programme Committee of all three programmes.

In preparation for the assessment, the management provided a critical reflection for the master's programme. In this critical reflection, the management described the current state of affairs and provided useful information for the assessment of its programme. The project manager checked the report for completeness of information before sending it to the panel members.

In consultation with the chair, the secretary selected fifteen master theses, covering the full range of marks given. In addition, the selection covered a range of thesis subjects that represented the various examiners and master tracks.

Site visit
The site visit to the Department of Industrial Engineering and Innovation sciences at TU/e took place on the 18th and 19th of January and on the 20th of February 2017. This two-stage site visit was necessary due to the absence of two panel members during the original site visit of January. For the programme of the two-stage site visit, see Appendix 5.

Prof.dr.ir. Rob van der Heijden was unable to attend the site visit on the 18th and 19th of January 2017 due to illness. Prof.dr. Harrie Eijkelhof stepped in as acting chairman. During the site visit, prof.dr.ir. Van der Heijden's input and questions were put forward in the various interview rounds and he was extensively consulted by telephone during both days. Prof.dr. Jan Kratzer was also absent during the site visit in January due to personal circumstances. Both prof.dr.ir. Van der Heijden and prof.dr. Kratzer prepared for the site visit. They both independently assessed a selection of bachelor's and master's theses, which was handed in by email with the other panel members and the panel secretary.

On the 20th of February 2017, prof.dr.ir. Van der Heijden, prof.dr. Eijkelhof and prof.dr. Demeulemeester returned to Eindhoven with the panel secretary for two additional discussion rounds to finalise the site visit, allowing prof.dr.ir. Van der Heijden to ask further questions and to formulate an independent assessment of the bachelor programme and two master programmes. Prof.dr. Kratzer en student member Vreriks were otherwise engaged and could not attend this additional visit. Both were briefed regarding the additional visit and read the draft report prepared by the secretary, allowing for their comments and input. After consultation amongst the panel members to discuss the new impressions, prof.dr.ir. Van der Heijden presented the panel's preliminary findings and general observations at the close of this February visit. This presentation was open to all.

The panel also examined relevant study material, assessment forms and additional material during the site visit. This material is listed in Appendix 6. The panel provided students and lecturers the opportunity to meet informally during a consultation hour outside the set interviews. No requests were received for this option.

Report
Based on the panel's findings, a draft report was prepared by the secretary. All panel members commented upon the draft report and their comments were implemented accordingly. Subsequently, the programme checked for factual irregularities. Comments by the programme were discussed between secretary and chair and, where necessary, other panel members before finalising the report.

Decision rules
In accordance with the NVAO's Assessment framework for limited programme assessments, the panel used the following definitions for the assessment of both the standards and the programme as a whole.

Generic quality
The quality that can reasonably be expected in an international perspective from a higher education bachelor's programme.

Unsatisfactory
The programme does not meet the current generic quality standards and shows serious shortcomings in several areas.

Satisfactory
The programme meets the current generic quality standards and shows an acceptable level across its entire spectrum.

Good
The programme systematically surpasses the current generic quality standard.

Excellent
The programme systematically well surpasses the current generic quality standard and is regarded as an international example.

SUMMARY JUDGEMENT

The master's programme Operations Management and Logistics (hereafter: OML) is a full time programme, consisting of 120 EC spread evenly over two years. It is taught in English. OML is part of the School of Industrial Engineering (hereafter: School IE) with the bachelor's programme Technische bedrijfskunde (Industrial Engineering and Management in English) and the master's programme Innovation Management, as offered by the Department of Industrial Engineering and Innovation Sciences at the Eindhoven University of Technology (hereafter: TU/e). The Educational Board of the School IE consists of a programme director, a vice-director, and two programme chairs. It is supported by a quality assurance officer and two study advisors.

OML focuses on logistics and operational processes and applied engineering techniques. The programme's profile is clearly distinct from the School IE's other master's programme Innovation Management. The panel considers the profile and aims of the programme in line with the demands of the field and appropriate for the domain of IE&IS. It suggests rendering the programme's international ambitions in both its profile and the intended learning outcomes to further strengthen and demarcate its, and the School IE's, position in the field of IE&IS.

The panel ascertained that the programme's profile and mission have been appropriately translated into programme- and domain-specific learning outcomes. OML's intended learning outcomes are appropriate for a programme at master's level and meet both the requirements of the Dublin criteria and the ACQA framework, which is based on the Meijer's criteria for academic curricula as developed by the Dutch Universities of Technology. Therefore they meet both international standards and the demands of the work field in the domain of IE&IS. Whereas the panel considered the learning outcomes in the domain-specific framework too generic, it considered the translation of these learning outcomes in the OML programme of the TU/e sufficiently operational.

OML is one of two of the School IE's master's programmes. Its programme and curriculum design was completely revised to fit the newly created TU/e Graduate School, which introduced a uniform format for all TU/e master's programmes based on a structure of 15 EC per quartile in order to facilitate alignment between different tracks, programs and departments. The programme and curriculum are based on six elements that feed into their design: two core courses (10 EC), four track specific core courses (20 EC), a minimum of three elective courses in one of the tracks allowing for disciplinary specialisation within OML (a minimum of 15 EC), a maximum of eight elective courses (a maximum of 40 EC), a literature review to prepare for the master's thesis (5 EC) and a master's thesis project, including a preparatory research proposal (30 EC). The programme is scheduled in such a way that students have in the first and second quartile of year two ample opportunity to follow electives away from the TU/e, preferably abroad.

The panel verified that the student learning environment at the master's programme OML enables students to meet the intended learning outcomes. The OML programme and curriculum is embedded in the School IE's research interests, but also provides a master's programme with its own profile. The curriculum offers five distinctive tracks for further specialisation within the field and, giving master students the opportunity to more extensively focus on research or to combine degrees. The coherence and content of the programme is well-structured and based on up-to-date scientific research and embedded within an engineering context, reflecting OML's focus on strategic decisions and business processes within a specific application domain or industry branch. In addition, the programme benefits from a wide variety in excellence programmes offered by the School IE and the university. The five specialisation tracks offer plenty of opportunity for gaining expertise within the discipline while also creating an individual profile. The internationalisation programme of OML is extensive and ambitious, and functions well. In the panel's eyes, the programme OML lays a good foundation for students of the programme to do well on the job market and in academia upon graduation. The wide availability of appropriate tracks and specialisation-related courses is, in the panel's eyes, an asset of the TU/e OML programme and translate in well-educated engineers with diverse profiles for an equally diverse work field.

The programme benefits from a dedicated teaching staff that regularly aligns its courses, and also acts upon feedback from students, colleagues and management. The panel appreciates the staff's proactive attitude regarding the challenges posed by the new curriculum and programme design and the increased workload in response to the increased student intake in the School IE since 2012. The School IE is currently suffering a high staff-to-student ratio and as a result, staff is pressed for research time. The panel has verified that the programme management is aware of this problem and that it is taking adequate measures to address the matter. Continuous vigilance in this matter is, however, necessary and the panel advises the management to continue addressing their current student-to-staff ratio.

Notable improvement regarding the professionalisation and reflection skills of the staff have been recognised by the panel, and it advises the management to continue doing so. The panel ascertained in meetings with the programme management and academic staff that both have a proactive and problem-solving attitude towards problems within the current programme. Staff and management regularly discuss the curriculum in formal and informal meetings with all relevant stakeholders. The panel considers the used methods (tutorials, group and individual assignments and lectures) appropriate, but feels that the OML staff may consider experimenting with innovative approaches such as blended learning.

Some courses were met with particular appreciation. The panel considered the core course 'Research Methods' well-designed and hands on and, in combination with the well-laid out thesis manual and the compulsory 'Literature Review', an excellent preparation for the master's thesis project both methodically and scientifically. The development of students' professional skills is organised on an individual basis, supervised by the students' mentors. Although the panel appreciated the centrality of the professional skills in the TU/e Graduate School's set up, its highly personal and individualised set up demands continuous evaluation of both students' and mentors' performance.

The panel ascertained that OML students are ambitious and driven; it appreciated the enthusiasm of students for the new curriculum. The programme also manages to successfully prepare its students to meet the intended learning outcomes. The internationalisation programme of OML is extensive and ambitious, and functions well. A high number of students take parts of their studies abroad, which the panel considers both desirable and praiseworthy. With a wide variety of options, a well-functioning homologation and internationalisation programme and a professional and innovative staff, OML's teaching-learning environment offers a good environment for students to achieve the intended learning outcomes.

The panel established that the master's programme OML has a satisfactory assessment system. The quality of assessment and achieved learning outcomes is safeguarded. Examinations are drafted with the involvement of two members of staff, and marked by two independent examiners. The quality of assessment of the master thesis is assured by the involvement of three members of staff: two supervisors and an independent assessor that assures the engineering aspect and disciplinary focus of the thesis project. The BoE's aims to develop test matrices for the different programmes in the school, an ambition warmly supported by the panel. Some other improvement could be considered. The panel recommends to redesign the thesis assessment forms for further qualitative feedback and additional transparency into the composition of grades. Furthermore, separate forms for all examiners would fuel further transparency into the assessment process. The panel advises the BoE to also consider introducing spot checks by independent educationalists in order to annually screen (a selection of) individual courses, including its assessment, within the programme to further assure the quality of assessment.

The Board of Examiners (hereafter: BoE) of the School IE functions within the constraints of the law. It regularly convenes with the management and informs both students and staff about assessment procedures and assures the quality of assessment throughout the programme. The BoE's MSc thesis assessment committee is bound to perform stratified spot checks of the BEP. This is appreciated and

deemed necessary by the panel to safeguard the quality of assessment. Therefore, the panel concluded that the BoE at OML is in control and has various instruments in place to guarantee a fair assessment of all assessments, including the master thesis project.

The panel learned that a course assessment committee has been introduced to perform spot checks, both proactively and reactively, on course assessments in December 2016. Although the panel could not verify the benefits of this measure yet, it warmly supports it. Adequate time allowances should be allocated to staff members performing this important task. The panel advises the BoE to also consider introducing spot checks by independent educationalists in order to annually screen (a selection of) individual courses in its totality to further assure the quality of the programme.

