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Foreword

This report describes the findings of the Industrial Engineering and Systems Engineering assessment committee for the bachelor’s programme Technische Bedrijfskunde and the master’s programmes Operations Management & Logistics and Innovation Management. The report is part of the quality assessment of university bachelor’s and master’s programmes in the Netherlands. The purpose of this report is to present a reliable picture of the results of the degree programmes, to give feedback to the internal quality assurance of the programmes, and to serve as the basis for accreditation of these programmes by the Accreditation Organisation of the Netherlands and Flanders (NVAO).

Quality Assurance Netherlands Universities (QANU) aims to ensure independent, unbiased, critically constructive assessments using standardised quality criteria, while taking specific circumstances into account.

The QANU Industrial Engineering and Systems Engineering assessment committee has fulfilled its task with great dedication. The programmes have been evaluated in a thorough and careful manner. We expect that the judgements and recommendations will be carefully considered by the programme organisation and the Board of the University.

We thank the chairman and members of the assessment committee for their willingness to participate in this assessment and for the dedication with which they carried out their task. We also thank the staff of the department concerned for their efforts and for their cooperation during the assessment.

Quality Assurance Netherlands Universities

Mr. Chris J. Peels                     Dr. Jan G.F. Veldhuis
Director                               Chairman of the Board
Preface

Our committee visited Eindhoven University of Technology on 15 and 16 April 2010 to assess the bachelor’s programme Technische Bedrijfskunde and the master’s programmes Operations Management & Logistics and Innovation Management.

To evaluate the programmes in Eindhoven, the committee carefully read the programmes’ self-evaluation reports and many supportive documents, and talked to the programme management, staff, students and alumni during the site visit. The committee appreciated the quality and clarity of the documentation provided and the willingness of those involved in the programmes to address the questions we raised. On the basis of this, the committee was able to form a well-reasoned opinion of the various aspects of the programmes, as summarized in this report.

On behalf of the committee members, I would like to thank all of those involved in the preparation and execution of this assessment procedure for their contributions and support, both at the Eindhoven University of Technology and at QANU. Without their effort and their willingness to respond constructively to the many requests from the committee, we could not have carried out the work as smoothly and pleasantly as we did.

Also, I gratefully acknowledge the contributions of the other committee members. In a very pleasant and creative atmosphere, we have been able to work through the whole process to produce this report. In this context, the support of Trees Graas deserves a special note of appreciation. Without her, we would have been nowhere.

Ludo Gelders
Chair, Industrial Engineering and Systems Engineering assessment committee
PART I: GENERAL PART
1. Structure of the report

In this document, the Industrial Engineering and Systems Engineering assessment committee (hereafter: the committee) reports its findings. The report consists of two parts: a general part (Part I) and a programme part (Part II).

The general part summarises the tasks, composition, input documentation and working methods of the assessment committee. This part of the report also contains the domain-specific requirements that were used by the assessment committee. The programme part describes the evaluation and assessment of the bachelor’s programme Technische Bedrijfswetenschap and the master’s programmes Operations Management & Logistics and Innovation Management at Eindhoven University of Technology. This programme part is structured in accordance with the accreditation criteria of NVAO (Accreditation Organisation of the Netherlands and Flanders).
2. Task and composition of the assessment committee

2.1. Task of the committee
The task of the Industrial Engineering and Systems Engineering committee is to evaluate and assess nine degree programmes at the three technical universities according to the accreditation criteria set by NVAO. Based on and in accordance with these criteria, the committee is expected to assess different aspects of quality of the programmes, according to the information provided by the programmes in the self-evaluation reports and discussions held during the site visits. The assessment report contains recommendations by the committee, but the emphasis lies on assessing the programmes’ basic quality.

The assessment committee has been requested to assess the following programmes (including CROHO number):

Delft University of Technology:
- Bachelor’s programme Technische Bestuurskunde (56995)
- Master’s programme Systems Engineering, Policy Analysis and Management (60358)
- Master’s programme Engineering and Policy Analysis (60179)
- Master’s programme Management of Technology (66995)

Eindhoven University of Technology:
- Bachelor’s programme Technische Bedrijfskunde (56994)
- Master’s programme Innovation Management (60430)
- Master’s programme Operations Management and Logistics (66430)

University of Twente:
- Bachelor’s programme Technische Bedrijfskunde (56994)
- Master’s programme Industrial Engineering and Management (60029)

2.2. Constitution of the committee
The committee consists of a chairman and seven members. Appendix B lists short descriptions of the curricula vitae of the committee members.

Chair
- Prof. dr. ir. L.F. (Ludo) Gelders, emeritus professor of Industrial Management, Katholieke Universiteit Leuven (University of Leuven), Belgium.

Members
- Prof. dr. J. (Jan) Kratzer, professor of Entrepreneurship and Innovation Management, Institute of Technology, Berlin, Germany;
- Prof. dr. J. (John) Grin, professor of Policy Science, especially System Innovation, University of Amsterdam;
- Ir. J.R. (Hans) Wierda, self-employed advisor on competence development for Centres of Excellence;
- Dr. C. (Cees) Terlouw, associate professor of Enrollment Management and Educational Transition, Saxion University of Applied Sciences, and director of LICA;
- Drs. N.J. (Nynke Jo) Smit, Academic Registrar and Head of the Office of Educational Affairs, Institute of Social Studies, Erasmus University Rotterdam;
• **F. (Frank) Pijnenborg**, MSc student of System Engineering, Policy Analysis and Management, Delft University of Technology;
• **R.M. (Richelle) Rijntjes BSc**, MSc student of Industrial Engineering and Management, University of Twente.

Prof. Gelders, Prof. Kratzer, Prof. Grin and Ir. Wierda participated in all the site visits of the committee. C. Terlouw was involved in the assessment of the programmes at Delft University of Technology and Eindhoven University of Technology. Drs. N.J. Smit was involved in the assessment of the programmes at the University of Twente. F. Pijnenborg participated in the site visits at Eindhoven University of Technology and the University of Twente. R.M. Rijntjes Bsc was involved in the assessment of the programmes at Delft University of Technology.

All members of the assessment committee signed a declaration of independence, as required by the QANU protocol, to ensure that they judge without bias, personal preference or personal interest, and the judgement is made without undue influence from the institute, the programme or other stakeholders.

The project leader of the assessment was drs. M. (Trees) Graas, QANU staff member. The site visit took place on 15 and 16 April 2010. The programme of the site visit is included as appendix C.
3. Working method of the committee

3.1. Introduction
The committee was constituted formally on 8 February 2010. During this inaugural meeting the committee discussed its task and the working methods. Furthermore, it discussed the proposal for domain-specific requirements. This proposal was adjusted and subsequently instituted as the domain-specific framework of reference, provided in chapter 4 of this report.

3.2. Preparatory phase
After receiving the self-evaluation reports, the project leader checked the quality and completeness of the information provided. After approval, the self-evaluation reports were forwarded to the committee. During the initial meeting at the start of the site visit, the committee members discussed their findings.

In addition, the committee members each read at least one thesis for the programmes being assessed. This led to the assessment of at least six theses for each programme. When considered necessary, committee members read additional theses during or after the site visit. Selection of the theses was done at random by the chair of the committee. Specific attention was paid to the scientific level of the theses, the requirements, and carefulness of judgement by the reviewer of the programme and the assessment procedure used. Since the evaluated programmes lead to a scientific degree, the student has to show evidence of the required qualifications to earn a degree in the thesis.

Within the committee a specific allocation of tasks was agreed upon, based on the expertise of its members. It should be emphasized that although specific tasks are assigned, the entire committee remains responsible for the judgements and the final report.

3.3. Site visits
Before each site visit the project leader created a programme for the interviews. The draft programmes were discussed with the chair of the committee and the coordinators of the programmes. During the site visits, interviews were held with representatives of the faculty boards, the programme management, alumni, programme committees, boards of examiners, and study advisors. Furthermore, for each programme selected students and lecturers were interviewed.

During the site visits the committee examined additional information, for example study books and reports from the meetings of the programme committees. A consultation hour was scheduled to give students and staff of the programmes the opportunity to talk to the committee.

The committee used a significant part of the final day of a site visit to discuss the assessment of the programmes and to prepare a preliminary presentation of its findings. Each site visit concluded with a presentation by the chairman, consisting of a general assessment and several specific findings and impressions of the programme.

3.4. Scores of the standards
The committee adopted the standard decision rules provided by QANU. These are:

- *Unsatisfactory*, which means that the level for this facet is below the basic standard of quality;
• **Satisfactory**, which means that the level meets the basic standards of quality;
• **Good**, which means that a quality level is attained that exceeds the basic standards of quality;
• **Excellent**, which means that a quality level is attained that is very good in all aspects and meets international benchmarking. It is an example of international best practice.

The default assessment is ‘satisfactory’, i.e. the programme complies adequately with the criteria.

The committee feels that despite critical remarks, the score ‘satisfactory’ can be given to a specific standard. In those situations, the critical remarks will be accompanied by positive observations. Furthermore, the committee is of the opinion that if the programme management deals adequately with the critical remarks, the score ‘satisfactory’ might become ‘good’ at the next site visit.

When the assessment committee observes a good national practice, the judgment will be ‘good’. When both a good practice is observed and a critical remark is made by the committee, a weighed average score is given.

### 3.5. Reporting

After each site visit the project leader wrote a draft report based on the findings of the committee. The draft report was read and commented upon by the committee members. It was then sent to the faculty involved to check for factual irregularities. Any comments of the faculty were discussed with the chair of the committee and, if necessary, with the other committee members. The final report was endorsed on July 9, 2010.
4. Domain-specific framework of reference for Industrial Engineering and Systems Engineering

This chapter contains a short summary of converging views on the field of Industrial Engineering and Systems Engineering (IE&SE). These views have been gathered from the following organizations that focus on the professional development and application of the field:

- the Global Association of Productivity and Efficiency Professionals (IEE);
- the Manufacturing and Service Operations Management Society (MSOM);
- the Institute for Operation Research and the Management Sciences (Informs);
- the International Council on Systems Engineering (INCOSE);
- and the Council of Engineering Systems Universities (an association of more than 50 universities in North America, Europe, Asia, and Australia with the aim to work together to develop engineering systems as a new field of study);

and from the following leading academic programmes in the field of IE&SE:

- Industrial Engineering and Operations Research at the University of California, Berkeley, USA; Industrial and Systems Engineering at the Georgia Institute of Technology, USA;
- Management Science and Engineering at Stanford University, California, USA;
- Engineering and Public Policy at the College of Engineering at Carnegie Mellon University, Pittsburgh, USA;
- Systems Engineering and Operations Research at George Mason University, Washington DC, USA;
- Engineering Systems at Massachusetts Institute of Technology, Cambridge, Massachusetts, USA.

A few excerpts from these views are included in section 4.4.

Although converging views are emerging for IE&SE, different domain names with slightly different emphases are also used for the field. Industrial Engineering is also known as Operations Management, Production Engineering, or Manufacturing Engineering, a distinction that seems to depend on the viewpoint or motives of the user. In healthcare, for example, IE&SE graduates are more commonly known as management engineers, engineering management, or even health systems engineers. Systems Engineering is sometimes known as Engineering Systems Design. Also, the examples in section 4.4 demonstrate the different emphases educational institutes give to the field.

Nevertheless, there are a number of clearly common elements that constitute the shared view of what the field of IE&SE represents in education, application, and research. Below we will first discuss the common elements, and then we will formulate some generic competences as a consequence of these common elements.

4.1. Common elements of the field of IE&SE

These common elements concern: (a) the common basis, (b) the focus: design, installation, and improvement of processes and systems, (c) broad application in private and public domains and within and between organisations, (d) the application of quantitative 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. IE is concerned with the design, improvement and installation of integrated systems of people, information, materials, equipment and energy. It focuses on the analysis, design and control of operational processes, at the level of both individual organisations and supply networks. 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 and SE draws upon specialised knowledge and skills in the mathematical, physical 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: design, installation, and performance improvement of processes 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 processes and systems have multiple goals concerning 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 form part of design and improvement initiatives. In summary, IE and SE graduates may be considered productivity and efficiency professionals.

