MANAGEMENT OF TECHNOLOGY

FACULTY OF TECHNOLOGY, POLICY AND MANAGEMENT,

DELFT UNIVERSITY OF TECHNOLOGY

QANU
Catharijnesingel 56
PO Box 8035
3503 RA Utrecht
The Netherlands

Phone: +31 (0) 30 230 3100
E-mail: support@qanu.nl
Internet: www.qanu.nl

Project number: Q0615

CONTENTS

This report was finalised on 28 March 2017

REPORT ON THE MASTER'S PROGRAMME MANAGEMENT OF TECHNOLOGY OF DELFT 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 Management of Technology

Name of the programme:	Management of Technology
CROHO number:	66995
Level of the programme:	master's
Orientation of the programme:	academic
Number of credits:	120 EC
Location(s):	Delft
Mode(s) of study:	full time
Language of instruction:	English
Expiration of accreditation:	31-12-2017

The visit of the assessment panel *Technische bedrijfs- en bestuurskunde* to the Faculty of Technology, Policy and Management of Delft University of Technology took place on 12 and 13 December.

ADMINISTRATIVE DATA REGARDING THE INSTITUTION

Name of the institution:	Delft 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 Systems Engineering, Policy Analysis and Management consisted of:

- Prof.dr ir. Rob van der Heijden, Radboud University Nijmegen [chair];
- Prof.dr. Harrie Eijkelhof, Utrecht University;
- Prof.dr. Arthur Petersen, University College London, United Kingdom;
- Prof.dr. Marcel Veenswijk, VU University Amsterdam;
- Prof.dr. Hens Runhaar, Wageningen University and Research & Utrecht University
- Maarten van Ruitenbeek, BSc, University of Groningen [student member].

The panel was supported by dr. Barbara van Balen, who acted as secretary. Appendix 1 contains the curricula vitae of the panel members.

WORKING METHOD OF THE ASSESSMENT PANEL

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

The project manager approached independent panel members based on the programmes' recommendations, taking into account the 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;
- Prof.dr Hens Runhaar, Wageningen University and Research & Utrecht 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. Prof.dr. Harrie Eijkelhof, an education expert with a long-standing academic career in the teaching of science, also 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 assure consistency of the assessments within the cluster.

Site visit TU Delft

Preparation
To prepare for the assessment, the management provided a critical reflection on each master's programme. In them, the management described the current state of affairs and provided useful information for the assessment of its programmes. The project manager checked the report for completeness of information before sending it to the panel members. In consultation with the chair, the secretary also selected 15 master's theses, covering the full range of marks given, a range of thesis subjects, and representing the various examiners and master's tracks.

Site visit
A site visit to the Faculty of Technology, Policy and Management at TU Delft took place on 12 and 13 December 2016 in the presence of all six panel members, assisted by an NVAO-certified secretary. Prior to the site visit, the panel asked the programme to select representative interview partners. It 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 the programme. For the timetable of the site visit, see Appendix 5.

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 with an opportunity to meet informally during a consultation hour outside the set interviews. No requests were received for this option. The panel used the final part of the visit for an internal meeting to discuss its findings. The visit concluded with an oral presentation of the preliminary impressions and general observations by the chair of the panel. This presentation was open to all.

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 incorporated accordingly. Subsequently, the programme checked it for factual irregularities. Comments by the programme were discussed by the secretary and chair and, where necessary, other panel members before the report was finalised.

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 master'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

Standard 1
The master's programme Management of Technology (MOT) aims to provide future leaders with opportunities to combine engineering and business knowledge in designing and implementing technology-based solutions to important commercial and social problems. Its ultimate objective is to improve the quality of technology and innovation management in the different engineering mono-disciplines in practice through the development of responsible decision-makers, professionals and leaders. The panel appreciates the ambition of the MOT programme to teach students to become comprehensive engineers, who go beyond the traditional boundaries of their fields.

The general learning outcomes have been elaborated in detailed intended learning outcomes. The panel was impressed by the thorough translation of the mission and objectives of the programme into the intended learning outcomes. The intended learning outcomes are transparent and informative, and they indicate what could be expected from a master's level programme. The panel ascertained that the intended learning outcomes meet the internationally accepted standards for academic master's programmes, the Dublin Descriptors.

Standard 2
The 120 EC MOT programme has an obligatory fixed package of 60 EC of course work in the first two semesters, where a solid analytical foundation is laid. The first year focuses on acquiring basic knowledge. The compulsory courses cover the four main clusters of technology and innovation: engineering economics, organisation, commercialisation and research/reflection. In a separate course, students learn how to integrate the different themes of the programme by the end of the first year. The third semester is filled with specialisation courses and electives, and the fourth semester is dedicated to the master's thesis project.

The didactical principle is learning by doing: practical application of theory. A variety of teaching methods is used, including innovative blended learning methods, which is greatly appreciated by the panel. The panel encourages the programme to progress further in this direction.