All graduates of the master's programme OML achieved the intended learning outcomes and performed on average good, based on the quality of their theses. The panel ascertained that all theses were adequately graded. They consider the level of achievement on average high, showing good research embedded in an engineering context. The panel established that some of the evaluated theses demonstrated excellent research, benefiting from a good theoretical and mathematical basis with an eye for innovative research topics with societal relevance. Master graduates easily enter the job market, on which their profile and skills are highly valued. Although the School IE has an established alumni organisation in place, the panel advises the programme to intensify its ties with its alumni and to strongly support Alumnia's initiatives.

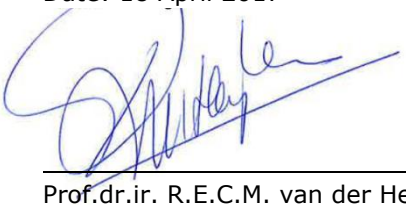
The panel assesses the standards from the *Assessment framework for limited programme assessments* in the following way:

Master's programme Operations Management And Logistics

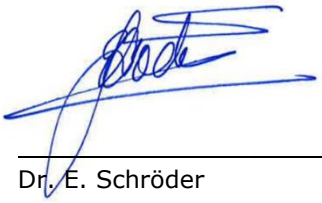
Standard 1: Intended learning outcomes	satisfactory
Standard 2: Teaching-learning environment	good
Standard 3: Assessment	satisfactory
Standard 4: Achieved learning outcomes	good
General conclusion	good

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

Date: 18 April 2017



Prof.dr.ir. R.E.C.M. van der Heijden



Dr. E. Schröder

DESCRIPTION OF THE STANDARDS FROM THE ASSESSMENT FRAMEWORK FOR LIMITED PROGRAMME ASSESSMENTS

The master's programme Operations Management and Logistics (hereafter: OML) is a full time programme, consisting of 120 EC spread evenly over two years. It is taught in English. OML is part of the School of Industrial Engineering (hereafter: School IE) with the bachelor's programme Technische bedrijfskunde (Industrial Engineering and Management in English; following the programme's practice, hereafter: IE) and the master's programme Innovation Management (hereafter: IM), as offered by the Department of Industrial Engineering and Innovation Sciences (hereafter: Department IE&IS) at the Eindhoven University of Technology (hereafter: TU/e). The Educational Board of the School IE consists of a programme director, a vice-director, and two programme chairs. It is supported by a quality assurance officer and two study advisors.

Standard 1: Intended learning outcomes
The intended learning outcomes of the programme have been concretised with regard to content, level and orientation; they meet international requirements.

Explanation:
As for level and orientation (bachelor's or master's; professional or academic), the intended learning outcomes fit into the Dutch qualifications framework. In addition, they tie in with the international perspective of the requirements currently set by the professional field and the discipline with regard to the contents of the programme. Insofar as is applicable, the intended learning outcomes are in accordance with relevant legislation and regulations.

Findings

Profile and aims
According to the critical reflection, students of the master's programme OML are educated to become academic engineers who, from a design perspective, possess scientific knowledge on and insight into the behaviour and performance of business processes in industrial and service organisations. During their studies, they are acquainted with the disciplines of operations research, information systems, work and organisational psychology, and engineering economics set in three capacity groups of the School IE: Operations, Planning, Accounting and Control (OPAC), Human Performance Management (HPM), and Information Systems (IS). In the panel's eyes, the programme is clearly directed towards making tactical decisions and operational choices in business processes in logistics and management. The panel renders the programme's profile appropriate and valuable, serving a clear demand for academic engineers with a broad expertise and sound knowledge base to make operational and strategic business decisions. It appreciates OML's interest in societal problems and the attention paid to sustainability. It also verified that OML's aims and mission differ considerably from the School IE's second master's programme IM, which in turn focuses on the enhancement of innovation processes and business development in technology-intensive organisations.

During the site visit, the panel learnt that internationalisation is high on the agenda for the School IE in Eindhoven. Currently, over 60% of all its master students, both in OML and IM, pursue parts of their master studies abroad. The management aims to raise this number to 95% of students in both masters. The panel appreciates these ambitions and suggests translating the internationalisation goals more explicitly in the master's profiles to further strengthen its unique profile, including the formulation of an intended learning outcome directed towards international collaboration and/or orientation as part of the master's programmes.

Domain-specific reference framework
The panel studied the domain-specific reference framework and finds it well-formulated. The framework was informed by international standards in the field as formulated by leading academic

institutions, amongst which the Institute of Industrial Engineers, Stanford University and Georgia Tech, and the criteria of the professional criteria of the Accreditation Board for Engineering and Technology (hereafter: ABET). In the panel's view, the framework gives an adequate description of the profile and objectives of the international field in IE&SE. The panel is satisfied with the listed competences for graduates in the framework of reference. Regarding content and orientation, the learning outcomes encompass what might be expected of academic bachelor's and master's programmes in the field of IE&ES. Nevertheless, the panel finds the differentiation between bachelor's and master's level in the domain-specific framework rather generic, in particular with regards to the listed general academic qualities.

Intended learning outcomes
The panel studied the translation of the domain-specific reference framework into the intended learning outcomes of OML (see Appendix 3). It compared the programme's intended learning outcomes both to the domain-specific framework and the intended learning outcomes of the School IE's other master's programme IM. OML's intended learning outcomes are clearly focused towards gaining knowledge of the design, behaviour, planning and performance enhancement of operational processes in industrial and service organisations, whereas IM's intended learning outcomes focus on innovation processes and the design of business development in technology-intensive organisations. Both master programmes have a distinct profile, which is also translated into the intended learning outcomes. The panel considered the learning outcomes adequate and ascertained that these meet the requirements of the Dublin criteria. They reflect appropriate choices and are aimed at the right degree level. Additionally, the programme meets the requirements of the ACQA framework, which is based on the Meijer's criteria for academic curricula as developed by the Dutch Universities of Technology.

The difference between both master programmes is firstly reflected in the domain-specific learning outcomes, which demonstrate a clear demarcation of the research field and knowledge base (D1 and D2). The panel is satisfied that OML has a defined and different take within the domain of IE&IS based on motivated and appropriate choices. Next to these domain-specific choices, the programme formulated seven academic criteria and twelve general scientific learning outcomes. The academic criteria for OML are appropriate for a programme at master's level.

At OML, the general scientific learning outcomes have been broken down into twelve specific learning outcomes. These are transparent yet could be further concretised to inform the programme's curriculum. The general scientific learning outcomes focus on the application of knowledge into both academia and industry, on collaboration and individual work, on reflection and the creation of systematic behaviour, on communication skills, on the importance of the societal impact of scientific knowledge, all applied in a multidisciplinary context. Although the panel appreciates the way in which the OML differentiated the various learning outcomes in categories, it feels that these generic outcomes could be further concretised to fuel student learning. Precise learning outcomes could clarify objectives, inform curriculum improvement and make assessment more transparent. It would also further set apart the unique take of the programme.

Considerations
The panel ascertained that the programme's profile and mission have been appropriately translated into both programme- and domain-specific learning outcomes. OML's intended learning outcomes are appropriate for a programme at master's level and meet both the requirements of the Dublin criteria and the ACQA framework, which is based on the Meijer's criteria for academic curricula as developed by the Dutch Universities of Technology. Therefore they meet both international standards and the demands of the work field in the domain of IE&IS.

Whereas the panel considered the learning outcomes in the domain-specific framework too generic, it considered the translation of these learning outcomes in the OML programme of the TU/e operational. Nonetheless, they could still be further concretised. In the panel's view, distinctive

learning outcomes would be able to translate the unique features of the programme, create further transparency and fuel student learning.

The programme's profile is clearly distinct from the School IE's other master programme, focussing on logistics and operational processes and applied engineering techniques. The panel considers the profile and aims of the programme in line with the demands of the field and appropriate for the domain of IE&IS. It suggests rendering the programme's international ambitions in both its profile and the intended learning outcomes to further strengthen and demarcate its, and the School IE's, position in the field of IE&IS.

Conclusion
The panel assesses Standard 1 as 'satisfactory'.

Standard 2: Teaching-learning environment
The curriculum, staff and programme-specific services and facilities enable the incoming students to achieve the intended learning outcomes.

Explanation:
The contents and structure of the curriculum enable the students admitted to achieve the intended learning outcomes. The quality of the staff and of the programme-specific services and facilities is essential to that end. Curriculum, staff, services and facilities constitute a coherent teaching-learning environment for the students.

Findings

Programme and curriculum design
OML is one of two of the School IE's master's programmes. Its programme and curriculum design was completely revised to fit the newly created TU/e Graduate School (hereafter: TU/e GS), which introduced a uniform format for all TU/e master's programmes based on a structure of 15 EC per quartile in order to facilitate alignment between different tracks, programs and departments. The revised master's programme OML offers a two-year full time programme of 120 EC.

The programme and curriculum are based on six elements that feed into their design: two core courses (10 EC), four track specific core courses (20 EC), a minimum of three elective courses in one of the tracks allowing for disciplinary specialisation within OML (a minimum of 15 EC), a maximum of eight elective courses (a maximum of 40 EC), a literature review to prepare for the master's thesis (5 EC) and a master's thesis project, including a preparatory research proposal (30 EC). The programme is scheduled in such a way that students have in the first and second quartile of their second year of study ample opportunity to follow electives away from the TU/e, preferably abroad. For an overview of the programme, see Appendix 4.

In their first year, OML students follow two compulsory core courses: 'Performance Enhancement' (5 EC) and 'Research Methods' (5 EC), addressing common content and applicable research methods for all OML students. In addition, students follow four compulsory track-specific core courses and a minimum of three elective courses within their specialisation track. They could also choose any of their eight elective courses in the first year instead of the three elective courses within their specialisation track, although students are encouraged to save their elective courses for study abroad in the first two quartiles of the second year.

In their second year, students can freely choose relevant electives at master's level to deepen and/or broaden their knowledge in the first two quartiles, next to taking a compulsory literature survey (5 EC) in preparation for the master's thesis. Studying abroad is strongly encouraged by the programme, resulting in a wide variation of options for students. The student's mentor is closely involved with identifying suitable courses and opportunities for studying abroad at this stage of the

study path of the individual students. In their last two quartiles, students need to execute an empirical master's thesis project (30 EC) in a company or service organisation, for which they write a mandatory research proposal and a thesis report. Additionally, they present a scientific poster as a prerequisite for the thesis defence.

OML core courses are provided by the School IE within the three disciplinary groups contributing to the master's programme, namely Operations, Planning, Accounting, and Control (OPAC), Human Performance Management (HPM) and Information Systems (IS). The master's programme provides six specialisation tracks: five tracks are related to a specific application domain or an industry branch, the sixth track is identified as the 'Special/Free' track and will be discussed separately.