(c) Broad application, in both private and public domains and both within and between organizations
IE&SE is used in a variety of fields. It applies to all steps in the product life cycle, from research and development through design, manufacturing, distribution and disposal. And it applies in all phases of the value chain. Whereas the 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 and in the public sector. Nowadays, 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 the 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 methods
IE&SE is a field of engineering, and one important element of its approach to the design and improvement of processes and systems is the use of quantitative methods. These are derived from fields such as operations research, management science, mathematics, economics, data analysis and statistics, information systems, and engineering.

(e) Complex problem-solving with a scientific and a pragmatic multidisciplinary approach
Complex problems 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, economics, mathematics, organizational behaviour, and 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 and SE graduates support scientific decision-making.

In addition, IE&SE graduates ought to be pragmatic people. They work to understand and resolve real problems from society and hence – as stated above – need to combine knowledge and experience from many disciplines to develop project and process management expertise and communication skills. They choose a method 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.

4.2. Generic competences
Taking into account the above-mentioned common elements of the field, the generic competencies for industrial and systems engineering are listed below:

- Sufficient understanding of technology and technological innovation;
- Keen analytic mindset combined with a drive to synthesize towards a solution;
- Competent in translating complex issues into workable models and designing and executing appropriate research programmes;
- Adequate mathematics skills for modelling and executing research activities;
- Adequate understanding and competencies 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 organize and aim 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.

4.3. Bachelor and master level
The specific blend of competencies varies per programme and is laid down more specifically in the final qualifications of each programme. Although the emphasis differs among the programmes, there is a distinction between the bachelor and master levels regarding:

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

Bachelor’s students receive a sound general education in all basic fields of IE&SE (technology, engineering, optimisation, engineering economy, business economy, organisational theory, social sciences, etcetera). They should be able to continue their studies in a more in-depth and specialised master’s programme or fill appropriate positions in business.
Master’s programmes 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, Communication and Information Technology, Product Design and Logistics, Policy Analysis, Man-Machine Systems, Performance Analysis, and Supply Chain Management.

Whereas bachelor’s students are mainly involved in analysis, master’s students typically deal with design questions. In addition, they should also be exposed to research questions. Master’s graduates should be able to formulate and carry out independent research projects.

The IE&SE bachelor’s programmes provide an excellent basis for one of the IE & SE master’s programmes, but students in IE&SE master’s programmes can also come from a variety of undergraduate backgrounds in engineering and other quantitative fields.

Graduates of a master’s programme will typically start their career as project or planning managers, functional managers, policy analysts/advisers, engineering consultants, et cetera. But they could also start an academic track through further involvement in research (e.g. PhD and academic positions). They should be able to move on later to managerial positions (e.g. as CTO). Some may prefer to become private entrepreneurs.

4.4. Excerpts

*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 specialized 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’. (www.iienet.org/Details.aspx?id=282)

*Stanford Engineering*

established the Department of Management Science and Engineering (MS&E) five years ago: ‘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 alumni 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.’ (www.stanford.edu/dept/MsandE/about/MSandE-5yr.pdf)

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.’ (www.isye.gatech.edu)
PART II: PROGRAMME REPORT
1. Report on the bachelor's programme Technische Bedrijfskunde and the master's programmes Operations Management & Logistics and Innovation Management offered by Eindhoven University of Technology

Administrative data

Bachelor's programme Technische Bedrijfskunde:

Name of the programme: Technische Bedrijfskunde
CROHO number: 56994
Level: bachelor
Orientation: academic
Number of credits: 180 EC
Degree: Bachelor of Science
Mode(s) of study: full-time, part-time
Location(s): Eindhoven
Expiration of accreditation: 28 April 2011

Master's programme Operations Management & Logistics:

Name of the programme: Operations Management & Logistics
CROHO number: 66430
Level: master
Orientation: academic
Number of credits: 120 EC
Degree: Master of Science
Mode(s) of study: full-time, part-time
Location(s): Eindhoven
Expiration of accreditation: 28 April 2011

Master's programme Innovation Management:

Name of the programme: Innovation Management
CROHO number: 60430
Level: master
Orientation: academic
Number of credits: 120 EC
Degree: Master of Science
Mode(s) of study: full-time, part-time
Location(s): Eindhoven
Expiration of accreditation: 28 April 2011

The site visit of the Industrial Engineering and Systems Engineering assessment committee to the School of Industrial Engineering of Eindhoven University of Technology took place on 15 and 16 April 2010.
1.0. Structure and organization of the department

The School of Industrial Engineering (IE) is part of the Department of Industrial Engineering & Innovation Sciences (IE&IS) at Eindhoven University of Technology (TU/e). The IE&IS Department (formerly, Department of Technology Management) was founded in 1995, subsequent to a merger between the former Departments of Industrial Engineering and Philosophy & Social Sciences.

Recently, the organization of the Department has changed. In February 2006, the Department Board issued a ‘vision document’. In this document, it identified two main research areas for the Department: innovation management and policy and operations/logistics management. The document states that the Department needs sufficient focus and mass to excel in these focal areas. This ultimately resulted in the division of the Department into two schools: the School of Industrial Engineering and the School of Innovation Sciences. The School of Industrial Engineering offers the education programmes that are assessed in this report.

The schools offer separate education programmes and consist of separate groups but share a dean, a departmental board and departmental offices. These offices provide personnel and budgeting services, and an education office provides services related to the running of the education programmes. The schools also share an advisory council and a departmental council. The Advisory Council consists of prominent people from different relevant sectors in society and regularly advises the Department Board on strategic and tactical issues. The Department Council consists of elected employees and students from the Department, and also advises the Board on strategic and tactical issues. The Council has the right to endorse policy on these matters.

The Board is responsible for education and research policy. The Dean is the head of the Department and responsible for its management, the education portfolio and the professor and associate professor appointments. The Board has two vice-deans, one for each school. The Managing Director deals with finance and departmental facilities.

The School of Industrial Engineering offers the following education programmes:

- Bachelor’s programme Technische Bedrijfskunde (TBK);
- Master’s programme Operations Management & Logistics (OML);
- Master’s programme Innovation Management (IM).

Together with other departments, the School offers:

- Master’s programme Business Information Systems (interdepartmental master together with the Department of Mathematics and Computer Sciences);
- Master’s programme Construction Management and Engineering (interdepartmental master together with the Department of Architecture, Building and Planning).

The Departmental Director of Education manages these programmes. Two programme directors are responsible for the programming of the master’s programmes.

The following programmes are also the responsibility of the School of Industrial Engineering:
Two-year postgraduate programme in Design of Logistics Management Systems;
Entrepreneurship minor;
Operations Management & Logistics minor;
Economics minor;
Certificate programme in Technology Management;
Certificate programme in Technology Entrepreneurship;
PhD programme Operations Management & Logistics.

The responsibility for the teaching in the Industrial Engineering courses in the bachelor's and master's programmes is allocated to four groups, each specialized in one or more relevant disciplines for research and teaching in operational processes:

- Human Performance Management (HPM).
- Information Systems (IS).
- Innovation, Technology Entrepreneurship and Marketing (ITEM).
- Operations Planning, Accounting, and Control (OPAC).

Each group is managed by a management team, headed by a chair appointed by the Board. A group’s task is to teach the allocated courses and to perform research in its domain and to attract sufficient, high-quality staff to conduct teaching and research tasks according to the mission of the School.

1.1. The assessment framework

1.1.1. Aims and objectives

<table>
<thead>
<tr>
<th>SI: Subject-/discipline-specific requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>The intended learning outcomes of the programme correspond with the requirements set by professional colleagues, both nationally and internationally and the relevant domain concerned (subject/discipline and/or professional practice).</td>
</tr>
</tbody>
</table>

**Description**

The School of Industrial Engineering focuses on the development and transfer of knowledge to improve operational processes. The School's scope covers the complete chain of processes from product marketing, product design, process design, purchasing and supply, production, to distribution and sales. The design, organization and management of this chain is strongly determined by the technologies used, the technological knowledge available, and the knowledge and training level of the people who play a role in the implementation, management and coordination of the processes.

According to the self-evaluation report, learning outcomes specify the knowledge, skills and attitude that a student should have acquired on completion of the programme; they are an operational definition of the programme objectives. The learning outcomes of the programmes of the School are divided into two categories: domain-specific and general. The general qualifications are those academic skills that students must acquire to behave professionally, participate in teams and conduct research independently (in master’s programmes) or under supervision (in bachelor’s programmes).

The objective of the bachelor's programme Technische Bedrijfskunde (TBK) is to educate academic engineers who possess scientific knowledge on and insight into the behaviour and performance of operational processes in industrial and service organizations, from a design
perspective. The self-evaluation report explains that until recently, bachelor’s students were trained to analyze processes, not to redesign them or offer suggestions for improvement. In response to the Ministry’s guideline to make bachelor’s programmes self-sufficient, this has been changed. The intended learning outcomes of the bachelor’s programme were brought in line accordingly.

Graduates of the TBK programme are, under supervision, capable of applying their multidisciplinary knowledge and insight, to organize and analyze complex, poorly structured operational problems, in an attempt to optimize (technical) operational processes systematically. A graduate of the TBK programme is able to:

1. analyze the performance of operational processes; in particular evaluate the output in terms of its input, the components and the operational efficiency and effectiveness of processes. The analysis is scientifically based. This means that it is carried out in a structured and reproducible manner, using a careful and well-founded selection of theoretical models and scientific methods, and that the analysis results are valid (or at least defensible);
2. determine how the performance of operational processes changes as a function of changes in input, the components and functioning and
3. (under supervision) produce and execute a research and design plan, i.e. plan for improvement.

The bachelor’s student bases his/her choices in analysis and design on broad scientific knowledge from the following disciplines:

- Engineering Economics (Group OPAC)
- Information Systems (Group IS)
- Operations Research (Group OPAC)
- Organization Sciences (Group ITEM)
- Work and Organizational Psychology (Group HPM)

Graduates have an academic attitude, design skills, and a set of communicative and social skills. Because of this they are able to:

1. reflect, think, and behave systematically (under supervision), i.e. they have acquired the skill to develop and use theories, models, and coherent interpretations and have a critical attitude;
2. communicate (in writing and orally) clearly, unambiguously, and in a professional manner in different contexts;
3. operate independently and in interdisciplinary teams;
4. analyze the ethical aspects and social and environmental consequences of scientific thinking and behaviour.

A more elaborated overview of the general academic skills is attached as appendix 1.

The School offers a special track TBK for Healthcare within the TBK bachelor’s programme. This track has the same objectives, level and orientation as the regular TBK bachelor’s programme.

According to the self-evaluation report, the TBK bachelor’s programme is comparable to the Industrial Engineering curricula commonly found in Europe and the United States. Both are
based on a foundation of mathematics, operations research, and statistics, supplemented by courses on scientific disciplines like operations management and logistics, information systems, organizational sciences, work and organizational psychology, and economic sciences. This choice of disciplines reflects the programme’s focus on an engineering approach to analysis and redesign of operational processes.

The objective of the master’s programmes Operations Management & Logistics (OML) and Innovation Management (IM) is to educate academic engineers who possess scientific knowledge on and insight into the design, behaviour, and performance of production and product innovation in industrial and service organizations. Graduates of these programmes are able to use this knowledge and insight to perform design-oriented research and develop and test science-based designs within the domain of the programme. Knowledge and insight into the domain of OML originate with the disciplines of information systems, operations research, work and organizational psychology, and engineering economics. Knowledge and insight into the domain of IM originate with the disciplines of organization sciences, marketing sciences and innovation sciences, information systems, work and organizational psychology, and engineering economics.