The panel established that the content and structure of the master's programme MOT enable the students to achieve the intended learning outcomes. With the MOT programme TU Delft fulfils an obvious demand from students to broaden their engineering knowledge and expertise with management expertise and to get a better view of what is happening with technology and engineering products in companies. The programme succeeds in building an international, stimulating learning environment supported by qualified teaching staff, creating a good study environment for students.

Standard 3
The Faculty of Technology, Policy and Management (TPM) described its assessment policy in the Assessment Policy 2013-2014 document. The panel studied a selection of test dossiers and master's theses and the accompanying assessment forms. Furthermore, it held a meeting with the Board of Examiners during the site visit. It verified that the programme has an adequate assessment system. The assessments are valid, transparent and reliable. The Board of Examiners is performing its legally mandated tasks adequately. The panel sees some risks in the preference of the Board of Examiners for an advisory instead of a more controlling position and recommends that it strengthen its independent position to guarantee the quality of the examinations.

Standard 4
The panel studied a selection of 15 master's theses to assess whether the graduates had achieved the master's graduation level. It concluded that the graduates had demonstrated that they had achieved the level that can be expected from an academic master. Furthermore, the panel concluded that master's graduates are highly appreciated in the professional field and that they

easily embark on promising professional and academic careers, in which their academic profile and skills are valued.
The panel assessed the standards from the *Assessment framework for limited programme assessments* in the following way:

Master's programme Management of Technology

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

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 it. They confirm that the assessment has been conducted in accordance with the demands relating to independence.

Date: 28 March 2017

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

dr. B.M. van Balen

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

The master's programme Management of Technology (MOT) is offered by the Faculty of Technology, Policy and Management at Delft University of Technology (TU Delft). The Faculty also offers one bachelor's programme *Technische bestuurskunde* and two other master's programmes: Engineering and Policy Analysis (EPA) and Systems Engineering, Policy Analysis and Management (SEPAM). The assessments of these programmes are described in separate reports.

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
The critical reflection stated that the master's programme Management of Technology aims to provide future leaders with opportunities to combine engineering and business knowledge in designing and implementing solutions to important commercial and social problems. Its ultimate objective is to improve the quality of technology and innovation management in the different engineering mono-disciplines in practice through the development of responsible decision-makers, professionals and leaders. It aims to teach the students to become comprehensive engineers and addresses questions that companies face such as: What technologies do we need and when? Do we procure the technology we need with our own research capabilities, in collaboration with outside parties, or by acquiring it or licensing it from others? How can we use the abundant technological opportunities to modify our mission, objectives and strategies?

The programme aspires to produce engineers who go beyond the traditional boundaries of their fields by engaging with people from other disciplines. According to the programme management, graduates of the programme are able to analyse technologies and their commercial impact and implement the solutions in the organisational context of the firm. They are able to investigate and understand what the current and future technological, economic and social environments are requiring technological firms to do, both internally in their own organisation and externally in relation to business partners. They are able to analyse and anticipate wider societal trends in which new technological production takes shape and which market the resulting products and services are to be sold in. The panel established that MOT not only educates the students as technology managers, innovation managers and analysts but also prepares them for an academic career. The combination of these objectives is challenging for the programme as well as for the students.

The objectives of the programme have been translated into general learning outcomes, which have been elaborated in detailed intended learning outcomes (Appendix 3). The panel was impressed by the thorough translation of the mission and objectives of the programme into the intended learning outcomes. The intended learning outcomes are transparent, they give a good indication of the knowledge and skills graduates should have achieved, and they are specific for the domain of the programme. Furthermore, they are informative about the content of the curriculum and indicate what could be expected from a master's level programme. The panel ascertained that the intended learning outcomes meet the internationally accepted standards for academic master's programmes, the Dublin descriptors. In the critical reflection the programme management specified that the learning outcomes were formulated in accordance with the Meijers Criteria[1], which are used by degree programmes of universities of technology in the Netherlands to indicate the academic level to be achieved.

MOT master's programmes are offered by a number of well-known academic institutions, like ETH Zürich and Technische Universität München. The critical reflection states that these programmes are comparable to the MOT programme, but a real benchmarking has not been performed yet. The panel would have appreciated a benchmark, but during the site visit the programme management and students gave sufficient evidence for the prominent position of the programme in the international academic community. The programme attracts international students and can be considered as an internationally well-known attractive programme according to the panel. The panel learnt during the site visit that students from all over the world choose this Delft programme because of the smart and systematic combination of focus on innovative technologies and issues of management. The programme also attracts students who already have some experience in industry and want to broaden their knowledge and expertise in management. The alumni data demonstrate that MOT graduates find jobs very easily in their field of expertise.

The incoming students usually have a bachelor's degree in a mono-disciplinary engineering field or natural sciences. Recently, for those students who have opted for a technology-based specialisation of 30 EC, it has become possible to enter the master's programme with a multi- or interdisciplinary bachelor's degree, like Technische bestuurskunde.