The five OML tracks are: (1) 'Healthcare', focussing on capacity planning business process management, transfer of training, decision support and human performance, (2) 'Capital Goods', addressing production and inventory planning, maintenance & reliability, sustainability, forecasting and human performance, (3) 'Consumer Goods', researching inventory planning, store operations, warehousing, pricing assortment planning, forecasting and human performance, (4) 'Service Operations', investigating business process management and human performance, and (5) 'Transportation', examining transportation optimisation, port and terminal operations, sustainability, business process management and human performance.

The sixth or 'Special/Free' track differs from the other OML tracks and is directed towards promoting research. It is created for students with an interest in research and also allows students to combine the programme with an excellence programme in research or a dual-degree programme. With their mentor's close advise, students choose within this track elective courses at master's level that must create a coherent study path, tie in with the OML profile, and are tailored towards their individual needs and research interests. The 'Special/Free' track is highly individual, closely monitored by staff and approved on an individual basis by the Board of Examiners.

During the site visit, the panel studied a selection of material and handbooks of several courses (see Appendix 6) and rendered these relevant and up to date with current scientific research. It was in particular positive about the studied material for the core course 'Research Methods'. It found it well-designed and hands on and, in combination with the well-laid out thesis manual and the compulsory 'Literature Review', a good preparation for the master's thesis project both methodically and scientifically that offers a solid underpinning to meet the intended learning outcomes in the master's thesis project. The panel concluded that students of OML encounter relevant and up-to-date literature and methods, are allowed to develop their research skills, learn to use and question scientific theory and models and acquire an academic, inquisitive and problem-solving attitude within their master's courses.

The panel ascertained that the track-specific core courses are defined in order to achieve the programme's objectives, while simultaneously giving students a clear, recognisable track-specific profile. The elective courses additionally offer students good opportunities to branch out within their track to pursue their own interest within their specialisation. The wide availability of appropriate tracks and specialisation-related courses is, in the panel's eyes, an asset of the TU/e OML programme and translates in well-educated engineers with diverse profiles for an equally diverse work field.

The panel considers the master's programme design and the way it is implemented into the curriculum well-structured and reflecting the programme's profile. It enables students to meet the intended learning outcomes of the programme, resulting in a master's degree with a clear focus on strategic decisions and business processes within a specific application domain or industry branch. The OML programme and curriculum clearly differ in this respect from the School IE's other master's programme IM, which is directed towards the innovation of process and business development. In the panel's eyes, the programme OML lays a good foundation for students of the programme to achieve the intended learning outcomes and to do well in the job market upon graduation.

The 'Special/Free' track offers excellent master students the opportunity to explore the option of a research career in academia, which is highly appreciated by the panel. This track also allows for further diversification and multidisciplinary focus, as it creates the opportunity for students to follow a dual-degree programme. This track, however, also introduces the need for close supervision of the individual student's choices. The mentor system, controlled by the Board of Examiners, seems to function well. Students indicated to feel well-advised by their mentors and the study advisor in selecting suitable electives.

In addition to their courses aimed at acquiring knowledge and the ability to use and question models and methods, the programme also allows for the development of students' soft skills. Students' skills are diagnostically tested at the start of the master's programme to identify the help needed to develop each student's individual skills. Several elements are tested in this assessment: thirteen competencies (as identified by the professional field and the TU/e Academic Competencies and Qualities Assurance office), collaboration, presentation and academic writing skills. Based on the test results, an individual skills development plan is discussed with the mentor. Students follow, if necessary, university-wide courses to improve their underdeveloped skills. Additionally, during their master courses in the OML programme they work on the development of their skills and are regularly tested in writing assignments, presentations and within project work. Students are obliged to report their progress in an individual portfolio under their own responsibility. The mentor then assures that students have duly developed their professional skill set according to the development plan at a satisfactory master's level before allowing students to graduate.

The panel is positive about the way in which students are motivated to work on their individual skill sets, yet feels slightly apprehensive about the diagnostic tests used to determine students' areas of 'concern'. Teaching staff and management emphasised, again, the close personal involvement of mentors in creating the students' development plan and in monitoring the students' progress. The panel appreciates the mentors' involvement, but also sees in this involvement a potential element of subjectivity and inequity – not all mentors may be equally equipped to identify students' needs, even if undertaken with the best of intentions. Staff members of OML engaged in supervision emphasised that they are well-aware of what a 'sufficient' level entailed and all readily advised their students to follow courses to develop their personal skills in this respect. In interviews with the panel, both students and teachers indicated that the monitoring of the professional skills is adequately evaluated. The panel advises the programme to be continuously aware of teaching staff's coaching role regarding the development of professional skills and to support them in it, when necessary.

In discussion with the panel, OML's teaching staff indicated to regularly discuss the coherence of the programme to align their courses. Students also emphasised that, in their eyes, courses and topics were well-aligned and showed coherence. The panel studied the wide variety of OML courses and congratulates the programme on the diversity and the results of these alignment sessions: it is pleasantly surprised about the lack of overlap between courses that potentially may introduce some, and it feels that the programme demonstrates coherence next to diversity and choice within all tracks.

As the new curriculum has been introduced in 2015-2016, the panel inquired with both OML students and OML staff about their current experiences with the programme. Students indicated that some decisions and changes still felt rather ad hoc; they recognised that within certain courses, teaching staff is still searching for the best way to implement the study load into a quartile structure rather than the old semester structure. They underlined that teaching staff and the programme management actively sought students' feedback, mostly informally and often organised by Study Association Industria, and that they also felt that this feedback was taken into account. Overall, students liked the redesign of the programme, pointing out that the quartile system allowed them to focus on less subjects at a time, resulting in a more focused and concentrated approach.

The teaching staff recognised this portrayal of current practice. They indicated that students seemed more motivated to really dive into the deep in their course work, also fuelled by more concentrated

blocks of teaching that allowed directly connecting instruction with practical application of knowledge in assignments. Some members of staff stressed that the more intense course demanded further staging in order to create enough breathing space for students to process the information. Practice assignments used to be more gradual in the semester structure when students had more time, in the eyes of the staff, for maturation. Nevertheless, teaching staff indicated to be positive about the change to completely rethink their approach to teaching, a necessary 'breath of fresh air' albeit with the usual teething problems, fuelled by an substantial increase in the student intake simultaneously. These problems and concerns are, however, readily discussed with the programme management and within the TU/e GS, also exploring alternative ways to programme the curriculum. Considering the challenging circumstances of both an increased intake and a complete curriculum overhaul, the panel appreciates the proactive attitude of OML's staff and management. It is satisfied that current problems and student concerns are adequately addressed and advises the programme to continue their discussions within the TU/e GS.

Excellence programmes and internationalisation
The panel appreciates the wide variety of programmes aimed at strengthening the students' profile. The School IE offers two excellence programmes of 20 EC, which can be followed on top of the IE programmes: in design, preparing for the Professional Doctorate in Engineering (PDEng) programme, and in research, preparing for the PhD programme. In addition, The TU/e Honors Academy offers a highly competitive option for all TU/e master's students: it teaches personal leadership skills in a professional context in science, society or industry in another 20 EC-programme. Additionally, all TU/e students may aim to pursue the Certificate Technology Entrepreneurship and Management (CTEM), a programme consisting of 25 EC of which 15 EC may be obtained as part of their master's programme. This option is unique for the TU/e and considered a good opportunity for further differentiation by the panel.

The panel also values the emphasis on internationalisation within the master's programme, considering it an example of good practice in the Netherlands. During the site visit, the panel learned that the teaching staff, and in particular mentors, closely advised students regarding potential courses at international universities. The panel considers this practice not only as an excellent way to vet universities and courses abroad, but also indicative of the broad international networks in which the teaching staff of the School IE participate and interact. It is therefore exemplary for the international outlook of the TU/e and indicative of the School IE's chances to actually meet their ambitious internationalisation goals.

OML students were positive about the opportunities offered for international study during their master's programme. They felt well-prepared and supported by their mentor and programme management, both in advance and during their months abroad. Overall, they considered their foreign experiences as of great value and the courses taken abroad in general at the required master's level – albeit with some exceptions to this general rule. They were actively questioned about their foreign experiences and felt that their feedback was taken into account, in particular with respect to courses failing to meet their (degree level) expectations. The panel verified in several conversations that active monitoring is indeed common practice and that encountered problems and irregularities regarding content or level at foreign universities are acted upon. It therefore feels satisfied regarding the monitoring of the international components of OML's master's programme and it praises the School IE's internationalisation programme.

Enrolment, feasibility and study progress
Students enrolling in the master's programme have a degree from a university bachelor's programme IE from either the TU/e, University of Groningen, University of Twente, Delft University of Technology, or a degree from a hbo-bachelor's programme in the area of Industrial Engineering supplemented by the successful completion of a premaster's programme, consisting of six courses with a maximum of 30 EC. Enrolment from other university and hbo bachelor's programmes and the need for supplementing these with an additional premaster's programme, are discussed on an individual basis and monitored by the admissions committee. In the event that this tailor-made

homologation programme is 15 EC or less, students are directly admitted to the programme. Students can then follow these homologation courses in their master's programme.

During the site visit, students agreed with the panel that the OML intake was generally homogeneous: most students enrolling in OML had a background in Industrial Engineering. In their eyes, OML provided a smooth transition and clearly met student expectations. All OML students met during the interview considered their preparation adequate. They were positive about the premaster courses and the additional homologation courses. They did not encounter particular problems in following suit during their master's studies and praised their mentor's involvement and the engaging and motivating study climate amongst students. In their eyes, the OML programme is feasible within two years and they did not complain about particular courses or the workload, although many of them opted for additional courses and/or experiences to be even better prepared to enter the job market.

Students mentioned the competitive study climate at OML that motivated students to aim high; they considered themselves ambitious and hard-working. Staff of the School IE endorsed this portrayal. They agreed that OML tended to produce very competitive and ambitious students that easily worked 40 hours, or more, a week. The panel considers the study climate at OML healthy and has the impression that the programme is feasible within two years of study.