Graduates of the master’s programmes are engineers who:

1. have acquired a thorough mastery of the state of the art of scientific knowledge and insight into the design, behaviour, and performance of operational processes in industrial and service organizations, or of innovation processes. Knowledge and insight in this domain stems from the following disciplines: engineering economics, information systems, operations research, organization sciences, and work and organizational psychology;
2. have acquired social and research skills to independently conduct studies that meet academic standards, in the domains of Operations Management & Logistics or Innovation Management;
3. are capable of modelling and designing or redesigning a complex business process, based on the results of a study, including specifications for the required information and the organizational context.

Graduates are engineers who have acquired academic skills, design skills, and communication and cooperation skills. They:

1. can apply their knowledge and insight into research & development tasks in academia;
2. can apply their knowledge and insight into operational, consulting, and managerial tasks in industry;
3. can operate independently and in teams, at an academic level;
4. can reflect critically on their own thinking, decisions and actions and behave systematically;
5. operate effectively and efficiently in a multidisciplinary context;
6. communicate clearly and unambiguously, both in industry and in academia, with non-specialists and specialists in the domain;
7. are aware of the relative importance of knowledge of scientific disciplines and the societal impact of scientific knowledge (and vice versa);
8. possess the necessary learning skills to enable them to enter subsequent programmes requiring substantial independence, such as PhD programmes or postgraduate professional programmes or courses;
9. are capable of independently identifying and supplementing any lack of knowledge.
According to the self-evaluation report, the learning outcomes of the OML and IM master’s programmes are defined according to the demands on academic engineers. These demands are mainly based on international benchmarks, the intertwining of education and research, and contacts with the business community. When the bachelor’s and master’s programmes were first designed, an extensive round of discussions was held among various interested parties and stakeholders in order to arrive at clear and widely accepted learning outcomes. Discussions with organizations from the business community, alumni and international researchers led to an initial set of learning outcomes. The self-evaluation report claims that to keep up with changes in the environment or internal changes, the learning outcomes are adjusted by the programme directors, in consultation with the interested parties/stakeholders. Valuable assistance in this is provided by the active alumni organization VBI (Association of Industrial Engineers) and an advisory council. The IE Advisory Council includes representatives from the industrial and service sector.

Assessment
The committee studied the intended learning outcomes of the programmes and compared them to its domain-specific frame of reference. The committee concludes that the general aim of the TBK bachelor’s programme, to provide students with the ability to apply their multidisciplinary knowledge and insight and to provide them with the skills to organize and analyze complex, poorly structured operational problems, corresponds with the domain-specific requirements as formulated for the assessment of programmes in Industrial Engineering and Systems Engineering. The committee appreciates the deliberate decision to focus on information technology.

The committee notes that no specific intended learning outcomes have been formulated for the bachelor’s track IE for Healthcare. The committee assesses this track as very important and interesting from a societal point of view. Moreover, the number of students, especially female students, with a Nature & Health profile increases. The development of the diversity of the student population is certainly supported by attracting more female students. The committee advises to reflect bachelor’s track IE for Healthcare explicitly in the intended learning outcomes in order to do justice to the identity and value of this track.

The committee appreciates the distinction made between domain-specific requirements and general academic requirements. In view of the professional practice, the committee advises incorporating management skills into the intended learning outcomes of the bachelor’s programme.

The committee also established that the intended learning outcomes of the OML and IM master’s programmes, to provide students with knowledge and insight of the current design, behaviour, and performance of operational or innovation processes in industrial and service organizations and to provide them with the skills to model and design or redesign complex business processes, correspond sufficiently with the general aims for a master’s programme as laid down in the domain-specific frame of reference. In addition, the general academic requirements correspond sufficiently to the generic competencies formulated in this frame of reference.

With regard to the professional relevance of the programme curricula, the committee observed that the active alumni organization VBI and the Advisory Council are considered important bodies to ensure the correspondence of the intended learning outcomes with the demands of the professional field. However, the committee observed that these bodies are not asked for their opinion on the intended learning outcomes, and therefore have no direct
influence on the design of the curricula. The committee feels this is an omission given that the future employers of the majority of the graduates are important actors. The committee recommends considering the implementation of an efficient procedure whereby the industrial and service organizations that employ master graduates confirm or influence what they consider relevant learning objectives.

On the basis of these considerations, the committee assesses the standard related to the domain specific requirements as 'satisfactory' for all three programmes.

Bachelor’s programme Technische Bedrijfskunde: the committee assesses this standard as satisfactory.
Master’s programme Operations Management & Logistics: the committee assesses this standard as satisfactory.
Master’s programme Innovation Management: the committee assesses this standard as satisfactory.

<table>
<thead>
<tr>
<th>S2: Bachelor and master level</th>
</tr>
</thead>
<tbody>
<tr>
<td>The intended learning outcomes of the programme correspond with the general, internationally accepted descriptions of a Bachelor's qualification or a Master's qualification.</td>
</tr>
</tbody>
</table>

Description
The intended learning outcomes of the three programmes have been formulated in line with the so-called Meijers criteria for academic competencies. The self-evaluation report explains that these criteria have been adopted by the European Joint Quality Initiative, as an implementation of the Dublin descriptors. Seven areas of competence that characterise a university graduate are distinguished:

1. Competent in one or more scientific disciplines;
2. Competent in doing research;
3. Competent in designing;
4. A scientific approach;
5. Basic intellectual skills;
6. Competent in co-operating and communicating;
7. Takes account of the temporal and social context.

The self-evaluation report provides the following table which compares the learning outcomes of the TBK bachelor's programme and the OML and IM master’s programmes with the Meijers criteria:

<table>
<thead>
<tr>
<th>Scientific disciplines</th>
<th>TBK bachelor's programme</th>
<th>OML and IM master's programmes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The graduate bases his/her choices in analysis and design on scientific knowledge from several disciplines. The graduate is able to apply his/her multidisciplinary knowledge and insight under supervision to solve complex, ill-structured problems, in an attempt to optimize (technical) operational processes systematically.</td>
<td>The graduate is an engineer who has acquired a thorough mastery of the state-of-the-art scientific knowledge and insight into the design, behaviour, and performance of operational processes in industrial and service organizations, or of innovation processes. The graduate can independently identify and supplement any lack of knowledge.</td>
</tr>
</tbody>
</table>

| Doing research | The graduate can carry out an analysis in a structured and reproducible manner, using a careful and well-founded selection of theoretical models and scientific results, and the analysis results are valid (or at least | The graduate has acquired research skills to independently conduct studies that meet academic standards. |
### Assessment

The committee studied the intended learning outcomes of the three programmes from the perspective of their level. The committee agrees with the way the relation of the Meijers criteria and the intended learning outcomes has been elaborated in the self-evaluation report. The committee found that graduates of the TBK bachelor’s programme acquire skills and attitudes at a basic level that is characteristic of a bachelor’s programme and that the intended learning outcomes correspond sufficiently to the Dublin descriptors. For instance, TBK graduates acquire scientific knowledge on and insight into the behaviour and performance of operational processes in industrial and service organizations (Dublin descriptor 1). In addition, they develop the skills to use theories, models, and coherent interpretations (Dublin descriptor 2). The ability to analyze ethical aspects and social and environmental consequences of scientific thinking and behaviour reflects Dublin descriptor 3 (Making judgments), while the ability to communicate (in writing and orally) clearly, unambiguously, and in a professional manner in different contexts is in concordance with Dublin descriptor 4. Finally, the development of a critical attitude and the ability to operate independently and in interdisciplinary teams corresponds with Dublin descriptor 5, Learning skills.

The intended learning outcomes of the OML and IM master’s programmes show that students acquire knowledge, understanding, skills and attitudes at an advanced level that is typical of a master’s programme. The committee established that the intended learning outcomes correspond sufficiently with the Dublin descriptors. For instance, students of the master’s programmes achieve a thorough mastery of state-of-the-art scientific knowledge and insight into the design, behaviour, and performance of operational processes in industrial and service organizations, or of innovation processes (Dublin descriptor 1). In addition, they can model...
and design/redesign a complex business process, based on the results of a study, including specifications for the required information and the organizational context (Dublin descriptor 2). Dublin descriptor 3 – making judgments – is most distinctively reflected in the awareness of the relative importance of knowledge of scientific disciplines and the societal impact of scientific knowledge (and vice versa). The ability to communicate clearly and unambiguously, both in industry and in academia, with non-specialists and specialists in the domain corresponds with Dublin descriptor 4. Finally, the abilities to reflect on the validity of information, analytical methods, results obtained and independently identify and supplement any lack of knowledge are in concordance with Dublin descriptor 5.

The committee notes that the differences in level between the bachelor’s and the master’s programme are clearly reflected in the intended learning outcomes, in particular by explicitly referring to the level of autonomy and the complexity of the problem situations. The committee concludes that the level of the three programmes sufficiently corresponds to the Dublin descriptors, which are considered general, internationally accepted descriptions of academic qualifications.

Bachelor’s programme Technische Bedrijfskunde: the committee assesses this standard as satisfactory.
Master’s programme Operations Management & Logistics: the committee assesses this standard as satisfactory.
Master’s programme Innovation Management: the committee assesses this standard as satisfactory.

**S3: Academic orientation**

The intended learning outcomes of the programme correspond with the following descriptions of a Bachelor’s and a Master’s qualification:

- The intended learning outcomes are derived from requirements set by the scientific discipline, the international scientific practice and, for programmes to which this applies, the practice in the relevant professional field.
- An academic bachelor (WO-bachelor) has the qualifications that allow access to at least one further programme at academic master’s level (WO-master) and the option to enter the labour market.
- An academic master (WO-master) has the qualifications to conduct independent research or to solve multidisciplinary and interdisciplinary questions in a professional field for which academic higher education is required or useful.

**Description**

According to the self-evaluation report, the most important objective of the TBK bachelor’s programme is to give students a scientific grounding in the field of operational process analysis and design. An indicator of the level of the bachelor’s programme is the direct transfer of graduates to (inter)national master’s programmes. After finishing the bachelor’s programme, students can enter the IM and OML master’s programmes. In addition, TBK graduates have direct access to the master’s programmes in Business Information Systems and Construction Management and Engineering. The same applies to a significant number of related master programmes, if necessary after completion of a limited transfer programme of no more than 30 EC.

In line with the TU/e vision on education, a bachelor’s degree is not considered a final destination in higher education: ‘the BSc programme must lay a solid foundation – consisting of a combination of knowledge of a particular field and engineering skills – for further education’. The self-evaluation report states that the TU/e bachelor’s programmes’ learning outcomes are derived from master’s programmes’ entry levels.

The self-evaluation report points out that the OML and IM master’s programmes allow for specialization and taking in most up-to-date scientific knowledge from the scientific
community. After completion of the master’s programmes, graduates will be able to work and think independently at an academic level in a career as engineer, researcher, manager or consultant.

According to the intended learning outcomes of the master’s programmes, graduates are able to carry out research independently regarding the behaviour and performance of operational or innovation processes in industrial and service organizations. In addition, they have acquired the qualifications, as engineers, to analyze and redesign an operational process from a multidisciplinary perspective.

Assessment

The committee studied the intended learning outcomes of the three programmes from the perspective of their orientation. The committee concludes that the intended learning outcomes of the TBK bachelor’s programme correspond sufficiently to the demands of the scientific discipline. According to the intended learning outcomes, students acquire the skills to develop and use theories, models, and coherent interpretations. In addition, they can analyze ethical aspects and social and environmental consequences of scientific thinking and behaviour. The committee also noted that TBK graduates have unconditional access to at least four master’s programmes.

In the assessment of standard 1, the committee concluded that the intended learning outcomes of the bachelor’s programme correspond sufficiently to the relevant professional requirements, most explicitly in the ability to operate independently and in interdisciplinary teams. The committee appreciates the decision of the programme management to include design skills in the intended learning outcomes of the bachelor’s programme. The committee believes that with this decision, the programme management successfully anticipated the ministerial guideline for bachelor’s programmes as a final degree programme.

According to the intended learning outcomes of the OML and IM master’s programmes, students acquire the qualifications to conduct independent research. This is most clearly reflected in the learning outcome which states that graduates have acquired social and research skills to independently conduct studies that meet academic standards, in the domains of Operations Management & Logistics or Innovation Management. However, the committee advises explaining the required research skills in more detail and, in addition, making what is perceived as academic standards more explicit.