Considerations
The panel considers it very positive that the master's programme MOT gives students with an engineering background the opportunity to broaden their knowledge and vision on management issues. The panel greatly appreciates that the general learning outcomes are elaborated in well-defined, detailed learning outcomes. It recognises the distinctive international profile and the resulting appreciation of the programme in the international field. The programme is well-known for its innovative approach to the interaction between technology and management and appears to be attractive to students from all over the world.

The panel concluded that the intended learning outcomes meet the Dutch qualifications framework and tie in with the international perspective of the requirements set by the professional field and the discipline. They fit the Domain-Specific Framework of Reference developed by the Dutch programmes for Industrial Engineering and Management.

Conclusion
The panel assesses Standard 1 as 'good'.

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.

[1] The Meijers' Criteria were specifically developed for degree programmes of the Universities of Technology to supplement the Dublin descriptors. Meijers, A.W.M., C.W.AM. van Overveld & J.C. Perrenet (2005), Academic Criteria for Bachelor and Master Curricula, TU Delft, TU/e & University of Twente.

Findings
The MOT programme has a quite stable intake of 75-80 students per year, 50% coming from abroad. Students from several mono-disciplinary engineering backgrounds are accepted into the programme. From 2016, students with a bachelor's degree in inter- and multidisciplinary engineering programmes have also been accepted into the programme, as indicated under standard 1, with the condition that they have a technology-based specialisation of 30 EC. Both exchange students and international students enrol into the programme, creating a diverse and international study environment.

The programme has an obligatory fixed package of 60 EC of course work in the first two semesters. The first year focuses on acquiring basic knowledge. The compulsory courses cover the four main clusters of technology and innovation: engineering economics, organisation, commercialisation and research/reflection (see Appendix 4 for an overview of the curriculum). In a separate course, students learn how to integrate the different themes of the programme by the end of the first year. The fixed curriculum is considered suitable and well-structured for a programme in this field by the panel.

The third semester allows students to study abroad or take specialisation programmes. They can choose a specialisation from a list of eight, which are offered for the three master's programmes of the TPM Faculty. A specialisation is a consistent package of 15 EC of course work on a specific subject, e.g. Innovation Management & Entrepreneurship, ICT Management, Supply Chain Management, and Finance. The panel appreciates that students have ample opportunity to diversify their studies in their second year based on their interests and thesis research project, creating an individual profile within the field. In its eyes, the curriculum design enables students to meet the intended learning outcomes.

The fourth semester is reserved for the 30 EC thesis project. Students can select their own thesis subject and are encouraged to find an external commissioner for their project or to choose a more theoretical project connected to the Faculty's research programmes. MOT students reported during the site visit that they are supported by the MOT staff to find projects in industry for their thesis. The research for most of the theses the panel studied was indeed done in industry. Some of the thesis projects were even done on commission, which impressed the panel.

The underlying didactical principle is the practical application of the theory offered: learning by doing, either as an integrated part of the course or as a separate project building on the preceding theory module. A variety of teaching and testing formats is used, ranging from traditional frontal lectures to group and individual assignments and group projects. Students confirmed that the usual teaching method comprises theory followed by application in a project or case. The students' background is taken into account in the classroom. According to the students and the staff, the different engineering backgrounds of the students make discussion and co-operating in the classroom very interesting and valuable. Each course contains a least one case study. The panel considered the learning environment of the MOT programme lively and stimulating, resulting in a good preparation to achieve the intended learning outcomes.

The students are actively involved in the classroom and have frequent interactions with the teaching staff. The teachers are experimenting with new teaching methods, such as the flipped classroom and serious gaming. Students acknowledged the use of innovative teaching methods and assignments with videos. The panel is very positive about the efforts of the staff to implement blended learning by introducing innovative teaching methods in combination with frequent student-staff interaction. The teachers reported that they make use of the experiences and expertise of the students in the classroom, which was confirmed and appreciated by the students. The variety in backgrounds of the students is described by both the teachers and the students as a valuable input in the learning process. The panel is impressed by the results of the innovations in teaching and encourages the programme to continue their efforts.

MOT is strongly embedded in the research programme Values, Technology and Innovation of the Faculty of Technology, Policy and Management. The MOT courses, as described by the teachers, always start from the perspective of the company, and the content relates to the research of the staff and the mentioned research programme. Qualitative and quantitative research methods are equally important for MOT. Students confirmed that both qualitative and quantitative methods are taught and applied in the programme. The programme has consciously chosen to offer both methods in one course taught by two teachers, who are the ambassadors of one of the perspectives. The panel finds this a good approach and assumes that this presentation stimulates the students to develop a critical attitude and make reasoned theoretical-methodological choices in their own projects.

Since all staff members of the Faculty are involved in all degree programmes, it is not possible to give a student-staff ratio for one of the programmes. The critical reflection presents a student/staff ratio of 21.3 for the whole Faculty. The critical reflection for the MOT programme mentioned that the current student/staff ratio is about 23 to 1. Based on their observations during the site visit, the quantity of staff at MOT is, in general, sufficient to create a stimulating learning environment for students.