Didactic methods
In its didactic approach, the master's programme aims to provide students with the knowledge and skills needed to function independently, in more complex settings and at master's level. Hereto, students follow lectures and tutorials, complete assignments (both individually and in small group work) and apply their skills in increasingly complex settings. They are closely supervised by their personal mentor, who supervises and advises them during the full two years of their master's studies. Students follow lectures with active researchers that integrate their own research with the concepts, models and ideas taught. The close connection between up-to-date research and research methods was also reflected in the courses studied by the panel during the site visit. In conversation with the panel, students indicated to appreciate and recognise direct links between research and teaching. They also praised the guest lecturers that were invited to participate in certain courses, linking research to work practices in order to show implementations of research into practice. When asked by the panel, students could not identify particular courses embracing alternative teaching approaches within their courses.

The panel considers the used methods (tutorials, group and individual assignments and lectures) appropriate. Nevertheless, staff indicated to feel supported to develop their teaching practice by both the management and by the expertise provided by the university, in particular the offered TEACH programme and training opportunities. They regularly evaluate their experiences within courses and also reflect on their own teaching methods, a practice approved of by the panel.

Staff, support and student community
The quality of the teaching is monitored by the Programme Committee. The students in general were positive about the quality of the teaching. A 'Basiskwalificatie Onderwijs' (hereafter: BKO, University Teaching Qualification in English) must be obtained by all new faculty members within three years after being appointed and by tenured faculty members who wish to be promoted from assistant professor to associate professor, or from associate professor to full professor (these are TU/e requirements). The panel learned during the site visit that the amount of BKO-holders has vastly improved in the School IE from 53% (December 2015) to 65% (February 2017), with another 18% of teaching staff currently enrolled in BKO-training courses. The panel also learned about the continuous support to develop staff's teaching skills in teach-the-teacher meetings to exchange examples of best practice in university teaching. The panel congratulates the School IE on its active BKO training policy and the vast improvements over the last years an encourages it to continue their staff's professionalisation and reflection skills.

The panel found students of the School IE, both at bachelor's and master's level, very positive about the availability and accessibility of the academic staff, who engage in informal and formal feedback, are willing to answer questions regarding the courses and/or students' individual study paths. They also value the willingness of staff to guide them in one-to-one meetings and their openness to feedback. The quality of their teaching is rated high. In the critical reflection, the management of the School IE indicated their student-to-staff ratio as a point of current concern. The revised programme and increase in admission rates has increased the workload for both academic and supporting staff dramatically since 2012. Staff indicated in interviews with the panel to feel pressed for time due to their teaching load, resulting in less time available for research. Nonetheless, it is still possible to ask for a quartile free of teaching in order to focus on research. In addition, the management recently hired new staff members and the student-to-staff ratio dropped subsequently from 33.2 to 30.6 within the School IE. This is still high, but the panel is convinced that the concerns are adequately met by the management.

Master students are supported during their studies by a variety of members of the School IE's community. The study advisor monitors students and is available to answer questions about study planning, study progress, study-related or personal issues that may affect a student's success in the programme and is involved if special circumstances arise. In addition, international students are assigned a 'study buddy' or student mentor, a fellow student that is specifically trained to support international students to make them feel at home within the TU/e student community and to offer help and advice regarding practical matters. Nonetheless, in the critical reflection the programme indicated to consider the integration of international students still 'limited'. During the site visit, language skills of international students in particular were mentioned as a matter that needed close supervision, even though the TU/e has adequate entry requirements in place. The panel appreciates the attention paid to international students arriving in Eindhoven for their master's studies and want to congratulate the programme on its thorough supervision programme.

The School IE is proud of its generous time allowance for supervision and the OML master's programme benefits from a highly personalised supervision system. All master students choose a personal mentor, an experienced lecturer and qualified researcher, during their first semester. Mentors supervise students during the entire master's studies and act as first supervisor during the master's thesis project. They advise students regarding curriculum choices, the development of professional and personal skills and with respect to studying abroad. Students are highly appreciative of their student mentor's involvement and availability and the panel considers it a well-functioning and appropriate system for helping students to make the most of their studies.

Supervision during the master's thesis project is extensive. Staff members are assigned 70 hours in total to mentor master students during their master's thesis project, including reading, and marking: 55 hours are assigned to the first supervisor/mentor and 15 hours to the second and third supervisor combined. Tasks between the three members of the thesis assessment committee are clearly defined. The first supervisor is involved in daily supervision; the supervised master theses are by and large an integral part of his or her own research projects and therefore are well-embedded within a capacity group's research. The second supervisor derives from any of OML's capacity groups, keeps an eye on the overall process and is involved in the go/no go decision based on the thesis plan. The third supervisor is not involved in actual supervision, but acts as an assessor. The assessor represents a more disciplinary focus than the first and second supervisor and is qualified to judge whether the engineering aspect is properly represented in the master's thesis project. In meetings with the panel, both students and teaching staff were highly appreciative of the current supervision system.

Industria, the School IE's Study Association, is also active in creating community building. Industria offers both social and study-related meetings and activities, of which company visits and study trips are rated high by the students that the panel met during the site visit. Industria also organises formal feedback sessions, of which the results are shared and discussed with the programme management. Alumnia, the alumni association of all three programmes of the School IE, regularly organises network opportunities for former and current students. These initiatives are appreciated by students,

but both the students and alumni met by the panel indicated that they would like to further establish connections between the work field and the student community. The panel therefore feels that Alumnia may be underused for creating links between the student community and the work field based on the reports by both students and alumni. It therefore recommends the programme to intensify its ties with its alumni and to strongly support Alumnia's initiatives. Alumni could potentially be a good source for internships, job market orientation.

The panel looked into the active involvement of stakeholders in the programme design. Both the Programme Committee and the student association Industria formally and informally advised the management on the curriculum redesign, and continue to do so. The academic staff was extensively involved in the programme redesign. They continue to meet on a regular basis, both plenary and within capacity groups, to curriculum and design of the master's programme, and to suggest changes driven by scientific research. The panel verified that the Programme Committee actively studies course evaluations and advises on measures to be taken in reaction to negative feedback by students. It also tracks the actions taken by the management regarding feedback. Both students and academic staff indicated to benefit from an open-door policy, which results in informal conversations on the content of courses and the curriculum design. Students pointed out to be taken seriously when offering feedback on their programme. Their feedback was promptly met by both teachers and the management.

Considerations

The OML programme and curriculum is embedded in the School IE's research interests, but also provides a clearly distinctive master's programme. The curriculum offers five distinctive tracks for further specialisation within the field and also allows excellent and ambitious students to either specialise in research or to combine degrees. In addition, the programme benefits from a wide variety in excellence programmes offered by the School IE and the university. The five specialisation tracks offer plenty of opportunity for gaining expertise within the discipline while also creating an individual profile.

The programme benefits from a dedicated teaching staff that regularly aligns its courses, and also takes feedback into account and acts upon it. The panel appreciates the staff's proactive and problem-solving attitude regarding the challenges posed by the new curriculum and programme design and the increased workload in response to the increased student intake in the School IE since 2012. Notable improvements regarding the professionalisation and reflection skills of the staff have been recognised by the panel. Staff and management regularly discuss the curriculum in formal and informal meetings with all relevant stakeholders. The panel suggests introducing an annual feedback moment regarding the full programme with students and staff, to continue improving the new curriculum.

Some minor improvements could still be made. The panel recommends the programme to connect more actively with its alumni, who could potentially be a good source for internships and job market orientation. The School IE is currently suffering a high staff-to-student ratio. As a result, staff is pressed for research time. The panel has verified that the programme management is aware of this problem and that it is taking adequate measures to address the matter. Continuous vigilance in this matter is, however, necessary in order to continue guaranteeing the good connection between research and teaching that has been established for the current programme.

The panel verified that the student learning environment at the master's programme OML enables students to meet the intended learning outcomes. The coherence and content of the programme is well-structured and based on up-to-date scientific research and embedded within an engineering context, reflecting OML's focus on strategic decisions and business processes within a specific application domain or industry branch. The wide availability of appropriate tracks and specialisation-related courses is, in the panel's eyes, an asset of the TU/e OML programme and translate into well-educated engineers with diverse profiles for an equally diverse work field.

The panel was in particular appreciative of studied material for the core course 'Research Methods'. It found it well-designed and hands on and, in combination with the well-laid out thesis manual and the compulsory 'Literature Review', an excellent preparation for the master's thesis project both methodically and scientifically. The development of students' professional skills is organised on an individual basis, supervised by the students' mentors. Although the panel appreciated the centrality of the professional skills in the TU/e GS, its highly personal and individualised set up demands continuous evaluation of both students' and mentors' performance.

The panel ascertained that OML students are ambitious and driven; it appreciated the enthusiasm of students for the new curriculum. The programme also manages to successfully prepare its students to meet the intended learning outcomes. The internationalisation programme of OML is extensive and ambitious, and functions well. A high amount of students take parts of their studies abroad, which the panel considers both desirable and praiseworthy. With a wide variety of options, a well-functioning homologation and internationalisation programme and a professional and innovative staff, OML's teaching-learning environment offers a good environment for students to achieve the intended learning outcomes.

Conclusion
The panel assesses Standard 2 as 'good'.

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

Explanation:
The tests and assessments are valid, reliable and transparent to the students. The programme's examining board safeguards the quality of the interim and final tests administered.

Findings
The master's programme OML is part of the School IE and shares an assessment policy with the bachelor's programme IE and the master's programme IM. The assessment policy of the School IE is described in both the critical reflection and in an addendum provided to the panel. This addendum contains the examination policy as in place since 2016, describing the school's vision on quality assurance of assessment, practical tools and procedures for implementing this vision and a description of the tasks and involvement of the Board of Examiners (hereafter: BoE). It is deduced from the examination policy of the TU/e. In addition to this material, the panel studied a selection of assessment material, a selection of theses with its accompanying assessment forms, and several result lists for past examinations during the site visit. It also met with representatives of the BoE.

Board of Examiners
The BoE consists of six members in total: five staff members and an external member. They are assisted by an independent secretary. Besides the expertise of the BoE members in the different disciplines of IE, the BoE members possess also basic knowledge expertise in law, quality assurance and testing. The BoE has delegated some of their tasks to subcommittees: a committee for daily tasks and an assessment committee for quality assurance of master's and bachelor's theses have been appointed. The BoE regularly meets with the management of the programme to discuss their findings and regularly meets with the teaching staff. During these meetings, it regularly brings up the need to secure both the engineering and science direction of the programme.

The MSc thesis assessment committee is bound to check a stratified sample of theses every semester. This system is considered a good measure by the panel to create the necessary alignment between marking practices. In December 2016, spot checks of OML's course assessments have additionally been introduced. The panel heartily supports the assessment committee's importance as a quality assurance mechanism and recommends paying attention to the time allocated to assessment committee members to perform these important tasks.