As described under standard 2, the intended learning outcomes of the bachelor’s and master’s programmes are formulated in line with the so-called Meijers criteria for academic competencies. These competencies explicitly reflect both scientific and professional requirements. The Meijers criteria 2 and 6 (competence in doing research and the development of a scientific approach) are clearly derived from requirements set by the academic discipline, while the criteria 3 and 5 (competence in design, cooperation and communication) most explicitly reflect requirements derived from the practice of the relevant professional field. In the learning outcomes which describe the awareness of the temporal, market and social context (Meijers criterion 7), requirements from the scientific discipline and from the professional practice are combined. Illustrative in this respect are the learning outcomes which refer to the ability to analyze ethical aspects and social and environmental consequences of scientific thinking and behaviour (bachelor’s programme) and the awareness of the societal impact of scientific knowledge and vice versa (master’s programmes).
The committee therefore concludes that all three programmes clearly aim at educating academic researchers as well as professionals for which academic higher education is required.

**Bachelor’s programme Technische Bedrijfskunde:** the committee assesses this standard as **satisfactory**.

**Master’s programme Operations Management & Logistics:** the committee assesses this standard as **satisfactory**.

**Master’s programme Innovation Management:** the committee assesses this standard as **satisfactory**.

### Assessment of the theme Aims and objectives

The committee comes to an overall assessment of the theme Aims and objectives on the basis of its assessments of the separate standards. In the case of the bachelor’s programme Technische Bedrijfskunde, it assesses this theme as **satisfactory**. In the case of the master’s programme Operations Management & Logistics, it assesses this theme as **satisfactory**. In the case of the master’s programme Innovation Management, it assesses this theme as **satisfactory**.

### 1.1.2. Curriculum

#### Description of the curriculum of the programmes

The self-evaluation report states that the curriculum of the TBK bachelor’s programme is designed to enable students to acquire the knowledge and skills necessary to analyze and design/redesign operational processes of all kinds. It defines operational processes as organized systems of equipment, people, and working methods that transform material and information into specified products and services. To understand the working of a process and explain its performance, fundamental knowledge is needed concerning the properties and characteristics of the constituting elements that embody the process. These elements are: the technologies involved; the human beings involved; the working methods used; and the organization of the process. Moreover, operational processes must be economically viable and allow for the realization of company goals in the market it serves. Therefore, economic knowledge is needed for understanding and designing operational processes.

The curriculum of the bachelor’s programme consists of four parts: knowledge of scientific disciplines; operational process knowledge; training and application; and mathematics and research methodologies. The self-evaluation report provides a diagram which shows the programme parts in percentage terms. Roughly 30% of the curriculum consists of courses in scientific disciplines (including a minor of 30 EC); 27% consists of courses providing process knowledge and 13% consists of skill development-oriented courses. The remaining courses concern mathematics (18%) and research methods (12%).

**Knowledge of scientific disciplines:** The core technologies of many processes are very specific and based on the physical sciences. According to the self-evaluation report, it is impossible to provide fundamental knowledge about the working of all these so-called hard technologies within the TBK curriculum. The programme management therefore decided to focus on the scientific disciplines that are generic for all types of processes and provide the ‘soft technologies’ for the design and control of operational processes. The disciplines in the core of the curriculum cover basic knowledge of operational processes and the way in which technology, human and social factors interact. These scientific disciplines are: Engineering Economics, Information Systems, Operations Research, Organization Sciences, and Work...
and Organizational Psychology. In addition to the obligatory courses (see the table below), students choose a minor (30 EC) to either broaden or deepen their knowledge.

Operational process knowledge: In addition to knowledge of scientific disciplines, the curriculum provides in-depth knowledge about the basic characteristics of the main operational processes that are present in most or all businesses. Fundamental to all operations are the processes that convert materials and/or information into products and services. The main ones are: supply processes, production processes, inventory processes, and transportation, warehousing, and distribution processes.

New technologies and changes in customer needs may lead to opportunities for revising products and services to improve customer satisfaction or sales margins. Two processes are key in controlling the innovation of products and services: marketing and purchasing processes and new product development processes.

Subjects dealt with regarding all these operational processes are: control of the quality of the products and services resulting from the processes; control of the volume and timing of products and services; and control of the availability of the volume and quality of the resources needed for execution of the process.

Training and application: The third part of the curriculum consists of elements that train the student in applying their knowledge of scientific disciplines and process knowledge to understand the working and performance of operational processes and design/redesign these processes (or parts of them). These elements are partly grouped under the heading of OGO (Design-Based Learning, Dutch abbreviation). In OGO, students are trained in design skills, such as critical analysis of design problems, specification of design parameters, and the implementation of knowledge and insights.

Mathematics and Research Methods The three parts mentioned above constitute the core of the curriculum. Most courses in the core curriculum require a basic knowledge of mathematics, statistics or methodology. This knowledge is provided in courses taught mostly by specialists from other departments. In addition, specialists from the School of Innovation Sciences provide courses on ethics and on the methodology of behavioural research.

An overview of the courses of the TBK bachelor’s programme is provided in the following table:

<table>
<thead>
<tr>
<th>Year</th>
<th>Course</th>
<th>EC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>Introduction to Industrial Engineering (OGO)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Quality Management</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Business Information Management (OGO)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Financial and Management Accounting 1 and 2 (OGO)</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Logistics 1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Organizational Science 1 (OGO)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Marketing (OGO)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Calculus 1, 2, and 3</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Probability Theory</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Statistics 1 and 2</td>
<td>6</td>
</tr>
<tr>
<td>1st</td>
<td>Optimization</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Set Theory and Logic</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Behaviour, Performance and Organization: basics</td>
<td>6</td>
</tr>
</tbody>
</table>
Master’s programme Operations Management & Logistics

The OML master’s programme focuses on production and product delivery processes. The self-evaluation report clarifies that operations form the basis of every organization, whether in the manufacturing, service or non-profit industries. OML is a multidisciplinary field that comprises disciplines such as production management, logistics, information and information systems management, and human resources management. Operations extend from the performance management of a group of design engineers or documenting and formalizing administrative workflows to the precise prediction of production and delivery performance. Supply chain management and the design of information architectures for e-business are also part of operations management.

The structure of the OML MSc programme is as follows. First, students follow compulsory modules (40 EC) in Philosophy of Management Science, Business Process Management, ICT Architectures of Enterprise Information Systems, Modelling and Analysis of Manufacturing Systems, Management Accounting, Supply Chain Operations Planning, Performance Enhancement, and Research Design, Data Collection and Analysis. In addition, students choose a mentor and a subject area for their master’s thesis. Generally, the thesis subject area is part of the research area covered by the mentor, mostly in one of the three specialization areas: Human Performance Management, Information Systems, or Operations, Accounting and Supply Chain Planning. The choice of a mentor implies the choice for a restricted set of elective courses (maximum 30 EC). In addition, the student selects a number of free electives (minimum 20 EC). Students may spend a part of their electives (usually 20-30 EC) on a semester at one of the partner universities. The students should settle the content of the semester abroad with their mentor as some of the courses taken abroad may form part of the restricted electives. The Master’s Thesis Preparation course (10 EC) consists of performing a literature study and drafting the research proposal, and needs to be completed and approved.
before the start of the thesis work. The programme concludes with the Master’s Thesis Project (30 EC).

Master’s programme Innovation Management

According to the self-evaluation report, the Innovation Management discipline studies the management of innovation processes and develops theories, tools and techniques to make businesses more innovative. Key aspects of this discipline are knowledge management, strategic alliances, new product development, close supplier partnerships, marketing management, quality and reliability engineering, and technology management. The object of the studies is the new product development process and the processes involving cooperation with other organizations and sharing knowledge with them.

The structure of the IM master’s programme is as follows: like OML students, IM students complete compulsory modules (40 EC). The IM compulsory courses are: Philosophy of Management Science, Project and Process Management, Human Aspects of Product Development & Quality, Marketing and Innovation, New Product Development, Research Design, Data Collection and Analysis, Design Science Methodology, and System Dynamics. In addition, IM students also choose a mentor and a subject for their master’s thesis. Furthermore, as advised by their mentor, students can choose from a restricted set of elective modules (20 EC), clustered in three tracks: New Product Development, Open Innovation or Technological Commercialization and Entrepreneurship. In addition, students select a number of free electives (minimum 20 EC). Students may spend a minimum of 20 and a maximum of 30 EC of their electives on an international semester. The students should settle the content of the international semester with their mentor as the electives are linked to the master thesis project (30 EC). The Master Thesis Preparation course (10 EC) consists of performing a literature study and drafting the research proposal.

During their master’s programme, students can broaden or deepen their study with a double degree programme with Grenoble INP, France; a programme at the Korea Advanced Institute of Science and Technology in Daegu; or a double degree in Operational Finance with Tilburg University (only for OML students).

### S4: Requirements for academic orientation

The proposed curriculum meets the following criteria for an academic orientation:

- The students develop their knowledge through the interaction between education and research within the relevant disciplines
- The curriculum corresponds with current developments in the relevant discipline(s) by verifiable links with current scientific theories
- The programme ensures the development of competences in the field of research
- Where appropriate, the curriculum has verifiable links with the current relevant professional practice.

### Description

The self-evaluation report states that the most direct link between research and education is the teaching and research input by the staff. Courses are taught by staff members who are active researchers. Also, the supervision of thesis work is done by researchers. According to the self-evaluation report, students are guaranteed a thorough grounding in the use of knowledge of scientific disciplines and process knowledge for design-oriented research and education.

The self-evaluation report furthermore points out that almost all of the research in the IE School is housed in the KNAW recognized Beta Research School for Operations Management & Logistics. Beta carries out multidisciplinary research in the field of Operations Science.
Management & Logistics. The research is typically quantitative and empirical, and involves the use of mathematical and statistical models. The researchers in this field work together with colleagues at partner institutes in North America, Asia and Europe.

As described in the preceding section, the TBK bachelor's programme focuses on the description and analysis of operational processes in industrial and service organizations. In the first two years of the programme, mainly textbooks are used, while in the later years students are required to use scientific literature also. The self-evaluation report further states that students become acquainted with research activities during OGO courses in the second year and especially during the Bachelor's Final Project. These courses and the project give students their first significant introduction to current research being conducted in the School. During the site visit, students indicated that they are informed about the research of the different groups at the start of the programme in the Introduction to Industrial Engineering module.

The self-evaluation report states that the bachelor's programme includes a number of design and research methodology courses and an ethics course on industrial engineering's potential societal impact. The core programme provides a substantial foundation in the basics of scientific research. Four so-called ‘integration components’ are included in the bachelor’s programme. These integration components are aimed primarily at methodical integration within the industrial engineering field. The self-evaluation report states that methodical integration is meant to explain and analyze an operational process from several angles of scientific knowledge, using methods and techniques from different scientific disciplines. In these integration moments, different analytic skills are integrated: modelling and data usage, data acquiring (in practice), and the use of models and data in design. In the Bachelor’s Final Project all of these skills are integrated.

During the programme, students are confronted with the professional world through case studies and projects. In the second year and the bachelor’s thesis in the third year, students (groups) mostly work on real-life research projects developed in consultation with industry. Furthermore, company visits are organized in some courses, for instance in the first year Introduction to Industrial Engineering course. The self-evaluation report states that these company visits give students a good idea of operational processes and of the everyday practice of industrial engineering professionals.

The School’s research focus is on two main areas, i.e. operations management and logistics, and innovation management. The OML and IM master’s programmes also focus on these knowledge domains. According to the self-evaluation report, the School imposed the following requirements for the development of modules in the master’s programmes to ensure sufficient interaction between education and research:

- course content is related to current research;
- course content is positioned within the research context in which it originated;
- course content contains various perspectives, including scientific controversies and critical analysis of these controversies;
- design projects are based on real-life operational processes;
- prescribed literature consists mainly of articles published in scientific journals, providing students with state-of-the-art information.