The students were positive about the quality and involvement of the teachers. Their doors are open, and staff and students are frequently present in the Faculty building. All teaching staff is engaged with research and education. Members of the teaching staff are UTQ (University Teaching Qualification) qualified, and many staff members have participated in advanced teaching qualification courses as well. All staff members fulfil the English language proficiency requirements. The quality of the teaching is regularly monitored and is an element in the annual performance review. The panel considers the staff qualified and well-prepared for their teaching responsibilities.

The panel toured the Faculty building and established that the study environment is very stimulating. Students have ample room and facilities to study, to cooperate in study groups and to meet each other and their teachers. They are actively involved in the programme. Each degree programme of the TPM Faculty has its own Board of Studies (BoS), on which both teachers and students participate. The BoS monitors the quality of the teaching and advises on matters relevant to the programme. Members of the faculty-wide study association participate on the Faculty board and the BoS and actively contribute to the process of evaluation and improvement of the programme. The study association also organises excursions to industry and lectures by representatives of the work field.

Considerations

The panel established that the content and structure of the master's programme MOT enable the students to achieve the intended learning outcomes. It assessed the content, the coherence, the teaching methods and the feasibility of the programme, as well as the quantity and quality of the teaching staff.

With the MOT programme, TU Delft fulfils an obvious demand from students to broaden their engineering knowledge and expertise with management perspectives and to get a better view on what is happening with technology and engineering products in companies. The programme has succeeded in building an international, stimulating learning environment supported by qualified teaching staff, which is acknowledged as a positive feature by the panel.

The panel appreciates the efforts to implement blended learning in the programme, which adds to the stimulating learning environment. It encourages the programme to progress further in this direction.

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 Faculty of Technology, Policy and Management (TPM) has described its assessment policy in the Assessment Policy 2013-2014 document. The document describes the current and the desired situation with regard to the roles and tasks of several bodies in the Faculty. The Faculty's assessment policy has evolved during the assessment period and now includes measures concerning the transparency, validity and reliability of assessment.

Transparency of assessment is achieved by course guides providing the necessary information about examinations, a Master Thesis Assessment Guide, and the availability of examples of earlier exams. The validity is achieved by peer-reviewed preparation of exams and the use of assessment plans for each module. Reliability is achieved by having a graduation committee of three staff members assess the theses and by using plagiarism detection programmes.

The panel studied a selection of test dossiers and of master's theses and the accompanying assessment forms. It met with the Board of Examiners during the site visit. It established that the Faculty has an adequate assessment policy in place.

According to the panel, the Board of Examiners (BoE) is performing its legally mandated tasks adequately. During the site visit the BoE presented a clear vision of its role to the panel. The BoE chair explained that the BoE doesn't have the ambition to check every examiner and every teacher, but prefers to take an advisory position. The panel sees some risks in this position and recommends the BoE to pay attention to the prescribed independence of the BoE.

The students reported that the testing and assessment procedures are transparent; they know in advance how they will be tested and what the criteria are. The quality of tests and examinations is included in the regular student evaluation procedure. In general, the students were satisfied with the tests and the examinations.

Master's thesis research projects are always assessed by a committee of at least three academic staff members. The committee meets at least four times during the project: kick-off, mid-term, green light, and thesis defence. The process is administered using prescribed forms. The thesis examiners use a grading scheme (rubric) to ensure that the grades are balanced and the intended learning outcomes are achieved.

As of 2011, two thesis reviews are performed annually. One of the reviews is performed by the BoE. This review focusses on the reliability of the assessment of the theses. The second review is performed by the Director of Studies, at the request of the BoE, and concerns the extent the theses fit the intended learning outcomes. Furthermore, every two years an independent committee is appointed by the BoE to assess and benchmark the grading of masters' theses of the Faculty's three master's programmes.

Considerations
The panel established that the Faculty of Technology, Policy and Management of TU Delft has an adequate assessment system. The assessments are valid, transparent and reliable. The Board of Examiners is performing its legally mandated tasks adequately.

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
The master's thesis project comprises 30 EC. Students can find all the information, rules and regulations concerning the thesis work on the online Graduation Portal.

The panel studied 15 master's theses to establish whether the graduates had achieved the intended learning outcomes of the programme and found that they had achieved the level that can be expected of a master graduate. The panel found the level of the master's theses to be good and agreed generally with the grading. It had one general remark concerning the length of the theses, several of the theses significantly exceeded 100 pages. It discussed this remark with the teachers and the Board of Examiners. This discussion did not lead to a consensus opinion, and the panel recommends limiting the size of the master's theses by setting a maximum length.

The research of most of the MOT theses studied was relevant for industry, which is appreciated by the panel. The panel was satisfied with the quality of the analysis in the theses and the presentation of the research results. The theses demonstrated that the students identify relevant scientific developments and take them into account and critically examine theories and models. Students clarify both positive and negative aspects of the research methods used and deliver well-formulated, suitable and practical recommendations to companies.