The BoE's main concern is quality assurance of the diplomas and checking for coherence of individual study paths next to its task to address individual student requests. In addition, it monitors the quality of all assessments of individual courses within the programme at procedure and content level and advise the programme management regarding the implementation of learning outcomes. The panel observed that the BoE is performing these tasks at a satisfactory level for the master's programme OML. The BoE checks the coherence of individual study paths of students. Test results are monitored and students fill in questionnaires after each course. All this information feeds to the BoE. When encountering irregularities, the BoE investigates and reports back to the programme management. The panel advises the BoE to also consider introducing spot checks by independent educationalists in order to annually screen (a selection of) individual courses, including its assessment, within the programme to further assure the quality of assessment.

The BoE's aims to develop test matrices for the different programmes in the School IE, an ambition that is warmly supported by the panel. Test matrices are useful to inform both staff and students about the various types and forms of assessment within each individual course. Additionally, they could connect individual learning outcomes to specific courses and examinations, creating transparency about the various ways in which the programme's intended learning outcomes are embedded within the curriculum. An additional benefit would be that further clarity is introduced regarding the composition of grades for both students and staff members.

Quality of Assessment
The panel studied a representative selection of module and course assessments during the site visit, as listed in Appendix 6. Examinations are drafted based on the course's intended learning outcomes and discussed, reviewed and assessed by at least two lecturers; this practice is monitored by the BoE. Examinations at OML are marked by two staff members to ensure that the assessment is fair. In certain courses, students additionally peer review their fellow students' work. Students reported to the panel to be well-informed about the assessment methods in the prospective and course manuals. They consider the assessment procedures transparent and are aware of the criteria for assessment. The panel renders the assessment procedures amply implemented and developed.

Students are allowed to start with their master thesis project when they have obtained at least 80 EC. They are supervised by their mentor. Every student is assigned a thesis assessment panel, consisting of three members: their mentor as first supervisor, a second supervisor – a senior member of one of the OML capacity groups that is involved in the go/no go decision and the assessment of the thesis – and a third member that acts as an assessor with a more disciplinary outlook that also safeguards the engineering aspects of the thesis project. The BoE's assessment committee performs spot checks since Spring 2016, providing an independent quality mechanism that assures alignment between and quality assurance of the master theses. This system is considered promising by the panel, yet needs to proof itself in the coming years.

In addition, the panel studied the assessment forms of the master thesis of students at OML. The assessment forms have been recently updated. A standardised assessment form is used for the evaluation of the graduation project. It is are currently divided in two categories of assessment: 1. the assessment of research and analysis, and 2. professional skills. Both categories have been divided in subcategories and some space for further justification of the assessment has been assigned to both categories. Students are assessed on both their thesis and the process resulting in the thesis. Thesis and process are separately graded, feeding into one final grade that is based for 70% on the thesis assessment and 30% on the process assessment. Supervisors are obliged to comment on both marks, and also to explain differences in the assessment of the thesis and the process. For the thesis part, students are assessed on four aspects: the scientific quality and scope, the quality of the research method, the quality of the solution and the quality of the written communication. For the process part, students are tested on five aspects: project management and planning, internal and external cooperation, academic attitude, societal awareness, oral communication. All nine aspects are rated on a scale of four judgements, ranging from 'insufficient' to 'excellent'. Three thesis aspects,

namely scientific quality and scope, the quality of the research method and the quality of the solution, must be at least rated 'sufficient' for grades over 5.5, or the absolute minimum for a pass grade.

Although the assessment forms have improved over the last couple of years, the panel recommends introducing, for example, rubrics or another suitable instrument to enhance the transparency of grading and the composition of grades. Rubrics set scoring guidelines that can be used to provide consistency in evaluating student work and would therefore benefit the transparency and reliability of the grading. They spell out scoring criteria so that multiple teachers would arrive at the same score or grade. As examiners fill in the same form and determine grades together in conversation, students have no insight into the discussion between their examiners. The panel recommends filling in separate forms for further transparency. In addition, it is currently difficult to tell what 'sufficient' entails. Whereas three out of nine aspects need to be assessed 'sufficient' for a pass grade, it is unclear what happens when other aspects fail to meet the pass mark based on the assessment forms.

Considerations
The panel established that the bachelor's programme OML has a satisfactory assessment system. The quality of assessment and achieved learning outcomes is safeguarded. Examinations are drafted with the involvement of two members of staff, and marked by two independent examiners. The quality of assessment of the master thesis is even assured by the involvement of three members of staff: two supervisors and an independent assessor that assures the engineering aspect and disciplinary focus of the thesis project. The panel considers these examples of good practice in the quality assurance of assessment at the master's programme.

The BoE's aims to develop test matrices for the different programmes in the school, an ambition warmly supported by the panel. Some other improvement could be considered. The panel recommends to redesign the thesis assessment forms for further qualitative feedback and additional transparency into the composition of grades. Furthermore, separate forms for all examiners would fuel further transparency into the assessment process. The panel advises the BoE to also consider introducing spot checks by independent educationalists in order to annually screen (a selection of) individual courses in its totality – including its course load, programme, assessment methods, evaluations – to further assure the quality of the programme.

The BoE of the School IE functions within the constraints of the law. It regularly convenes with management and informs both students and staff about assessment procedures and assures the quality of assessment throughout the programme. The BoE's assessment committee is also bound to perform stratified spot checks of the master theses every semester. In December 2016, spot checks of course assessments had also been introduced. This is appreciated by the panel and deemed a good additional and fully independent control mechanism to safeguard the quality of assessment by the panel, yet the results of this measure could not yet be ascertained. The panel recommends paying attention to the time allocated to assessment committee members to perform these important tasks. Therefore, the panel concluded that the BoE at OML seems to be in control and has various instruments in place to guarantee a fair assessment of all assessments, including the master thesis project.

Conclusion
The panel assesses Standard 3 as 'satisfactory'.

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

Explanation:
The level achieved is demonstrated by interim and final tests, final projects and the performance of graduates in actual practice or in post-graduate programmes.

Findings
Prior to the site visit, the assessment panel studied a selection of fifteen master theses in order to establish the level achieved by graduates. Being the final element of the programme, and the only element to cover all intended learning outcomes, the thesis is best suited to determine the level achieved by students. Students conduct a project that should not only result in a (data) analysis, but also in a theoretical or applied design to address the problems identified in the analysis. The design orientation of the master thesis is therefore ensured, which is also assessed by the third assessor with a disciplinary focus. An overview of the thesis selection is included in Appendix 6.

The panel confirms that all theses are at least of sufficient quality, and that the average level of achievement is good and in individual cases outstanding. All studied theses demonstrated the students' achievement of the intended learning outcomes and were graded appropriately. The panel considered the average level of achievement high: based on the information provided for the complete cohorts 2014-2015 and 2015-2016, approximately 30% of all OML students scored a grade of 8,5 or higher and only approximately 22% a grade of 7 or lower. The studied theses also reflected this tendency towards good achievement: they reflected creativity and innovation in the used approaches and models, embedded within a well-developed theoretical framework, benefiting from a good literature survey – potentially partly the result of the compulsory literature survey undertaken in year 2. The mathematical embedment and model-building was on average well-developed. The panel appreciated the attention paid to sustainability in some of the theses with the highest grades in the studied selection, reflecting a keen eye for new developments and problems with societal relevance within the capacity groups' research. It also encountered many helpful suggestions that could truly benefit a company's or organisation's practice that were both operational and relevant.

During the site visit, it became clear that all thesis projects are executed within the mentor's professional and research networks, all of which are of good reputation. The mentor vets the student's research question, helps the student to find a suitable company or organisation from the mentor's network. Consequently, the master thesis is always related to the mentor's research, to the capacity group's research interests and to the mentor's professional network. This results in close connections between research and the master's thesis project. Teaching staff indicated that this collaborative attitude worked well, as it also ensured that students worked within their particular expertise and interests that eventually also fed into their own research. Students reported back to the panel to appreciate the opportunity to work within both a research group and a company or service organisation, and they felt embedded and appreciated.

The level achieved by graduates is also demonstrated by their performance upon graduation. Alumni of the master's programme reported that they did not encounter significant problems in finding a job and they felt sufficiently prepared for the labour market. The number of graduates that pursue an academic career is limited. Most students are interested in a job in industry or a service organisation. Nonetheless these observations, the alumni indicated to feel adequately prepared for a potential academic career and knew some former students that indeed had embarked upon a career in academia. The alumni of the OML master's programme emphasised their solid mathematical background and their more analytical approach in countering problems within the work field. They considered themselves theoretical in their approach, but aiming at operational solutions that were appreciated by their current employers. The panel confirms these impressions, also based on their evaluation of the considered theses. It considers OML students well-placed to succeed in their careers, also based on the noted ambitious drive to excel during their master's studies and on their good theoretical and mathematical background.

Alumni of OML emphasised not feeling actively engaged with their former School, to the panel's surprise. Eindhoven, both as a city and with its university's reputation, is in its eyes in an excellent position to involve their alumni within their programmes, for example by inviting them for additional guest lectures and network events. Based on the critical reflection, the School IE's alumni organisation Alumnia seems part of the programmes' fabric. The panel therefore recommends the programme to further develop their alumni engagement.

Considerations
The panel ascertained that all graduates of the master's programme OML achieved the intended learning outcomes at a satisfying level and performed on average good, based on the quality of their theses. All theses were adequately graded. They consider the level of achievement on average high, showing good research embedded in an engineering context. The best of the evaluated theses demonstrated excellent research, benefiting from a good theoretical and mathematical basis with an eye for innovative research topics with societal relevance. Master graduates easily enter the job market, on which their profile and skills are highly valued. Although the School IE has an established alumni organisation in place, the panel advises the programme to further develop their alumni engagement.

Conclusion
The panel assesses Standard 4 as 'good'.

GENERAL CONCLUSION

The panel assessed standard 1, the intended learning outcomes, as satisfactory. The intended learning outcomes have been specified in terms of content, level and orientation; they meet international requirements. Nonetheless, these could be further concretised to inform the curriculum and direct student learning.