This is supported by the departmental policy to offer staff positions that combine research and teaching tasks.
According to the self-evaluation report, a typical characteristic of modules of the OML master's programme is that students conduct design projects, based on actual business processes, and relate them to the scientific literature. The reporting is not limited to the actual design assignment but always reflects the relative contribution of the various disciplines. All thesis projects are conducted in close cooperation with industrial partners and offer students the opportunity to obtain further in-depth knowledge of the best practices in industry. Most of the projects are conducted in full or in part on site at industrial partners. Projects cover a wide variety of subjects, and require students to specialize further in one of the three key disciplines that contribute to the programme (Human Performance Management, Information Systems or Operations, Accounting and Supply Chain Planning).

The IM master's programme conveys tools and techniques to manage and improve innovations both within and across companies. The self-evaluation report claims that during the programme, students learn how to apply the knowledge they gain in carrying out research to innovation management and to industrial applications. They learn ways to analyze the current innovative performance of a company, how to explain it in terms of quality, cost and time, and how to improve this performance by re-engineering innovation processes. Students furthermore experience what it means to carry out research, to gain new insights and to apply the acquired knowledge in projects.

The self-evaluation report claims that during both master’s programmes, students conduct design projects and relate their work to the current scientific literature and research. In addition, students are required to perform a literature study independently on their thesis subject. Students become further acquainted with research activities during the Master’s Thesis Project, in which they learn to apply scientific methods creatively to the solution of operational problems. In their thesis, students must reflect on the relative contribution of the various disciplines to the design, the societal context and impact of the design, and the feasibility of the design, related to specific circumstances including the regional and business culture.

Each student seeks a mentor, who plays a crucial role in the interaction of education and research. During the site visit, the committee was informed about the meetings held for students about the current research activities of potential mentors. Students have to apply for a mentor and sign up for a selection interview. In these interviews, students are informed about the research interests of their possible future mentor and the projects and companies which are available. Students indicated that they chose their mentor mainly on the basis of their current research topics and confirmed that mentors involve them in issues regarding their own research and introduce them to current scientific debates. The research projects’ design questions are formulated within the thesis mentor’s research area and mostly performed in an industrial organization. Mentors are always qualified researchers.

**Assessment**

During the site visit the committee discussed the interaction between education and scientific developments with students and lecturers. In addition, the committee studied a significant number of course descriptions and literature of the three programmes. Based on this inspection, the committee concludes that the learning material of the TBK bachelor's programme includes thorough state-of-the-art introductions to the field. The committee notes that the number of scientific articles offered in the first two years of the programme is very limited. The committee recommends introducing scientific articles earlier in the programme, to ensure students become sufficiently acquainted with scientific debates. The committee appreciates that students are informed about the main research topics of the five groups in one of the first modules of the programme. In addition, the committee is positive about the case studies.
and projects through which students are introduced to the relevant professional field of practice.

The committee was impressed by how well acquainted the students of both master's programmes were with current scientific debates in their field of study, and with high-impact scientific journals. Students confirmed that they often choose to align their master’s thesis to current research topics and gave some good examples of these recent issues. The committee highly appreciates the role of the mentor in this matter. During the site visit, the committee was informed about the meetings held for students about the current research interests of their potential mentors. Students attend those meetings to make an informed decision about their thesis project. The committee feels that the connection of students with a personal mentor particularly in an early stage of the programme stimulates a strong link with current scientific debates throughout the programmes. The committee highly appreciates this approach.

In addition, the committee established that recent scientific developments are incorporated into the courses. Lecturers provide examples from their own research as study cases and inform students about topics of relevant dissertations of the last few years. The modules and the Master’s Thesis Project ensure the development of research skills. The committee appreciates the embedding of the main body of research carried out in the School in the Beta Research School for Operations Management & Logistics. Furthermore, the committee concluded that by means of the Master’s Thesis Project, students are sufficiently introduced into the professional field.

On the basis of these considerations, the committee assesses this standard as ‘satisfactory’ in the case of the bachelor’s programme, and ‘good’ in the case of both master’s programmes.

**Bachelor’s programme Technische Bedrijfskunde:** the committee assesses this standard as **satisfactory**.

**Master’s programme Operations Management & Logistics:** the committee assesses this standard as **good**.

**Master’s programme Innovation Management:** the committee assesses this standard as **good**.

**S5: Correspondence between the aims and objectives and the curriculum**

The curriculum is an adequate realisation of the intended learning outcomes of the programme and this regards the level, the orientation and the subject-/discipline-specific requirements.

The intended learning outcomes are adequately transferred into the educational goals of the curriculum or parts thereof.

The contents of the curriculum ensure the students’ achievement of the intended learning outcomes.

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**Description**

The self-evaluation report claims that the modules provide students with the knowledge and skills necessary to analyze and design/redesign operational processes of all kinds in order to achieve the intended learning outcomes.

The self-evaluation report provides a detailed overview of the relation between the intended learning outcomes and the contents of the curriculum of the **TBK bachelor’s programme**. For each course, it indicates whether it pertains to knowledge or skill development, what type of knowledge (domain-specific or process knowledge), the study load (in EC) and the teaching method used. Some of the courses provide both knowledge of scientific disciplines and process knowledge. The programme is built up as follows. In the first year, all disciplines are introduced, some process courses are taught, and students are introduced to process thinking. Much of the rest of the year is devoted to acquiring basic knowledge in mathematics and
statistics. In the second year a mixture of courses in scientific disciplines, process knowledge and skill development is taught. In addition, courses on research methods are given. In the third year, the emphasis is on process knowledge and the application of scientific disciplines and process knowledge, mainly in the bachelor’s thesis project. Furthermore, students choose a minor (30 EC) with which they can either broaden or deepen their knowledge.

The self-evaluation report provides a detailed overview of the compulsory part of the OML and IM master's programmes. For each course, it indicates whether it pertains to knowledge or skill development, what type of knowledge is developed, the study load (in EC) and the teaching method used. The majority of the programme curricula consists of courses on process knowledge and research skill development. A third of the compulsory courses of the IM master’s programme consists of courses in design methods.

**Assessment**

The committee studied the overview of the learning outcomes of the courses in the TBK bachelor’s programme, classified into domain-specific knowledge and skills and general academic skills. The committee established that learning outcomes of the courses sufficiently translate the intended learning outcomes of the programme as a whole. The learning outcomes of most modules are described in a clear and detailed way which promotes their valid assessment.

However, the committee doubts whether the curriculum ensures that students acquire a broad scientific knowledge of the field of Engineering Economics. It believes that the curriculum in this field is rather narrow. Curriculum components which are particular relevant for engineers should be covered more extensively, such as cost estimation, bidding theory, learning curves, and decision making under uncertainty.

The committee appreciates the elaborate description of the master's curricula provided by the self-evaluation report. On the basis of the information provided, the committee has established that the curricula have been designed in a well-considered way. The committee established that the learning outcomes of the various compulsory courses are not linked explicitly to the qualifications of the programmes, but they relate sufficiently to the overall outcomes. The committee verified the tables which relate the courses in the master’s programmes to the various competencies and concludes that the information provided is adequate and correct. The committee notes that the mentor and an elaborate selection of electives are crucial in ensuring that students achieve the intended learning outcomes. Obviously, quality control of the mentors and the electives is of prime importance in such a situation.

With this remarks, the committee assesses this standard as ‘satisfactory’ for all three programmes.

*Bachelor’s programme Technische Bedrijfskunde:* the committee assesses this standard as **satisfactory**.
*Master’s programme Operations Management & Logistics:* the committee assesses this standard as **satisfactory**.
*Master’s programme Innovation Management:* the committee assesses this standard as **satisfactory**.

**S6: Consistency of the curriculum**

The contents of the curriculum are internally consistent.
Description
As described in section 1.1.2, the core of the TBK bachelor's programme is formed by five disciplines: Engineering Economics, Information Systems, Operations Research, Organization Sciences, and Work and Organizational Psychology. These disciplines are the pillars of the two focus areas: Product Development Processes and Operational Processes.

The self-evaluation report claims that the contents of the basic courses in the bachelor’s programme are carefully aligned to ensure that prerequisite knowledge for each course is available from previous courses. Moreover, the self-evaluation report states that a series of integrative elements ensures that students acquire a multidisciplinary overview of the object of study (operational processes) and can integrate the views from different scientific disciplines. The aim here is to look at a given operational process from a series of viewpoints from different scientific disciplines.

In the bachelor’s programme students analyze process problems in OGO courses, aiming to solve problems using knowledge from one of the disciplines. Students reflect on the assumptions made regarding the contribution of other disciplines. Mathematics and research methodology courses provide the necessary prior knowledge in the disciplines, process and integration courses.

During the site visit, the committee was informed about the integrative line in the bachelor’s programme, which is designed primarily with methodological integration in mind. Students indicated that at the end of the first year, a final assessment on elements from different modules is carried out. Students confirmed that during the programme, cases become more and more complex. During the final project, students integrate the knowledge, methods and techniques that they have acquired from the entire curriculum.

The self-evaluation report states that the internal coherence of the OML and IM master’s programmes follows directly from their design. As indicated under standard 4, each student determines his or her own personal study programme with the guidance of a mentor, who will also guide the student during the Master’s Thesis Project. Furthermore, a strong link exists between the courses and the thesis research, which is in most cases connected to the research area covered by the supervising professor.

The core courses build on and deepen the knowledge acquired in the TBK bachelor’s programme in the area of either Product Development or Production and Distribution. The restricted elective courses provide a scientific basis for the Master’s Thesis Project and are tailored to research areas and/or job profiles. The Master’s Thesis Preparation is directly linked to the Master’s Thesis Project and consists of performing a literature study and drafting the research proposal. For the free electives, the student selects a number of courses from those offered by the groups. These courses are not necessarily related to the thesis project. However, the courses selected are usually closely related to the focus area of the master’s programme in question.

Assessment
During the site visit, the committee was informed about the construction of learning lines in the bachelor's programme. The committee appreciates the way in which the curriculum is divided into disciplines and supports the development of additional learning lines in view of a coherent curriculum. The committee studied the newly developed integrative line in the programme and in particular the assignments in the relevant modules. Based on this elaboration and discussions with the lecturers and students, the committee concludes that the
assignments adequately support the methodical integration. The committee applauds the development of the disciplinary integration in addition to the integration of methods.

The committee appreciates the interesting approach taken for the development of the research skills by using ‘methodical integration’ in four ‘integration components’ in the bachelor’s curriculum. The committee considers the role of these OGO courses as very relevant, because besides research skills the ‘design language’ is also an important topic in these courses. Actually, the integration components are intended to relate ‘design’ with ‘research’, ultimately resulting in design based research. The committee values this approach, also because this relates well with the master’s programmes.

However, the committee wonders if these integration components reflect sufficiently upon the relationship between ‘design’ and ‘research’. Methodical integration is an important goal, but the four design courses (12 EC) in the second year are monodisciplinary design courses using a joint ‘design concept’. Taking into account that the School is currently discussing the additional learning line ‘integration & design’ the committee advises to reflect deeper on the relation between ‘design’ and ‘research (skills)’ and their place on the continuum ‘disciplinary’ - ‘multidisciplinary’.

The committee furthermore believes that more attention could be paid to the visibility of the design of the curriculum and the rationale behind it. If students were aware of the importance of particular courses in terms of the overall learning outcomes, they could be better motivated. During the site visit, students indicated that it was not clear from the start why the programme required so much mathematics and statistics. Because a large part of the first year consists of these modules, and many students find them difficult, it is important to make the interrelation of these modules with the rest of the curriculum explicit.

During the site visit, the committee discussed the coherence of both master’s programmes with the students. The committee appreciates that the first semester consists of compulsory courses. After this first semester, students choose a mentor, with whom they draw up a detailed study plan. Students confirmed that their mentors play a crucial role in the selection of electives. Each group offers a coherent package of elective courses. The committee believes that in this way sufficient attention is paid to ensure that students complete a coherent curriculum in preparation for their master’s thesis project.