The graduates of the MOT programme easily find jobs in their field and according to their expertise. Graduates find jobs in industry, in international strategy or engineering consulting firms or strategy departments, in multinationals or the banking sector, and some proceed to research a PhD. According to the critical reflection, more than 90% of the graduates find a job within six months, and the average time to find a job is less than two months. Alumni are doing work they are trained for and are grateful for the good training they received in the programme.

Considerations
The panel concludes that the graduates of the master's degree programme MOT have achieved the intended learning outcomes. The level of the master's theses concurs with that expected for an academic master's programme. Furthermore, the panel finds that the graduates are highly appreciated in their professional field and that students easily embark on promising professional and academic careers, in which their academic profile and skills are valued.

Conclusion
The panel assesses Standard 4 as 'satisfactory'.

GENERAL CONCLUSION

The master's programme Management of Technology aims to provide future leaders with opportunities to combine engineering and business knowledge in designing and implementing solutions to important commercial and social problems. The panel assessed standard 1, Intended learning outcomes, as good. The intended learning outcomes have been specified in concrete terms of content, level and orientation; they meet international requirements. The panel greatly appreciated that the general learning outcomes are elaborated in well-defined, detailed learning outcomes. 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 students to achieve the intended learning outcomes. The panel assessed standard 3, Assessment system, as satisfactory. The Faculty has an adequate assessment policy, and the Board of Examiners is performing its legally mandated tasks. Standard 4, Achieved learning outcomes, was assessed as satisfactory. The panel concluded that the graduates had achieved the intended learning outcomes.

Considering the assessments of the four criteria for the master's programme Management of Technology, the panel assesses the programme as satisfactory.

Conclusion
The panel assesses the *master's programme Management of Technology* as 'satisfactory'.

APPENDICES

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

Panel chair

Professor Rob Van der Heijden 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 Scientific Director of the Institute of Management Research and Vice-Dean of Research at the Nijmegen School of Management (NSM). He was Dean of the Nijmegen School of Management from 2011-2016. Since June 2016, he has been 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.

Panel members

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 the 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 Arthur Petersen joined the Department of Science, Technology, Engineering and Public Policy at University College London full-time in September 2014 after more than thirteen years' work as scientific adviser on environment and infrastructure policy with the Dutch government. Additionally, he is Professorial Fellow at the Dutch National Institute for Public Health and the Environment – RIVM (since April 2016) and Research Affiliate at the Massachusetts Institute of Technology (since 2009). From 2011-2016, he was Adjunct Professor of Science and Environmental Public Policy at VU University Amsterdam. Professor Petersen studied Physics and Philosophy, obtained doctorate degrees in Atmospheric Sciences at Utrecht University (1999) and in the Philosophy of Science at VU University Amsterdam (2006). He now conducts research in Anthropology and Political Science. Most of his research focuses on managing uncertainty.

Maarten van Ruitenbeek, BSc (student member) is a first-year master's student in Industrial Engineering and Management at the University of Groningen. Besides his studies, he follows the High Tech Systems and Materials Honours Programme in collaboration with Royal Philips Drachten and tutors first-year bachelor students in Industrial Engineering and Management. He completed his bachelor in Industrial Engineering and Management Science at the University of Groningen in 2016. In 2015-2016, he was president of TBV Lugus, the student association of Industrial Engineering and Management in Groningen.

Professor Hens Runhaar is a Special Professor of Management of Biodiversity in Agricultural Landscapes at Wageningen University and Research and an Associate Professor of Environmental Governance at the Copernicus Institute of Sustainable Development at Utrecht University. The integration of environmental objectives into sectoral policies, planning and practices is his main area of interest. Dr Runhaar has researched this subject in various domains – such as transport, urban planning, natural resource management and, more recently, agriculture – encompassing environmental themes such as climate change mitigation and adaptation, environmental health and biodiversity. Other subjects addressed in his research are science-policy interactions, the framing of environmental problems and the consequences of these framings – including governance practice, effectiveness, and controversies. He has published over fifty scientific papers and (co)edited three special journal issues, most recently a special issue on coastal management for *Environmental Science and Policy*.

Professor Marcel Veenswijk is Full Professor in Management of Cultural Change at VU University Amsterdam. Professor Veenwijk graduated from the University of Leiden with a degree in Public Administration and holds a PhD from Erasmus University Rotterdam. He has worked as a researcher, lecturer and research manager. He has published widely on cultural change, institutional transformation and innovation processes, especially in the context of public sector organisations. The work of his current research group addresses the tensions between institutionalised structures and individual agency, the changing norms in institutional fields, the establishment of newly emerging fields, the breakdown or cut across institutionalised boundaries, and the micro-processes of conflict and identity formation. In addition to his scientific work, he has extensive experience as a consultant. Prior assignments included projects for ABN AMRO, Rijkswaterstaat, ProRail, the City of Amsterdam, Enexis, ING, KLM and several ministries.