Standard 2, the teaching-learning environment, was assessed as good. The panel established that the curriculum, staff and programme-specific services and facilities enable the incoming students to achieve the intended learning outcomes, with certain room for improving the involvement of alumni, the organisation of formal feedback on the programme and curriculum design and the student-to-staff ratio. The panel found in particular the programme's international ambitions and the way they were implemented commendable and an example of good practice within the field. It considers the didactic methods and teaching methods accurate, yet encourages the staff to experiment with innovative teaching methods to further stimulate student learning and development.

The panel assessed standard 3, assessment system, as satisfactory. The programme has an adequate assessment policy, and the Board of Examiners is performing its legally mandated tasks. The assessment forms currently used for the master's thesis project could be improved upon, which the panel therefore recommends.

Standard 4, achieved learning outcomes, was assessed as good. The panel ascertained that graduates of the master's programme OML achieved the intended learning outcomes at a satisfying level for an academic master's programme and performed on average good. All theses were adequately graded. Master graduates embark relatively easy on promising careers, in which their profile and skills are valued.

Conclusion
The panel assesses the *master's programme Operations Management And Logistics* as 'good'.

APPENDICES

APPENDIX 1: CURRICULA VITAE OF THE MEMBERS OF THE ASSESSMENT PANEL

Professor Rob Van der Heijden (chair) graduated in 1981 from Eindhoven University of Technology as a building engineer. He received his PhD in Building Engineering from the same university in 1986. From 1987-1993 he worked as (Associate) Professor at the Faculty of Civil Engineering of TU Delft. In 1994, he was appointed Full Professor in Transport and Logistics at TU Delft. Radboud University Nijmegen offered him a position as Full Professor in Urban and Regional Planning in 2001. Between 2008-2010, he was Director of Research at the Institute of Management and Vice-Dean of Research at the Nijmegen School of Management (NSM). Professor Van der Heijden was Dean of the Nijmegen School of Management from 2011-2016. Since June 2016, he is Professor in Innovate Planning Methods within the NSM. His research is in the fields of spatial planning, decision making and governance with a special focus on issues of transport, logistics and infrastructure development.

Erik Demeulemeester is Full Professor at the Faculty of Economics and Business (since 2001) and Head of the Research Center for Operations Management at KU Leuven in Belgium. Additionally, he is Chair of the Department of Decision Sciences and Management Informatics. Erik Demeulemeester received a degree as commercial engineer in Management Informatics in 1987, a Master of Business Administration in 1988 and a PhD in 1992, all from KU Leuven. Professor Demeulemeester is a member of the editorial board of the *European Journal of Operational Research*, the *Journal of Scheduling, Computers and Operations Research* and the *European Journal of Industrial Engineering*. He is a jury member for the EURO Excellence in Practice Award (EEPA), which will be awarded at the EURO-k conferences in 2016, 2018 and 2019. His main research interests are project scheduling and health care planning, both feeding into his current teaching practice and his numerous publications.

Professor Harrie Eijkelhof has specialised knowledge of didactics and teaching methods in science education. Until his retirement in 2014, he was Director of the Freudenthal Institute for Science and Mathematics Education at the Faculty of Science at Utrecht University (2011-2014). Previously, he was Professor of Physics Education at the Faculty of Physics and Astronomy at the same institution (1997-2011). Professor Eijkelhof has ample experience in teaching, educational models, didactics, assessment and professional development of executives in university education. From 2005 to 2010, he was Vice-Dean of undergraduate studies at the Faculty of Science, Chairman of the Board of Studies of the Undergraduate School, member of the examination board of Liberal Arts and Sciences and a member of the Advisory Board of Education at Utrecht University.

Professor Jan Kratzer is Chair of Entrepreneurship and Innovation Management and Managing Director of Center for Entrepreneurship at Berlin Institute of Technology, Germany. In the School for Business and Economy, he holds the function for Vice-Dean for Research and Internationalisation. In addition, he is editor of *Creativity and Innovation Management* (CIM) and member of the editorial board of the *Journal of Product Innovation Management*. Within the European Institute of Innovation and Technology (EIT), professor Kratzer was involved in designing the educational programs. His research mainly focuses on factors that drive entrepreneurial activities towards success: he studies networks of entrepreneurs, social networks and creativity, entrepreneurial education, social entrepreneurship, online social networks and entrepreneurial opportunities, among others. His work is widely published in many leading international scientific journals.

Sofie Vreriks BSc (student member) is in her second year of her master Industrial Engineering and Management at the University of Twente. From 2010 – 2011, she studied Communication Science before moving to Industrial Engineering and Management, also at Twente. Vreriks received her bachelor's degree in 2014, with a minor in International Business and Exploration. After finishing her undergraduate degree, she worked for a year as an intern and a project coordinator for Royal Philips in Amsterdam.

APPENDIX 2: DOMAIN-SPECIFIC FRAMEWORK OF REFERENCE

Domain-Specific Frame of Reference Industrial Engineering and Systems Engineering
(As confirmed in Utrecht on 10 March 2016)

This document has been written as a short summary of views on the field of Industrial Engineering and Systems Engineering (IE&SE). These views have been gathered from organizations that focus on the professional development and application of the field http://esd.mit.edu/;http://www.abet.org/). In addition, SE engineers (http://www.iienet.org; http://msom.society.informs.org; http://www.informs.org; http://www.incose.org) and leading academic programs in the field (http://ieor.berkeley.edu/; http://www.isye.gatech.edu/; http://www.cesun.org; http://www.stanford.edu/dept/MSandE/; http://www.epp.cmu.edu/; http://esd.mit.edu/; http://www.seor.gmu.edu/). A few excerpts from these texts are included in the separate text box.

Although there are some clearly common elements in these descriptions, we observe that the various different emphases of these organizations' IE&SE programs have necessitated each of them to formulate their own view of what the field of Industrial Engineering and Systems Engineering represents in education, application, and research. The same also holds for the IE&SE programs at UG, TUD, TUe, and UT. This document gathers the overarching elements of these programs, but we emphasize that each of these IE&SE programs has unique elements that will be highlighted in the self-assessments.

1. Common elements of the field of IE&SE
These common elements concern: (a) the common basis, (b) the focus: (re-)design, implementation, installation, and improvement of products, processes and systems, (c) broadly applied in private and public domains and within and between organisations, (d) the application of quantitative methods (and combination with qualitative methods), and (e) complex problem solving with a scientific and a pragmatic multidisciplinary approach.

(a) The common basis
Industrial Engineering (IE) and Systems Engineering (SE) are interrelated.[1] IE is concerned with the design, improvement, implementation and installation of integrated systems of people, information, materials, equipment and energy. It focuses on the analysis, design and control of (innovative) processes, products and systems in an industrial and/or societal environment, both at the level of individual organisations and supply networks as well as strategic issues. It involves the use of new processes, materials and production- and manufacturing techniques in innovative ways. SE mainly focuses on inter-organisational questions that involve the use of technology and the interests of multiple stakeholders, typically linking public and private organisations. As a consequence the common basis of IE en SE draws upon specialised knowledge and skills in the mathematical, physical, chemical and social sciences together with the principles and methods of engineering analysis and design in order to specify, predict, and evaluate the results to be obtained from the systems involved.

(b) The focus: analysis, design, implementation, and performance improvement of processes, critical infrastructures, and systems
IE&SE is concerned with the design and improvement of operational and/or strategic processes and integrated systems. These processes or systems provide products or services to customers or to the society at large. As such both private and public organisations are concerned. The design and improvement of products, processes and systems considers multiple goals and the availability of limited resources, such as time, money, materials, energy and other resources. Several organizations and multiple stakeholders may be involved (supply chains, alliances, public-private partnerships) and governance structures can be part of design and improvement initiatives. The scope of design thus

[1] "Industrial Engineering" refers to the programmes at TU/e and UT, while the term "Systems Engineering" better fits most programmes at TUD.

may include supply chain networks, production and manufacturing techniques, products, control of systems, implementation, installation and validation. The multidisciplinary, integrated design approach including the design context distinguishes IE and SE's from specialized engineering disciplines. In summary, IE's and SE's may be considered Productivity and Efficiency Professionals.

(c) Broadly applied, both in private and public domains and both within and between organizations

IE&SE is used in a variety of fields. It applies along all steps in the product life cycle, from research and development over design, manufacturing, distribution and disposal. And it applies in all phases of the value chain. Whereas initial applications were mainly limited to industrial settings, we now witness more and more applications in the service industry. Its principles apply as well in all fields of the private as in the public sector. Today there is a fast growth of applications in banking, healthcare, transportation, and the like.

Therefore the term "industrial" can be misleading; this does not mean just manufacturing. It encompasses service industries as well. It has long been known that industrial engineers have the technical training to make improvements in a manufacturing setting. However, many of the same techniques can be used to evaluate and improve productivity and quality in a wide variety of service industries, as well as in the public sector. The term "Systems Engineering" emphasizes this broader scope for design, improvement, and problem solving.

(d) The application of quantitative and qualitative methods

IE&SE is a field of engineering and one important element of its approach to the design and improvement of products, processes and systems is the use of data analytics and quantitative modelling methods. These are derived from fields such as operations research, management science, mathematics, natural sciences, economics, data analysis and statistics, information systems, game theory (gaming, simulation and Q-methods), engineering and social science methods such as interviews and questionnaires.

(e) Complex problem solving with a scientific and pragmatic multidisciplinary approach

Complex problems where value systems may clash and the status of knowledge claims may be disputed are central to IE&SE. In order to be able to solve these kinds of problems, it is necessary to synthesize knowledge from different disciplines (e.g., engineering, natural sciences, (institutional) economics, mathematics, organizational behaviour, law, psychology, although not all disciplines are equally important in all problem domains). IE&SE draws upon specialized knowledge and (analytical) skills in the mathematical, physical, and social sciences, together with the principles and methods of engineering analysis and design. Unlike traditional disciplines in engineering, IE&SE addresses the role of human decision-makers and other stakeholders as key contributors to the inherent complexity of systems. The programmes offer the relevant knowledge and skills from different disciplines and provide a framework for the application and integration of this knowledge in analysing a problem situation and in designing and implementing solutions. In brief, IE's and SE's might support (scientific) decision making.

Besides scientific IE&SE people also ought to be pragmatic people. They work to understand and resolve real problems from society and hence - as stated above - need to combine the knowledge and experience from many disciplines to develop project and process-management expertise and communication skills. They choose their method so as to fit the problem, which means that they combine the quantitative and problem-solving approach of engineers with research methods and qualitative insights from the social sciences.