On the basis of these considerations, the committee assesses the standard related to the consistency of the curricula as ‘satisfactory’ for all three programmes.

**Bachelor’s programme Technische Bedrijfskunde:** the committee assesses this standard as **satisfactory**.

**Master’s programme Operations Management & Logistics:** the committee assesses this standard as **satisfactory**.

**Master’s programme Innovation Management:** the committee assesses this standard as **satisfactory**.

### S7: Workload
The curriculum can be successfully completed within the set time, as certain programme-related factors that may be an impediment in view of study progress are eliminated where possible.

### Description
The study load of the TBK bachelor’s programme is 180 EC. It is evenly divided over the three course years, and within a given year, the EC are equally divided over the semesters. Many of
these courses include one or more assignments, which count towards the course grade. Some courses, especially the OGO courses, consist almost exclusively of group work, and the course grade is usually based on a paper. The self-evaluation report mentions that the study load is monitored on a regular basis through student evaluations of courses and programmes. Furthermore, the deputy Departmental Director of Education checks the study load of the programme before the start of each semester. The results of this analysis are discussed in the Programme Committee.

The self-evaluation report points out that in the past few years, the regulations concerning sequential relations in the bachelor’s programme have been changed to enable students to complete their programme without too many formal restrictions. Two restrictions are retained, however, to assure that students can comply with enrolment regulations. First, students must finish their first-year exams, or at least obtain a positive study recommendation, before they can take the second-year course Data Collection and Analysis. Second, students cannot start their final thesis project until they have completed their propedeutic phase and the Data Collection and Analysis course.

The self-evaluation report reveals that despite these efforts, students still encounter problems with progress because their secondary schools have not always brought them to the level needed for the first year of the bachelor’s programme. In the past, students predominantly ran into trouble with calculus and statistics. As a result, the first-year courses on these subjects have been adjusted and expanded.

During the site visit, students confirmed that many of them have trouble with the calculus and statistics modules. Because students have to take 5 exams in two weeks, students are tempted to put off the difficult ones. As a result, they run into trouble with the subsequent modules in the second year of the programme. If students have to do resits, they have to prepare even more, because resits occur in the next examination period. The committee was informed that students who are not proceeding according to plan in their first year have restricted access to second-year courses. In addition, students who face substantial delay receive extra support from the student counsellor, in the form of a study contract, an agreement between the student and the counsellor to plan the student’s second year.

Students indicated that they spend 35 hours a week on their studies on average, including contact hours.

The study load of both master’s programmes is 120 EC. It is evenly divided over the two years and, within a given year, evenly divided over the semesters. Most of the courses in the first year end with a regular exam, which can be taken twice a year. Many of these courses include one or more group assignments, which also contribute to the course grade. The second year consists of elective courses, preparation for research, the research itself and writing a thesis. These programme elements are closely monitored by the mentor and usually take place within the time period set.

The self-evaluation report mentions that the Programme Committee occasionally checks the study load of the master’s programmes and discusses the results with the programme directors. According to the self-evaluation report, the last check showed that there are no serious structural bottlenecks preventing the students from completing their programmes in the time available. The workload is monitored on a regular basis through student evaluations of courses and programmes. According to these evaluations, delays occurring in the master’s programmes are usually encountered in the thesis projects. During the site visit, students
indicated that for students who which to take an international semester, it is difficult to finish the programme in the time allotted.

**Assessment**
The committee believes that the spread of the workload in all programmes is sufficient, and it is possible to complete the curricula within the set time. The committee notes that the School has taken several measures to ensure the bachelor’s curriculum is feasible, such as the regulations governing starting the Data collection and analysis module. The committee highly appreciates the involvement of the student counsellor to draw up an individual study plan and to sign a study contract with students who face substantial delay.

The committee observes that students find it difficult to complete five modules within one quarter. In addition, students indicated that they often postpone their work until the final two or three weeks. The committee believes that the School could aim more at keeping students to their study schedule, for instance with the introduction of half-term assignments in all courses of the first year of the programme, as is already done in the mathematics courses.

The committee observes that students in both master’s programmes are highly motivated and that the workload is substantial, but feasible. The committee notes that for students who wish to take a semester abroad, it is difficult to finish their programme in two years. The committee finds that the programme management should investigate opportunities to schedule the elective courses more flexibly, in order to create more possibilities for students who want to study abroad, without facing study delay. The committee stresses that the programme is always responsible for the quality of modules completed outside the Netherlands, even when it is not mandatory for students to go abroad.

With these recommendations taking into account, the committee assessed the standard related to the workload as ‘satisfactory’ for all three programmes.

* Bachelor’s programme Technische Bedrijfskunde: the committee assesses this standard as satisfactory.
* Master’s programme Operations Management & Logistics: the committee assesses this standard as satisfactory.
* Master’s programme Innovation Management: the committee assesses this standard as satisfactory.

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**S8: Admission requirements**
The structure and contents of the intended curriculum are in line with the qualifications of the incoming students:
- Academic bachelor’s programme (WO-bachelor): VWO (pre-university education), propaedeutic certificate from a hogeschool (HBO) or similar qualifications, as demonstrated in the admission process
- Master’s programme (WO-master): a bachelor’s degree and possibly a selection (with a view on the contents of the discipline).

**Description**
The TBK bachelor’s programme is open to students who hold a pre-university secondary school diploma (in Dutch: vwo) with an NT profile (Nature and Technology) or with an NG profile (Nature and Health). Students who have successfully completed the first year at one of TU/e’s other departments or at one of the other Dutch universities of technology or at specific institutes of higher professional education (in Dutch: hbo) also have access to the programme.
Most students enter the propaedeutic phase of the programme directly from the vwo. Since 2004, the number of students enrolling in the bachelor’s programme has more than doubled, from 101 in 2004 to 220 in 2009. The IE for Healthcare track has a steady intake of some 15-20 mostly female students.

The intake of students with a NT profile seems to be declining, while the intake of students with a NG profile is increasing. The self-evaluation report notes that this is probably caused by the growing number of secondary school students choosing a NG profile.

During the site visit, the committee discussed the correspondence of the qualifications of the incoming students regarding mathematics with students, lecturers and the programme management. The committee was informed that an intake assessment is done to determine if the level of mathematics of first year students is adequate. In addition, a fundamental focus of the first mathematics module is developing calculus skills. Particular attention is paid to the evaluation of the mathematics modules.

In order to keep the structure and contents of the curriculum in line with the qualifications of the incoming students as much as possible, the programme management stays in close contact with secondary schools. Together with lecturers from secondary schools, instruments were developed for students who want to practise mathematics, especially algebraic skills, in order to meet better the prerequisite mathematical knowledge and skills demanded in such courses as calculus, statistics, logistics and business economics in the first year. The idea is to connect more closely to secondary school mathematics training, and aim less at general mathematical knowledge and more at the knowledge used in the TBK curriculum.

The OML and IM master’s programmes are open to students who hold a bachelor’s degree in Industrial Engineering. All other students must successfully complete a set of preparatory courses, the number of which depends on the relevance of their educational background. The Admissions Board for the master’s programmes decides on the admission of these students and of students who hold an hbo degree or one from institutes which do not provide direct access to a standard pre-master programme. The Admissions Board consists of two staff members and the Programme Director of the master’s programme in question, supported by a secretary.

The self-evaluation report presents an overview of the requests the Admission Board has received over the past few years. It reveals a growing number of requests for admittance, particularly to the IM master’s programme. In addition, the self-evaluation report provides tables which show the intake numbers in the master’s and pre-master’s programmes. From 2006, an average of 29 students enrolled in the IM pre-master’s programme, while an average of 20 students started with the OML pre-master’s programme. The pre-master’s programmes (40 EC) consist mainly of acquiring knowledge of the scientific discipline and mathematics skills. The IM pre-master’s programme also consists of modules on project management, marketing and purchasing management, and innovation management. In addition, students of both programmes take an introductory module on ethics and one on methods and models in behavioural science.

The self-evaluation report furthermore shows that intake figures in the master’s programmes have declined over the years. The following table shows the intake numbers from the last four years.
The self-evaluation report notes that the School undertakes various information activities to recruit new students for the programmes. For instance, it organizes information days at the university, information meetings at secondary schools and at institutes for higher education, and master classes. For the bachelor’s programmes, the School aims to recruit students from the west of the Netherlands. For the master’s programmes, the School particularly wants to recruit from abroad (for example, Germany, Belgium and other countries of the European Union).

### Assessment

The committee states that for two vwo profiles, it is possible to enrol in the TBK bachelor's programme without restrictions. The committee appreciates the efforts taken by the programme management to ensure that the transition from secondary education to the bachelor’s programme proceeds smoothly, in particular regarding mathematics skills. The committee notes that the mathematics modules are taught by very competent lecturers, who are highly appreciated by their students. The committee highly supports continuing paying attention to this matter.

The committee feels that the pre-master’s programmes are substantial and offer a balanced and coherent package of modules. The committee furthermore believes that it is an appropriate choice to limit the time allotted for completion of the pre-master’s programme. The committee observed that pre-master students are treated as regular students. For instance, they are represented on the Programme Committee. Furthermore, pre-master students can request student counselling in the same way regular students can. The committee believes that with these measures, the School successfully facilitates the transition of students from higher professional education (hbo) to academic education.

The programme makes an effort to inform prospective students fairly and adequately. During the site visit, students indicated that they felt properly prepared for their studies.

*Bachelor’s programme Technische Bedrijfskunde:* the committee assesses this standard as satisfactory.

*Master’s programme Operations Management & Logistics:* the committee assesses this standard as satisfactory.

*Master’s programme Innovation Management:* the committee assesses this standard as satisfactory.

### S9: Credits

The programme meets the legal requirements regarding the range of credits:

- Academic bachelor’s programme (WO-bachelor): 180 credits
- Academic master’s programme (WO-master): a minimum of 60 credits.

### Description

The curriculum of the bachelor’s programme Technische Bedrijfskunde comprises 180 EC and complies with the formal requirements with respect to the size of the curriculum.
The curriculum of the master’s programme Operations Management & Logistics comprises 120 EC and complies with the formal requirements with respect to the size of the curriculum. The curriculum of the master’s programme Innovation Management comprises 120 EC and complies with the formal requirements with respect to the size of the curriculum.

Assessment
The bachelor’s programme Technische Bedrijfskunde complies with the formal requirements with respect to the range of credits. The master’s programme Operations Management & Logistics complies with the formal requirements with respect to the range of credits. The master’s programme Innovation Management complies with the formal requirements with respect to the range of credits.

S10: Coherence of structure and contents
The educational concept is in line with the aims and objectives. The study methods correspond with this educational concept.

Description
The self-evaluation report offers the following description of the didactic concept of the TBK bachelor’s programme. For each course learning outcomes are described. Examinations focus on these learning outcomes. In order to coordinate the courses’ learning outcomes and the programme’s learning outcomes, there are learning lines set out in the bachelor’s curriculum. These learning lines are meant to ensure that there are no overlaps; qualifications are continually developed further; and the level aimed for at the end of the programme is achieved. For the division of learning goals over the different years of the bachelor’s programme, the following principles serve as starting points:

The first year:
• Goal: orientation, selection, but also offering basic knowledge and developing an academic attitude.
• Structure: in the beginning, the emphasis is on relatively simple tasks, with more attention paid to the area of competence as a whole (generic).
• Level: students cannot yet operate completely independently; they are often not capable of independently organizing and planning their studies. This means that specific attention should be paid in this phase to laying a foundation for further development of competencies in later years (beginner’s level).

The second and third year:
• Goal: deepening of knowledge, learning to apply knowledge, and developing skills and an academic attitude.
• Structure: tasks become more complex. The various aspects of competencies are covered (specifically).
• Level: slowly, more attention can be paid to working independently, and the programme can be filled in a more student-oriented way (advanced level).

The self-evaluation report stresses the importance of all competencies being covered without repetition throughout the programme, i.e. at the beginner’s and advanced levels.