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.[2] 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

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

partnerships) and governance structures can be part of design and improvement initiatives. The scope of design thus 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 Management of Technology

A MoT graduate:
1. is competent in one or more scientific disciplines, in particular the management sciences, and is able to adapt and apply the concepts of these sciences in a high-tech engineering environment.

a) Has a thorough mastery of parts of the relevant fields extending to the forefront of knowledge (latest theories, methods, techniques and topical questions).
b) Looks actively for structure and connections in the relevant fields, and the connections between subfields.
c) Has knowledge and skills in the way in which….
- truth-finding and the development of theories and models
- interpretations (texts, data, problems, results)
- experiments, gathering of data and simulations
- decision-making

… take place in the relevant fields.
d) Is able to reflect on standard methods and their presuppositions; is able to question these; to propose adjustments and to estimate their implications. e) Is able to spot gaps in his/her own knowledge, and to revise and extend it through study.

2. is competent in doing research
a) Is able to reformulate ill-structured research problems. Takes account of the system boundaries in this. Is able to defend the new interpretation against involved parties.
b) Is observant, and has the creativity and capacity to discover in apparently trivial matters certain connections and viewpoints and put these into practice for new applications.
c) Is able to produce and execute a research plan.
d) Is able to work at different levels of abstraction. Given the process stage of the research problem, chooses the appropriate level of abstraction.
e) Is able, and has the willingness to draw upon other disciplines in his or her own research.
f) Is flexible in dealing with changes in the research process.
g) Is able to assess research within the discipline on its scientific value.
h) Is able to contribute to the development of scientific knowledge.

3. has a scientific approach
a) Is able to identify and take in relevant scientific developments.
b) Is able to critically examine existing theories, models or interpretations in the area of his or her graduation subject.
c) Has skills in, and affinity with the use, development and validation of models; is able consciously to choose between modelling techniques.
d) Has insight into the nature of and differences between management and technical sciences and is able to distinguish and combine scientific fields.
e) Is able to document adequately the results of research and thereby contribute to the development of the knowledge in the field, and is able to publish these results.

4. possesses basic intellectual skills to reflect and decide
a) Is able to critically reflect on his or her own thinking, decision making, and acting and to adjust these on the basis of this reflection
b) Is able to reason logically within the field and beyond; both 'why' and 'what-if'-reasoning.
c) Is able to recognize modes of reasoning (induction, deduction, analogy etc.) within the field. And is able to apply these modes.
d) Is able to ask adequate questions, and has a critical yet constructive attitude towards analyzing and solving real life problems in the field

e) Is able to form a well-reasoned decision (and adopt effective strategies) in the case of incomplete or irrelevant data.
f) Is able to take a standpoint with regard to a scientific argument in the field, and is able to assess this critically as to its value
g) Possesses numerical skills, and has an understanding of orders of magnitude.

5. is competent in co-operating and communicating in an intercultural and multi- disciplinary environment
a) Is able to communicate in writing in English about research and solutions to problems with colleagues, non-colleagues and other involved parties.
b) Is able to communicate verbally in English about research and solutions to problems with colleagues, non-colleagues and other involved parties.
c) Is able to debate about both the field and the place of the field in society.
d) Is characterized by professional behavior. This includes: drive, reliability, commitment, accuracy, perseverance and independence.
e) Is able to perform project-based work: is pragmatic
f) and has a sense of responsibility; is able to deal with risks; is able to compromise.
g) Is able to work within an interdisciplinary and intercultural team.
h) Is able to assume the role of team leader.

6. takes account of the temporal , market and the social context
a) Understands relevant developments in the history of the fields. This includes the interaction between the internal developments (of ideas) and the external (social) developments, and integrates this in scientific work.
b) Is able to analyse and to discuss the social consequences (economical, social, cultural) of new developments in relevant fields and integrates these consequences in scientific work.
c) Is able to analyse the consequences of scientific thinking and acting on the environment and sustainable development and integrates these consequences in work
d) Is able to analyse and to discuss the ethical and the normative aspects of the consequences and assumptions of scientific thinking and acting and integrates these ethical and normative aspects in work.

APPENDIX 4: OVERVIEW OF THE CURRICULUM

Master's programme Management of Technology

First semester		Second semester	
First period	**Second period**	**Third period**	**Fourth period**
MOT1524 **Leadership and Technology Management** **5 EC**	**MOT1421** **Economics Foundations** **5 EC**	**MOT1531** **Business Process Management and Technoloy** **5 EC**	**MOT2421** **Emerging and Breakthrough Technologies** **5 EC**
MOT1412 **Technology Dynamics** **5 EC**	**MOT1532** **High-Tech Marketing** **5 EC**	**MOT1434** **Technology, Strategy and Entrepreneurship** **5EC**	**MOT1451** **Inter- en Intra-Organisation Decision Making** **5EC**
MOT1461 **Financial Management** **5 EC**	**MOT1442** **Social and Scientific Values** **5EC**	**MOT2312** **Research Methods** **5 EC**	**MOT1003** **Integration Moment** **5 EC**