2. Generic competences

Taking into account the before mentioned common elements of the field generic competencies for industrial and systems engineering are listed below:

- Sufficient understanding of science, technology and technological innovation;
- Keen analytic mind-set combined with a drive to synthesize towards a solution;

- Competent in translating complex issues in workable models and design and execute appropriate research programmes;
- Adequate mathematics skills for modelling and executing research activities;
- Able to conduct standard experiments, tests and measurements, and to analyse and interpret and apply the results in order to improve products, processes and systems;
- Able to (re)design products, processes and systems in an IE&SE context;
- Adequate understanding and competences in a number of technical, economic and social disciplines to underpin research programmes;
- An adequate understanding of the drivers of socio-,economic and political organizations in society;
- Able to assess the impact of IE&SE products, processes and systems in a business, societal and global context;
- Able to organize and drive for efficiency and effectiveness;
- Resourcefulness and creative problem solving;
- Excellent communication, listening, and negotiation skills;
- Ability to adapt to many environments, interact with a diverse group of individuals and understand the roles of various stakeholders in the processes;
- Experience in working in an interdisciplinary and international environment;
- Able to identify the arising ethical dilemma and to reflect on this dilemmas.

3. BSc and MSc levels

The specific blend of competencies varies per programme and is laid down more specifically in the final qualifications of each programme. Although the emphasis varies among the programmes, there is a differentiation between the BSc and MSc levels regarding to

- Complexity of the problem situations (in terms of technical and/or stakeholder complexity and/or the number of disciplines involved);
- The amount of information necessary, known, and available from the practical problem situation;
- The level of autonomy.

Bachelors receive a sound general education in basic fields of IE&SE, like Natural Sciences, technology, engineering, optimisation, production- and process techniques, engineering economy, business economy, organisational theory, social sciences, etc...) However, specific choices in these basic fields, varies per programme. They should be able to continue studies on a more in depth and specialised Master's track or they may fill appropriate positions in business.

Master programs in IE&SE generally offer different fields of study in which students can specialise. Examples of such fields are operations management, operations research and management science, CIT, product design and logistics, policy analysis, man-machine systems, performance analysis, supply chain management, process- or production techniques, innovation processes, control engineering, etc.

Whereas bachelors are mainly involved in analysis (as the initial step in the design cycle), Masters typically deal with design questions. Above that they should also be exposed to research questions. Masters should be able to formulate and carry out independent research projects.

The IE&SE Bachelor programs provide an excellent basis for one of the IE & SE Master programs, but students in IE&SE Master programs also can have various undergraduate backgrounds in engineering and other quantitative fields. Graduates of a Master's programme will typically start their career as engineers, project or planning managers, functional managers, policy analysts/advisers, engineering consultants and the like. But they may as well start an academic track through further involvement in research (e.g. PhD and academic positions). They should be able to move later on to managerial positions (e.g. as CTO). Some may prefer to become private entrepreneurs.

Excerpts from: http://www.iienet.org/Details.aspx?id=282

Institute of Industrial Engineers (IIE) **Definition of Industrial Engineering:**

'IE is concerned with the design, improvement and installation of integrated systems of people, materials, information, equipment and energy. It draws upon specialised knowledge and skill in mathematical, physical and social sciences together with the principles and methods of engineering analysis and design, to specify, predict and evaluate the results to be obtained from such systems'

Excerpts from http://www.stanford.edu/dept/MSandE/about/MSandE-5yr.pdf

Stanford Engineering established the Department of Management Science and Engineering five years ago with a logic and a purpose: engineers know how to analyze and solve problems and they thoroughly understand technology. With this quantitative background and additional training, for example in social sciences or finance, engineers should therefore be leaders in management and public policy.

The department's eight research areas [are]: organizations, technology management and entrepreneurship; production and operations management; decision analysis and risk analysis; economics and finance; optimization and the analytical tools of systems analysis; probability and stochastic systems; information science and technology; and strategy and policy. MS&E also includes several centres and programs such as the Energy Modelling Forum and the Centre for Work, Technology and Organization. In addition, it hosts the Stanford Technology Ventures Program. The department's strengths are also manifest in the talents of students and alums who work in investment banking, management consulting, and other fields that have not been closely associated with engineering in the past. These fields will be in the future because a deep understanding of technology has become critical to their operations. "For example, a growing number of people address finance problems using methods that have been traditionally associated with engineering systems analysis," says Paté-Cornell, referring to the fast-growing specialty of financial engineering. Paté-Cornell's hope is that more engineers will also join the ranks of government and use their skills to shape and implement policies.

MS&E students gain the training that they need to be leaders in finance, industry, policy, or other specialties by completing a core engineering curriculum, followed by a concentration in an area such as finance, operations research, production, or public policy.

Excerpts from www.isye.gatech.edu

Georgia Tech: Industrial engineering (IE), operations research (OR), and systems engineering (SE) are fields of study intended for individuals who are interested in analyzing and formulating abstract models of complex systems with the intention of improving system performance. Unlike traditional disciplines in engineering and the mathematical sciences, the fields address the role of the human decision-maker as key contributor to the inherent complexity of systems and primary benefactor of the analyses. In short, as practitioners and researchers in IE/OR/SE, we consider ourselves to be technical problem solvers. We are typically motivated by problems arising in virtually any setting where outcomes are influenced by often complicated and uncertain interactions, involving a variety of attributes that affect system performance. Against this backdrop, students have historically been attracted to our academic programmes with a variety of career objectives and from a host of disciplines and academic interests.

APPENDIX 3: INTENDED LEARNING OUTCOMES

Master's programme Operations Management and Logistics

Domain-specific learning outcomes of IE MSc OML
Graduates of the IE MSc OML program are engineers who:

D1. Have state-of-the art scientific knowledge of the design, behavior, planning, and enhancing performance of operational processes in industrial and service organizations. For this purpose graduates have multidisciplinary knowledge and insights stemming from the following disciplines: engineering economics, information systems, operations research, organization sciences, and work & organizational psychology.
D2. Have the research skills needed to independently conduct studies meeting academic standards in the domain of Operations Management and Logistics.
D3. Are well-capable of modeling and (re)designing complex business processes, based on the results of a study, including specifications and required information. Are capable of applying this knowledge and insight into operational, consulting, and managerial jobs in industry.

General scientific learning outcomes of IE MSc OML
The graduates of the IE MSc OML have an academic attitude, design skills, and a set of communicative and social skills. Because of this, they:

G4. Are capable of applying their knowledge and insight into research & development jobs in academia.
G5. Are capable of applying their knowledge and insight into operational, consulting, and managerial jobs in industry.
G6. Are capable of operating independently and in teams, at an academic level.
G7. Can critically reflect on their own thinking, decisions, and actions and behave systematically.
G8. Operate effectively and efficiently in a multidisciplinary context.
G9. Communicate clearly and unambiguously, both in industry and in academia, with non-specialists and specialists in the domain.
G10. Are aware of the relative importance of knowledge of scientific disciplines and the societal impact of scientific knowledge (and vice versa).
G11. Possess the necessary learning skills to enable them to enter subsequent programs requiring substantial independence, such as PhD programs or postgraduate professional programs or courses.
G12. Are capable of independently identifying and supplementing any lack of knowledge.

Academic criteria for IE MSc OML
Within the Dutch Qualification Framework, the IE MSc OML program is a WO (Wetenschappelijk Onderwijs, Higher Education) master's degree program.
In the following, we compare the learning outcomes of the IE MSc OML program with the academic criteria of the ACQA framework. From this we conclude that the IE MSc OML program has the required academic orientation.

Ad 1. Scientific disciplines: The IE MSc OML graduates have state-of-the art scientific knowledge of the design, behavior, planning, and enhancing performance of operational processes in industrial and service organizations. For this purpose graduates have multidisciplinary knowledge and insights stemming from the following disciplines: engineering economics, information systems, operations research, organization sciences, and work & organizational psychology.
Ad 2. Doing research: The IE MSc OML graduates have research skills to independently conduct studies meeting academic standards.
Ad 3. Designing: The IE MSc OML graduates are well-capable of modeling and (re)designing complex business processes, based on the results of a study, including specifications and required information.

Ad 4. Scientific approach: The IE MSc OML graduates are capable of independently identifying and supplementing any lack of knowledge. They possess the necessary learning skills to enable them to enter subsequent programs requiring substantial independence, such as PhD programs or postgraduate professional programs or courses.

Ad 5. Basic intellectual skills: The IE MSc OML graduates are able to critically reflect on their own thinking, decisions, and actions and behave systematically.

Ad 6. Co-operating and communicating: The IE MSc OML graduates are able to communicate clearly and unambiguously both in industry and in academia, with non-specialists and specialists in the domain. Therefore, they have adequate social and communication skills. Graduates are also capable of operating effectively and efficiently in (multidisciplinary) teams.

Ad 7. Temporal and social context: The IE MSc OML graduates are aware of the relative importance of knowledge of scientific disciplines and the societal impact of scientific knowledge (and vice versa).

APPENDIX 4: OVERVIEW OF THE CURRICULUM

Master's programme Operations Management and Logistics

IE MSc OML	Q 1.1	Q 1.2	Q 1.3	Q 1. 4
Year 1	1JM11 Performance Enhancement	1 - 3 Track Core Courses depending on track chosen (Track Core/specialization Electives: 1BM05, 1CM10, 1CM40, 1CM110, 1BM41, 1BM70)	1ZM11 Research Methods	1 - 3 Track Core Courses depending on track chosen (Track Core: 1CM60, 1CM140, 1BM100, 1CM130. Track Core/specialization: 1CM100, 1CM75)
	2 Electives (e.g. Specialisation Electives: 1BM10, 1CM120, 0LM120, 1ZM31) or other Free Electives or Homologation Course 1BK50	0 - 2 Electives e.g. Specialization Electives above. 1JM30, 1ZM35 or other Free Electives	2 Electives e.g. Specialization electives 1CM22, 1CM36, 1JM100, 1BM56 or Track Core Course 1BM56 or Other Free electives	0 - 2 Electives e.g. More Specialization Electives (1BM20, 1BM65, 1CM65, 1JM21, 1ZM65) or other Free Electives
Year 2	International experience and/or electives (such as literature review): 30 credits		Research proposal and Master Thesis Project: 30 credits	