According to the self-evaluation report, the teaching methods used are chosen according to the courses’ learning outcomes. The School distinguishes three types of learning goals:
acquiring new knowledge, working with knowledge (practising and applying knowledge in a context), and developing academic competencies (skills and attitude). In addition, the School distinguishes four kinds of teaching methods: lectures, tutorials, OGO (design-oriented education), and individual study. The self-evaluation report provides the following description of each method.

**Lectures:** Lectures are suitable for presenting the framework of a course. The teacher explains terms, concepts and theories, illustrates methods, strategies, algorithms, methods of research and approaches, and puts them into context. Lectures can also be orienting in nature. New scientific knowledge is discussed, explained and placed in context. Students have fundamental elements of knowledge in the discipline pointed out to them; examples of application are presented, and the content is related to current development in research and daily life. Lectures are meant to stimulate and supervise students, helping them tackle individual study in a serious manner. A series of lectures is usually finished with a written exam.

**Tutorials:** Depending on the context, a tutorial can take one of many forms, ranging from a set of instructions for completing a task to an interactive problem-solving session. A tutorial encourages students to apply theories and concepts by means of assignments that are carried out under the supervision of lecturers. Students learn to switch from concepts to reality and vice versa: they learn to apply theoretical principles, rules and procedures, assess their usefulness, clearly explain their choice of methods and make connections for themselves. In addition, they gain insight into the profitable use of tools and instruments, such as a certain software package. The eventual goal is to teach students to generalize theoretical principles, rules and procedures, so that they can acquire knowledge for themselves and work with it.

**OGO:** This focuses mainly on the transfer of knowledge. Transfer is a process in which knowledge and skills gained from a certain situation are applied to a new or unknown situation. In design-oriented education, there is room to learn design skills through typical engineering tasks such as the critical analysis of design problems, specifying design parameters, and implementing knowledge and insight. Design at an academic level is a creative process as well as a process of learning to apply, extrapolate and integrate existing knowledge as a precondition for design. OGO activates knowledge, focusing students’ attention on its application. Because of this, OGO usually consists of practical case studies. OGO mostly takes place in groups, so that students also learn to work in teams and to communicate with each other. Students learn to lead a discussion, listen, explain, summarize, and reflect critically on their own work and that of others, and present information both verbally and in written form. OGO is usually completed with a report in which the design process is covered. In order to assess the individual contribution of students, oral or even written tests can be part of completing an OGO course.

In summary, OGO consists of:

- Active learning: an assignment is worked on in groups, students actively participate;
- Applying and transferring knowledge: knowledge that is acquired in previous lectures and tutorials is applied;
- Integration: knowledge is integrated for analysis and design/redesign. Students learn about models in such a way that they can apply them, work with them and appreciate their added value;
- Multidisciplinary: attention is paid to various disciplines within the IE domain;
- Skills: there is also a focus on the development of academic skills.
Individual study: Students spend most of their time on individual study in all types of education. Individual study is essential if students are to be successful. The School aims to ensure that the study material is of high quality. The self-evaluation report claims that the teaching methods support and stimulate individual study by students.

To further support individual study, the Department has a distance electronic learning environment, ‘Studyweb’. Most of the courses make use of Studyweb. Since 2004, more and more lectures are videotaped and made available on Studyweb. These lectures are not meant to replace the live lectures; they give students the opportunity to refer to them during their individual study time.

The self-evaluation report notes that in some courses, other new types of electronic learning systems have been developed. For example, in the ‘Software Management Experience’ course, students work in virtual teams with students from Hong Kong, Beijing, Orlando and Tilburg. In the ‘Methods and Models of Behavioural Research’ module, the lecturer has developed a wiki for questions and answers.

The didactic concept for the bachelor’s programme offers a combination of teaching methods: lectures, lectures combined with instructions, guided individual study or OGO. The following table shows the distribution of teaching methods in the bachelor’s programme (in EC, minor of 30 EC excluded):

<table>
<thead>
<tr>
<th>Year</th>
<th>Lectures</th>
<th>Lectures, tutorial</th>
<th>OGO</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6</td>
<td>39</td>
<td>15</td>
<td>60</td>
</tr>
<tr>
<td>2</td>
<td>18</td>
<td>18</td>
<td>24</td>
<td>60</td>
</tr>
<tr>
<td>3</td>
<td>-</td>
<td>18</td>
<td>12</td>
<td>30</td>
</tr>
</tbody>
</table>

The table shows that in the second and third years of the programme, 40% of the teaching forms consist of OGO. This is in accordance with the TU/e education policy. In the first year the main teaching form is tutorials, including lectures. The self-evaluation report explains that in this form a combination can be made between acquiring the necessary basic knowledge and a preliminary introduction to applying this knowledge.

In the bachelor’s programme, two levels are distinguished: beginner: directed by teacher, learning guided by the education material (e.g. many hours of contact between teacher and student, selection of literature by lecturers); and advanced: increasing self-direction, education guided by study programme (independent planning and self-motivation).

Students in the master’s programmes create their own learning path. Therefore, no formal learning lines are laid down in advance, and the didactic concept is almost entirely student-centred. Lectures, tutorials and group assignments are combined. Group assignments increasingly take the form of small, independent, research and design exercises that form a preparation for the master’s thesis project. In the master’s thesis project, a fruitful apprentice relationship is created between mentor and student. The self-evaluation report claims that the assignment of a thesis mentor at an early stage in the master’s programme guarantees the coherence of the individual programme, optimal preparation for the master’s thesis and accomplishment of the learning objectives.

Assessment
The committee established that a generic didactic concept is developed, and thus, the curriculum of the bachelor’s programme has been arranged with care. The didactic concept is in
line with the aims and objectives of the programme. The committee highly appreciates the detailed consideration given to the balance of the teaching methods used. The committee notes that the TBK curriculum offers a variety of teaching methods, with different types of learning goals. The committee believes that the principles in terms of goals, structures and levels laid down in the self-evaluation report are a fruitful starting point for the construction of modules at different levels. The OGO courses are good and consistent. Students appreciate the variation in teaching methods and the integrative element of the OGO modules. However, the committee thinks that the time reserved for self-study could be better structured and linked to concrete tasks in the course material.

As stated under standard 6, the committee highly values the development of learning lines, which clearly structure the curriculum. Nevertheless, the committee thinks that there is room for improvement in the level of consensus among teaching staff as to the value of the learning lines. The committee is convinced that the programme management is currently paying this sufficient attention.

The committee took note of the student-centred approach in the master's programmes. The committee highly appreciates the role of the mentor in creating a coherent learning route. It established that the working methods used in the master's programmes are appropriate and in line with the aims of the different modules.

On the basis of these considerations, the committee assesses this standard as ‘satisfactory’ for all three programmes.

Bachelor's programme Technische Bedrijfskunde: the committee assesses this standard as satisfactory.
Master's programme Operations Management & Logistics: the committee assesses this standard as satisfactory.
Master's programme Innovation Management: the committee assesses this standard as satisfactory.

<table>
<thead>
<tr>
<th>S1.1: Learning assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>By means of evaluations, tests and examinations, the students are assessed in an adequate and for them insightful way to determine whether they have achieved the intended learning outcomes of the programme or parts thereof.</td>
</tr>
</tbody>
</table>

Description
The School's teaching and examination regulations (Dutch abbreviation OER) cover the examination procedures, for instance they include formal regulations on participation, enlistment, frequency, fraud, form and sequence. Every year the Board adopts an updated version of the OER. Assessment forms are provided for the assessment of bachelor’s and master’s theses.

The self-evaluation report draws attention to the fact that in 1999, the Education Management conducted a project concerning the quality and organization of examinations in the propaedeutic phase. The aim of this project was the improvement of the quality, reliability and validity of examinations. The project encompassed several activities, such as the organization of a training course for 36 lecturers on the construction and analysis of examinations, and the preparation of a brochure on examinations. Furthermore, a control mechanism for the quality and organization of examinations was established.

In addition, the programme management recently carried out an evaluation of the quality of the supervision and assessment of the bachelor’s theses. Students are required to fill in
evaluation forms, and the outcomes of these evaluations are discussed with the responsible group chairs. In addition, the programme management organizes special meetings for thesis supervisors to discuss the quality of the feedback on, and supervision and assessment of the bachelor's theses.

In addition, the student association Industria conducted a quick scan of the current practices on examinations in 2008. The results indicate differences between lecturers, which create difficulties in the measurement of the quality of examinations and their comparison.

The introduction of the Binding Recommendation on the Continuation of Studies (Dutch abbreviation BSA) stimulated the Education Management to initiate a project on the quality of examinations in 2009. The School is obliged to guarantee the quality of the exams and to check the consistency of the exam procedures with the quality regulations specified in the law on Higher Education. The goal of this project is to lay down clear procedures for examinations, such as peer review, to guarantee their quality. During the site visit, the committee discussed this project with the Board of Examiners. The committee was informed about the Board’s plans to systematically monitor the quality of the theses by random sampling and to add a second assessor for the bachelor’s theses.

Assessment
According to the committee, the methods of examination of the three programmes are in line with the intended learning outcomes and the teaching methods used. During the site visit, the committee studied a substantial number of written exams and established that the questions show a clear correlation with the intended learning outcomes of the course components. The written exams are of an academic level and consist of a balanced variety of questions. The committee notes that for most courses, a model examination including answers is provided. The committee appreciates the project launched by the Education Management concerning the quality of examinations. The committee supports the ideas of peer review and the establishment of clear procedures, and advises paying close attention to ensure that all lecturers conform to them. During the site visit the committee observed that the School’s culture is still in need of a change in this regard.

First, the committee thinks that the assessment of the bachelor’s theses needs to be improved. During the site visit, students indicated that they did not know which criteria were the most important in the assessment of their final bachelor’s project. Therefore, the committee advises clarifying the relative importance of the different assessment criteria. Also, a more differentiated assessment of these various aspects, providing a more accurate ‘profile’ of the student’s achievement, is missing in many cases. The committee feels that more accurate feedback may be functional in creating common professional and academic standards. In addition, the committee remarks that for a final project, students deserve sufficient feedback on their first draft. The committee is convinced that the thesis supervisors are ultimately responsible for the quality and feasibility of a work plan and advises the School to keep an eye on the initial stages of the bachelor project as well. The committee appreciates the evaluation of the quality of the feedback on the bachelor’s theses.

The committee established that during the site visit, the ‘examinations project’ was still running. After the site visit, the committee was informed about the follow-up of this project. The School has adopted a clear procedure regarding the quality control of the bachelor’s theses and the assessments of the theses. An independent assessment committee, installed by the Board of Examiners, will systematically monitor the quality of the bachelor’s theses and
the accompanying assessment forms by random sampling. The Board of Examiners will evaluate the outcomes of this quality check and report this evaluation to the Programme Committee. The committee highly appreciates this approach and the fact that these measures are endorsed by the Department Board.

The committee is confident that the measures taken will have the desired effect. The committee strongly advises to ensure that every bachelor’s project is assessed by two staff members, because it is a final project of an academic degree programme.

The committee concludes that all three programmes fulfil the criteria regarding the assessments. The committee established that the course exams are in line with the intended learning outcomes and working methods of the programmes. Therefore, the committee assesses this standard as ‘satisfactory’ for all three programmes.

Bachelor’s programme Technische Bedrijfskunde: the committee assesses this standard as **satisfactory**.
Master’s programme Operations Management & Logistics: the committee assesses this standard as **satisfactory**.
Master’s programme Innovation Management: the committee assesses this standard as **satisfactory**.

Assessment of the theme Curriculum
The committee comes to an overall assessment of the theme Curriculum on the basis of its assessments of the separate standards. In the case of the bachelor’s programme Technische Bedrijfskunde, it assesses this theme as **satisfactory**. In the case of the master’s programme Operations Management & Logistics, it assesses this theme as **satisfactory**. In the case of the master’s programme Innovation Management, it assesses this theme as **satisfactory**.