<table>
<tr><th colspan="2">First semester</th><th colspan="2">Second semester</th></tr>
<tr><th>First period</th><th>Second period</th><th>Third period</th><th>Fourth period</th></tr>
<tr><td colspan="2">Specialisation

15 EC</td><td colspan="2" rowspan="3">MOT2910

Master Thesis project 30 EC</td></tr>
<tr><td colspan="2">Elective courses

9 EC</td></tr>
<tr><td></td><td>MOT2003

Preparation Master Thesis

6EC</td></tr>
</table>

Technology, Innovation and Engineering Economics

Technology, Innovation and Commercialisation

Technology, Innovation and Organisation

Research and Reflection

APPENDIX 5: PROGRAMME OF THE SITE VISIT

Programme site visit degree programmes 12 and 13 December 2016

Location: Faculty of TPM Jaffalaan 5 2628 BX Delft

Monday 12 December 2016

8.15 Arrival of audit committee

8.15-8.30 Welcome

Mr Prof.dr. T.S. (Theun) Baller	Dean TPM
Mr Prof.mr.dr. E.F. (Ernst) ten Heuvelhof	Director of Education TPM

8.30-9.00 Preparatory meeting committee

09.00-10.00 Education management team (EMT)

Mr Prof.mr.dr. E.F. (Ernst) ten Heuvelhof	Director of Education TPM
Mr Dr.ir. I. (Ivo) Bouwmans	Director of Studies TB
Ms Dr.ir. Z. (Zofia) Lukszo	Director of Studies SEPAM
Mr Dr.ir. B. (Bert) Enserink	Director of Studies EPA
Mr Dr. R.M. (Robert) Verburg	Director of Studies MOT
Ms Drs. J.K. (Jenny) Brakels	Manager Education &Student Affairs
Mr M.A. (Mathijs) Bijkerk BSc	Commissioner MSc Curius
Ms C.A. (Elsemiek) Smilde	Commissioner BSc Curius

10.00-10.30 Meeting audit committee (incl. break)

10.30-11.00 Students B Technische bestuurskunde (TB)

Ms M.M.G.C. (Menghua) Prisse	1st year
Mr P.X. (Pepijn) Thijssen	2nd year; Commissioner Bachelor Education FSC TPM 2016-2017
Ms A.C. (Claire) Post	2nd year
Ms M. (Mira) Groot	3rd year
Mr. J.B. (Jelle) van der Lugt	3rd year
Mr A.P. (Toon) Jansen	4th year

11.00-11.30 Students M Systems Engineering, Policy Analysis and Management (SEPAM)

Ms I. (Inés) Martínez Bustamante	1st year; BSc international
Mr J. (Joris) Zwijnenburg	1st year; BSc TB
Ms. L. (Leonie) Vogelsang	1st year; BSc TB
Mr Á.A. (Álvaro) Papic González	2nd year, BSc International
Mr S.F. (Stephan) Kool	3rd year; BSc TB
Ms F.C. (Fransje) Oudshoorn	3rd year; BSc TB

11.30-12.15 Lecturers B TB and M SEPAM

Ms Dr.ir. C. (Els) van Daalen	Associate professor, Systems Dynamics and Systems Modelling
Mr Dr. J.A. (Jan Anne) Annema	Assistant professor, Transport Policy
Ms Dr.ir. P.W. (Petra) Heijnen	Assistant professor, Energy & Industry
Mr Dr.ir. L.J. (Laurens) de Vries	Associate professor, Energy economics and regulations
Dhr. Dr. S (Stephan) Lukosch	Associate professor, Design Methodologies, requirements engineering, collaboration
Dhr. Dr. H. (Haiko) van der Voort	Assistant professor, Organisation science, process management, regulation
Mr Ir. H.W. (Herman) de Wolff	Assistant professor, Land development
Mr Prof.dr.ir. M.F.W.H.A. (Marijn) Janssen	Full professor, ICT

12.15-14.30 Meeting audit committee (incl. lunch)

14.30-15.00 Students M Management of Technology

Ms. A.F. (Lieke) van den Eijnden	1st year, BSc Life Science & Technology
Ms S. (Silvia) Fernandez Gelonch	1st year, BSc Industrial Technologies Engineering
Mr A.D.B. (Abe) Scholte	1st year; BSc Industrial Design Engineering
Ms P.D.L.A. (Pamela) Nunez Araya	2nd year; BSc Electromechanical Engineering
Mr J.A. (Juan) Carvajal Rodriguez	2nd year; BSc international
Mr M.A. (Misha) Grift	2nd year; BSc HBO, Commissioner MOT education FSC TPM 2016-2017

15.00-15.30 Lecturers M Management of Technology

Mr Prof.dr.ir. M.F.W.H.A. (Marijn) Janssen	Full professor, e-government, business processes
Ms Dr. H.K. (Heide) Lukosch	Assistant professor, Participatory systems, augmented reality
Mr Dr. J.R. (Roland) Ortt	Associate professor, Breakthrough technologies, innovation management
Mr Prof.dr. C.P. (Cees) van Beers	Full professor, Frugal innovations, developmental economics, innovation management
Mr Dr. G. (Geerten) van de Kaa	Assistant professor, Business strategy, standardisation