APPENDIX 5: PROGRAMME OF THE SITE VISIT

Wednesday 18 January			
8.15	8.30	Arrival panel	
8.30	9.30	Preparation panel and checking documents	
9.30	10.30	Panel 0: Educational Management	Dr. Gunter J.T. Bombaerts, coordinator USE Dr.ir.Eric van der Geer-Rutten-Rijswijk, educational director Dr. Jeroen J.L. Schepers, program manager MSc IM Prof.dr.ir. Geert.Jan.J.A.N. van Houtum, substitute for dr. Tarkan Tan, program manager MSc OML Dr.Marjan C.W. Vrijnsen-de-Corte, adjunct educational director
10.30	11.00	Discussion panel (including break)	
11.00	11.30	Panel 1: Students BSc IE	Emma de Bruijn (first year) Martijn Buijvoets (second year) Jan Kleinlugtenbeld (third year) Jordy Klei (first year) Marliek Raadsheer (second year) Alexander Schoonderwoerd (second year) Tara Veldhuizen (third year)
11.30	12.00	Panel 2: Lecturers BSc IE (Major Courses	Dr.ir. Emiel E.M. van Berkum, department W&I Dr.ir. Nico P. Dellaert, OPAC Prof.Dr. Eva Demerouti, HPM Dr. Pieter M.E. van Gorp, IS
12.00	13.30	Discussion panel	
13.30	14.00	Panel 3: Students MSc OML	Renée Albers (first year) Jochem Kamst (second year) Justin Heel (second year) Tamara Schouten (first year)
14.00	14.30	Panel 4: Lecturers MS OML (core courses)	Dr. Zümbül Atan, OPAC Dr.ir. Remco M. Dijkman, IS Prof.dr.ir. Paul W.P.J. Grefen, IS Dr. Wido G.M. Oerlemans, HPM Prof.dr. Tom van Woensel, OPAC
14.30	14.45	Break	
14.45	15.30	Additional meeting: discussion BSc theses	Dr. Myriam.M.A.H.Cloodt, Quality Control Committee theses (BSc and MSc) Dr.ir. Eric van der Geer-Rutten-Rijswijk, educational director Dr. Prof.dr. Ton G. de Kok, chair examination board Dr. Allard Kastelein, Item, BSc examiner Dr. ir. Simme Douwe FlapperFlapper, BSc examiner Prof.dr. Tom van Woensel, substitute for S.Dabia who has left the Tu/e and who was BSc examiner
15.30	16.00	Panel 5: Students MSc IM	Sophie Arends (first year) Maaike Mennen (second year) Wouter Boersma (second year) Marieke Kil (first year)
16.00	16.30	Panel 6: Lecturers MSc IM (core courses)	Dr. Sarah E.C. Gelper, ITEM Dr. Josette M.P. Gevers, HPM Dr. ir. Bob Walrave, ITEM Dr.ir.arch. Isabelle M.M.J. Reymen, ITEM Dr. Anna M. Wilbik, IS

16.30	17.00	Discussion panel	
17.00	17.45	Panel 7: Alumni	Stan van Klink (BSc IE, no master) Pascal Mertens (MSc OML) Joost Vandewal (MSc IM) Floor Wiersma (BSc IE, started with master) Gillis van de Zande (MSc IM)

Thursday 19 January			
8.15	8.30	Arrival panel	
8.30	9.15	Panel preparations/office hour	
9.15	10.00	Panel 8: Program Committee	Dr. Sonja Rispens, HPM Dr.ir. Irene T.P. Vanderfeesten (chair), IS Dr. Luuk P. Veelenturf, OPAC Ward Beekmans (BSc-student) Zosha Droog (MSc-student)
10.00	10.15	Discussion panel	
10.15	11.15	Panel 9: Board of Examiners	Dr. Pascale M. Le Blanc, HPM Dr. Myriam M.A.H. Cloodt, ITEM Prof.dr. Ton G. de Kok (chair), OPAC Ing. Baukje Osinga-Kuipers (study advisor) Prof.dr.ir. Jos J. Trienekens, IS Dr.ing. Joost P.M. Wouters, ITEM
11.15	13.30	Preparation final interview	
13.30	14.30	Second interview Management	Dr.ir. Eric van der Geer-Rutten-Rijswijk, educational director Dr. Marjan C.W. Vrijnsen-de-Corte, adjunct educational director Prof.dr. Ingrid E.J. Heynderickx, dean Dr. Jeroen J.L. Schepers, program manager MSc IM Prof.dr.ir. Geert.Jan.J.A.N. van Houtum, substitute for Dr. Tarkan Tan program manager MSc OML
14.30	17.00	Discussion panel regarding preliminary findings and consultation with prof.dr.ir. R.E.C.M van der Heijden by telephone	

Monday 20 February			
15.15	16.30	Arrival panel and preparation	
16.30	17.30	Additional meeting: quality control and assessment procedures, skills development and assessment	Dr.Gunter J.T. Bombaerts, coordinator USE Dr.ir. Michel. W. van der Borgh, Item Dr.ir. Nico P. Dellaert, OPAC Dr.ir. Eric van der Geer-Rutten-Rijswijk, educational director Prof.dr. Ton G. de Kok (chair ex.cie), OPAC Ing. Baukje Osinga-Kuipers (study advisor) Dr. Thijs J.G. Peeters, ITEM Dr.Jeroen J.L. Schepers, program manager MSc IM Dr Marjan C.W. Vrijnsen-de-Corte, adjunct educational director
17.30	18.00	Panel discussion	
18.00	19.00	Final interview Management	Dr.ir. Eric van der Geer-Rutten-Rijswijk, educational director Prof.dr. Ingrid E.J. Heynderickx, dean Prof.dr.ir. Geert Jan van Houtum,vervanger. prog.man. MSc OML Prof.dr. Ton G. de Kok, chair ex.cie, OPAC

			Prof.dr. A.M.C. Lex Lemmens, dean Bachelor College Dr.Jeroen J.L. Schepers, program manager MSc IM Dr Marjan C.W. Vrijnsen-de-Corte, adjunct educational director
19.00	19.30	Deliberation panel, consultation, formulation preliminary findings	
19.30	19.45	Presentation preliminary findings (open to all)	

APPENDIX 6: THESES AND DOCUMENTS STUDIED BY THE PANEL

Prior to the site visit, the panel studied the theses of the students with the following student numbers:

Master's programme Operations Management And Logistics (OML)

667596	659041	619406
751049	629056	671481
653092	653630	791280
742274	616683	631705
825767	632369	633696

During the site visit, the panel studied, among other things, the following documents (partly as hard copies, partly via the institute's electronic learning environment):

MSc OML:
1CM140 Design of operation planning & control systems consumer goods
1JM11 Performance enhancement
IBM05 Business process management service operations
1BM41 Business information systems architecture transportation
1CM10 Modeling and analysis of manufacturing systems
1CM60 Design of health care planning and control systems
1 JM110 Research methods

Additional documents
Peer review lists ITEM, IS, HPM and OPAC
Graduate School Master Thesis Manuel Industrial Engineering
Study guide Bachelor End Project (18EPO)
Examination Policy School of Industrial Engineering (Version 2016)
Annual report Examination Board 2014-2015
Minutes Examination Board 2015-2016
Minutes Programme Board 2014-2015 and 2015-2016
Certificaat Technology Entrepreneurship MSc 2014.pdf
Curriculum Enquête 1e jaar TBdk tussenstand 2015-2016.pdf
Curriculum Enquête 2e jaar TBdk tussenstand 2015-2016.pdf
Curriculum Enquête 3e jaar TBdk tussenstand 2015-2016.pdf
International Experience 2015-2016
Jaarverslag internationale toelating 2015-2016-def.pdf
MSc IM Course description.docx
MSc OML Course description.docx
Overzicht Beoordelingen afstuederen BSc IE MSc IM, MSc OML.xlsx
TUe Intake and Enrollment 2016.pdf
Update Student Staff Ratio 2016.docx
Professional Skills in the Bachelor program Industrial Engineering.pdf
Memo vervolgbezoek visitatie IE 20 februari 2017.pdf

Index USB Stick Assessement 2016:
000_Index_File.docx
000_Index_File.pdf
000_Read_Me_First.pdf
000_Self_Assessment_School_IE_2016.pdf

000_Self_Assessment_School_IE_2016_PRINT.pdf
Ref_001_BSc_IE_Admission_2015-2016_en.pdf
Ref_002_BSc_IE_Annual_Report_2013-2014_en.pdf
Ref_003_BSc_IE_Annual_Report_2014-2015_en.pdf
Ref_004_BSc_IE_Awards_for_Students_and_Rankings_2010-2016_ennl.pdf
Ref_005_BSc_IE_Bachelor_College_Description_en.pdf
Ref_006_BSc_IE_Bachelor_Thesis_Assessment_Form_2015-2016_en.pdf
Ref_007_BSc_IE_Bachelor_Thesis_Description_nl.pdf
Ref_008_BSc_IE_Bachelor_Thesis_Study_Guide_en.pdf
Ref_009_BSc_IE_Basic_Courses_Assessments_2015-2016_en.pdf
Ref_010_BSc_IE_Basic_Courses_List_2015-2016_en.pdf
Ref_011_BSc_IE_Basic_Courses_Professional_Skills_2015-2016_nl.pdf
Ref_012_BSc_IE_Basic_Courses_Professional_Skills_Matrix_2015-2016_Enlarged_en.docx
Ref_013_BSc_IE_Basic_Courses_Professional_Skills_Matrix_2015-2016_Enlarged_nl.pdf
Ref_014_BSc_IE_Basic_Courses_Professional_Skills_Matrix_2016-2017_Enlarged_nl.pdf
Ref_015_BSc_IE_Basic_Courses_Professional_Skills_Matrix_2016-2017_Summary_en.pdf
Ref_016_BSc_IE_BSA_Study_Advice_VWO-Intake_2009-2015_nl.pdf
Ref_017_BSc_IE_Certificate_Technology_Entrepreneurship_2015-2016_en.pdf
Ref_018_BSc_IE_Coherent_Elective_Packages_2015-2016_ennl.pdf
Ref_019_BSc_IE_Coherent_Elective_Packages_2016-2017 ennl.pdf
Ref_020_BSc_IE_Declaration_TUe_Code_of_Scientific_Conduct_Bachelor's_Final_Project_2016_en.pdf
Ref_021_BSc_IE_Design_Based_Learning_Description_en.pdf
Ref_022_BSc_IE_Elective_Package_Advanced_Information_Systems_for_IE_en.pdf
Ref_023_BSc_IE_Elective_Package_Advanced_Operations_Management_en.pdf
Ref_024_BSc_IE_Elective_Package_Business_Economics_en.pdf
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