15.30-17.00 Meeting audit committee (incl. break)

17.00- 17.30 Alumni

Ms J.E.L. (Joke) Blom BSc	BSc TB, student MSc Transport, Information and Logistics

Mr T.T. (Tim) Romijn BSc	BSc TB, student MSc Engineering and Policy Analysis
Mr Y. (Yi) Yin MSc	MSc SEPAM, PhD student at ICT, VRE4EIC project
Ms ir. D.M. (Diana) Vonk Noordegraaf	MSc SEPAM, PhD TRAIL, Consultant at TNO
Ms ir. K.K. (Kaveri) Iychettira	MSc EPA, PhD student at SETS Joint Doctorate on Energy Policy at TU Delft, KTH Stockholm and Comillas, Madrid
Mr J. (Jerome) Vincendon MSc	MSc MOT; Technical Consultant at Gen25
Mr A. (Amir) Piltan MSc	MSc MOT; PTech B.V., Owner and Director

19.00-21.30 Diner audit committee

Tuesday 13 December 2016

8.15 Arrival of audit committee

8.30-9.00 Preparatory meeting committee (optional: walk-in hour)

9.00-9.30 Students M Engineering and Policy Analysis

Ms I.M. (Isabelle) van Schilt	1st year; BSc TB, Commissioner EPA education FSC TPM 2016-2017
Ms M.B.C. (Marijne) Kramer	1st year, BSc TB
Mr J.C. (Jasper) Meijering	1st year, BSc TB
Mr G.P.S. (Gurvinder) Arora	1st year, Bachelor of Technology in Mechanical Engineering
Mr J.P. (Juan Pablo) Nieto	2nd year, Telecommunication Engineer

09.30-10.00 Lecturers M Engineering and policy Analysis

Mr Prof.dr. W.M. (Martin) de Jong	Full professor, Urban and infrastructure development in China
Mr Dr. E. (Erik) Pruyt	Associate professor, System Dynamics Modelling, Exploratory Modelling and Analysis
Mr S. (Scott) Cunningham	Associate professor, Operations research, data science, tech policy
Mr Prof.dr.ir. A. (Alexander) Verbraeck	Full professor, Large-scale models, discrete event simulation, data analysis
Mr Dr.ir. L.M. (Leon) Hermans	Assistant professor, Actor models, policy analysis, water governance
Mr Dr. S.T.H. (Servaas) Storm	Assistant professor, Macroeconomics and development economics, CGE modelling

10.00-11.00 Meeting audit committee (incl. break)

11.00-12.00 Members Boards of Studies

Ms Dr.ir. M.P.M. (Tineke) Ruijgh - van der Ploeg	Chair Board of Studies TB
Mr Dr. P.W.G. (Pieter) Bots	Chair Board of Studies SEPAM

Mr Dr. J.A. (Jan Anne) Annema	Chair Board of Studies EPA
Mr Dr. M.P.M. (Maarten) Franssen	Chair Board of Studies MOT
Mr M. (Mike) Band	Student member Board of Studies TB
Mr M.E. (Martijn) Cligge	Student member Board of Studies SEPAM
Ms R. (Rhythima) Shinde	Student member Board of Studies EPA
Mr T. (Tim) Joosten	Student member Board of Studies MOT

11.00-11.30 Tour Faculty

12.00-13.00 Meeting audit committee (incl. lunch)

13.00-14.00 Members Board of Examiners

Mr Prof.dr. R.W. (Rolf) Künneke	Chair Board of Examiners TPM
Mr Prof.dr. W.K. (Willem) Korthals Altes	Member Board of Examiners TPM
Ms Drs. J. (Jolien) Ubacht	Chair Meeting of Graduation coordinators

14.00-14.30 Preparation final meeting management (incl. break)

14.30-15.30 Final meeting management

Mr Prof.dr. T.S. (Theun) Baller	Dean TPM
Mr Prof.mr.dr. E.F. (Ernst) ten Heuvelhof	Director of Education TPM
Mr Dr.ir. I. (Ivo) Bouwmans	Director of Studies TB
Ms Dr.ir. Z. (Zofia) Lukszo	Director of Studies SEPAM
Mr Dr.ir. B. (Bert) Enserink	Director of Studies EPA
Mr Dr. R.M. (Robert) Verburg	Director of Studies MOT
Ms Drs. J.K. (Jenny) Brakels	Manager Education &Student Affairs

15.30-17.30 Meeting audit committee – first findings

17.30-17.45 Plenary presentation first findings – ENG

17.45 Drinks TB-café

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:

4001370	4241282	4325273
1327771	4237986	4329597
1340506	4257324	4319052
4135210	4259017	4320379
1303570	4300866	4419030

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):

- Annual report Board of Examiners 2014-2015;
- Minutes of the Programme Committee;
- Course dossiers, including the tests of a selection of master courses;