1.1.3. Staff

**S12: Requirements for academic orientation**
The programme meets the following criteria for the deployment of staff for a programme with an academic orientation: Teaching is principally provided by researchers who contribute to the development of the subject/discipline.

**Description**
Full professors, associate professors and assistant professors spend on average 50% of their time on teaching and 50% on research. The policy of the School is to combine research and teaching in each available position. This means that the School, as a rule, no longer appoints lecturers (80% teaching, 20% management) to permanent positions. Assistant professors should hold a PhD. PhD students are involved in teaching 20% of their time, generally in OGO courses, tutorials and coaching of bachelor’s and master’s thesis projects. Apart from this, a number of student assistants contribute to various parts of the educational programme.

As of June 2008, the majority of the staff of the School of Industrial Engineering is member of the KNAW-recognized research school Beta. The Beta Research School is a national university research school that educates PhD students, in which several scientific disciplines contribute to a deeper understanding of the performance of operational processes. These disciplines range from mathematics and computer science to work psychology and organizational behaviour. Members meet requirements regarding publishing in international refereed journals, confirming that all are active researchers in their field.
The self-evaluation report states that the expertise of the staff covers a wide range of disciplines: operations research, organizational science, psychology, economics, and information systems. Most staff members have a background in a single discipline. The self-evaluation report notes that this improved the quality of the courses on knowledge of scientific disciplines. However, it is difficult for these lecturers to teach the engineering or design part of the curriculum for this requires staff with an industrial engineering background and/or experience.

The self-evaluation report provides an overview of the involvement of staff in teaching the programmes. It shows that a substantial number of the full professors teach a course in the master’s programmes, and that most of the full professors give guest lectures in their field of expertise in the bachelor’s course Introduction to Industrial Engineering. It argues that in this way, the students meet role models from the world of research right from the start. Nevertheless, assistant and associate professors teach most of the basic courses in the bachelor’s programme.

According to the self-evaluation report, the lecturers of the master’s programmes create the necessary links with the relevant professional fields. These links take the form of e.g. contributions to enhancing professional knowledge and supervising master’s thesis projects performed within organizations.

**Assessment**

The committee established that all staff members except one from the School who contribute to the bachelor’s and the master’s programmes have a PhD degree and that the vast majority is a member of the Beta Research School. The committee noted that OGO courses, tutorials and the coaching of bachelor’s and master’s thesis projects rely to a certain extent on contributions from PhD students. It established that the final responsibility of the contents, assessments and supervision always rests with senior staff members who have substantial research experience.

The committee concludes that almost all teaching is provided by researchers who make active contributions to the development of the discipline. The staff as a whole has a broad scientific expertise. The committee appreciates the equal division of research and education which guarantees lecturers who are actively involved in both.

*Bachelor’s programme Technische Bedrijfskunde:* the committee assesses this standard as **satisfactory.**

*Master’s programme Operations Management & Logistics:* the committee assesses this standard as **satisfactory.**

*Master’s programme Innovation Management:* the committee assesses this standard as **satisfactory.**

<table>
<thead>
<tr>
<th>S13: Quantity of staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sufficient staff are deployed to realise the desired quality of the programme.</td>
</tr>
</tbody>
</table>

**Description**

The self-evaluation report provides the following overview of the staff available for teaching in the three programmes:
<table>
<thead>
<tr>
<th>category</th>
<th>male</th>
<th>female</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>no.</td>
<td>fte</td>
<td>no.</td>
</tr>
<tr>
<td>professor</td>
<td>19</td>
<td>11.7</td>
<td>1</td>
</tr>
<tr>
<td>associate professor</td>
<td>8</td>
<td>6.8</td>
<td>0</td>
</tr>
<tr>
<td>assistant professor</td>
<td>21</td>
<td>20.3</td>
<td>10</td>
</tr>
<tr>
<td>PhD student</td>
<td>23</td>
<td>22.6</td>
<td>19</td>
</tr>
<tr>
<td>other staff members</td>
<td>2</td>
<td>1.35</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>73</td>
<td>62.75</td>
<td>30</td>
</tr>
</tbody>
</table>

As noted in the preceding standard, the policy of the School is to combine research and teaching in each available position. The self-evaluation report mentions that occasionally staff members who still need to qualify for an assistant professor’s position, within a number of years, are appointed as teacher (80% teaching time).

In view of the lower percentage of female staff members in each category, the TU/e recently started a ‘Woman in Science Tenure Track’ (WISE) programme. It aims to stimulate and appoint more female talent at higher scientific levels, such as associate and full professorships.

The self-evaluation report claims that the number of staff members is adequate because all courses are taught each year, while maintaining their quality. The self-evaluation report provides a table which shows the number of students and the number of diplomas per teaching fte. Over the past years, the student/staff ratio has increased, requiring adjustments of tasks by the staff members. The number of students per teaching fte is on average 36.2 (2005-2009).

**Assessment**

Students are satisfied with the availability of lecturers and supervisors. Lecturers indicated that the time allotted to thesis supervision is substantial. Therefore, the committee assesses the number of staff as currently sufficient to realize the curricula of the three programmes in an adequate way.

*Bachelor’s programme Technische Bedrijfskunde:* the committee assesses this standard as **satisfactory**.

*Master’s programme Operations Management & Logistics:* the committee assesses this standard as **satisfactory**.

*Master’s programme Innovation Management:* the committee assesses this standard as **satisfactory**.

**S14: Quality of staff**

The staff deployed are sufficiently qualified to ensure that the aims and objectives regarding the content, didactics and organisation of the programme are achieved.

**Description**

According to the self-evaluation report, the School has a clear and detailed set of guidelines and procedures for the appointment, promotion and appraisal of staff members. The Director of Education is consulted about the appointment or promotion of professors. In preparing his/her advice, the Director of Education draws on a portfolio supplied by the group chair. The group chair is primarily responsible for safeguarding the quality of teaching in the School.
The self-evaluation report mentions that since 2007, the School has been participating in a 3TU pilot project with regard to the development of a so-called University Teaching Qualification (BKO). At the School, new staff members are obliged to obtain their BKO within two years of appointment; already tenured staff is offered this possibility on a voluntary basis. The BKO is a prerequisite to be considered for promotion or to obtain a permanent position.

Staff members who have earned their BKO make sure they continue to update their portfolio. They maintain a teaching portfolio to support their tenure or promotion track. Staff members who are just starting out begin building their portfolios during the BKO process. Staff from Human Resources (Education & Training Unit) is available to provide support in gathering this evidence. In addition, it is the School’s policy that all staff members must follow one or more didactic training courses. Tenured and new staff members can participate in ‘teacher training’ when required. Staff members can enrol in didactic courses on their own initiative, or can be asked to follow such courses if student evaluations are not satisfactory.

The self-evaluation report provides a table which shows that in October 2009, 8 out of 61 staff members had obtained their BKO, while 9 others were working on their portfolio to gain the qualification. In addition, the vast majority of the teaching staff passed the English proficiency test.

Result and development review meetings

Each staff member is annually reviewed by the group chair with respect to teaching activities, research output and management activities. This Result & Development review meeting typically takes place at least once a year (between April and June). According to the self-evaluation report, student course evaluations, scientific publications and contributions to the managerial chores of the School are addressed. The review meeting also serves to affirm teaching commitments for the coming period and to formulate personal development plans. The self-evaluation report points out that teaching performance has increasingly become an important issue in discussions with respect to career perspectives. Result & Development reviews are documented in the lecturer’s personnel records.

Assessment

The committee took note of the obligation of new staff members to obtain their BKO within two years of appointment. However, the committee observed that not all staff members are very interested in obtaining a BKO as it is regarded as very basic for experienced lecturers. There appeared to be rather large differences between the different staff groups. In view of the multi-disciplinary character of the bachelor’s programme and the role of OGO in the didactic concept of the School, the committee advises the programme management to consider making some didactic courses mandatory for both new and established staff members to ensure that the didactic qualities of the lecturers are in line with the didactic concept and the specific character of the programme. The committee was highly impressed by the quality of the BKO dossiers that were available during the site visit. In addition, the committee is positive about the Result & Development interviews.

The different interviews conducted during the site visit and the evaluation outcomes examined provided the committee with the impression that the programmes are organized adequately, and that the didactic quality of the staff is generally sufficient.

Bachelor’s programme Technische Bedrijfskunde: the committee assesses this standard as satisfactory.
Master's programme Operations Management & Logistics: the committee assesses this standard as satisfactory.
Master's programme Innovation Management: the committee assesses this standard as satisfactory.

### Assessment of the theme Staff

The committee comes to an overall assessment of the theme Staff on the basis of its assessments of the separate standards. In the case of the bachelor’s programme Technische Bedrijfskunde, it assesses this theme as satisfactory. In the case of the master’s programme Operations Management & Logistics, it assesses this theme as satisfactory. In the case of the master’s programme Innovation Management, it assesses this theme as satisfactory.

### 1.1.4. Services

**S15: Facilities**

Housing and facilities are adequate to achieve the learning outcomes.

**Description**

The TBK bachelor's programme and the OML and IM master's programmes are taught at the Department of Industrial Engineering and Innovation Sciences. The Department’s IE School is housed in the ‘Paviljoen’ on the TU/e campus. These buildings feature three lecture halls, some 50 rooms for group work, instruction rooms, PC rooms, staff offices and a library. Students and staff members can also make use of the central teaching facilities; approximately 50 other lecture rooms and lecture halls elsewhere on the campus. All lecture halls, both at the Paviljoen and those situated more centrally on campus, are equipped with multi-media facilities. The large lecture theatres in the auditorium are particularly used for freshman courses.

According to the self-evaluation report, the TU/e library is primarily a digital provider, electronically offering services and information to students and staff members. TU/e is planning to emphasize digital services even more in the future. All information needed for research purposes is accessible to researchers and students via their desktops or notebooks. Scientific information for education is and will be further integrated into the electronic learning environment. The TU/e's own scientific publication output is integrated into the digital library in full text and according to international standards. The ‘Repository’ is the digital archive of publications from TU/e. This contains institutional publications as well as publications by authors who are (or were) affiliated to TU/e. Types of publications include dissertations, scientific reports, lecture notes, annual reports, as well as journal articles, book chapters and conference papers. As far as copyright conditions permit, all publications by TU/e staff members are available worldwide according to ‘open access’ standards.

According to the satisfaction survey, the library facilities at the TU/e are highly appreciated by students and staff members. The Industrial Engineering and Innovation Science departmental library, one of TU/e’s seven libraries including a central library, is specialized in the fields of industrial engineering, management sciences and social sciences. It comprises approximately 60,000 book volumes and 200 journal subscriptions in print. Many journals are available electronically in full text via the TU/e library’s website. It has 166 workplaces with wireless network connections for the students’ notebooks. In addition, there are six group rooms and a separate video room. Students use the library as a convenient place for individual study.
ICT facilities

The vast majority of the students (> 95%) have a notebook that is subsidized by the university and which is provided with all the general and specific software used in education at TU/e. This arrangement influences the character of education. The use of notebooks is supported by a helpdesk, insurance, data storage, e-mail, personal web pages, RSI package, etc.

In all buildings of the School and their surroundings, wireless connection is available. In addition, over 400 network connections for notebooks are available in the School buildings. Over 300 of these places conform to legal requirements for healthy workstations. There are approximately 70 network printers (including colour printers) and approximately a dozen scanners.

ICT facilities are available at both a central and School level. At the central level these facilities include dial-in services via TU/e’s own providers and database management. The central library is responsible for the dissemination of information via TuEcis, central servers, CD-R’s and web pages. In addition, shared information is made available in this way. According to the self-evaluation report, the service package of the Information and Service Desk consists of a large number of services in the field of fault identifying, fault clearing and follow-up. The Notebook Service Centre supports students’ use of notebooks, and the ICT shop offers a variety of ICT products for sale. In the Central Open Shop, students can use PCs and other ICT facilities.

The Department’s Service Desk sets up and maintains file servers and ICT facilities for students and staff members. The self-evaluation report claims that scientific software can be downloaded easily. The Department’s Open Shop features 20 PC working places. Videoconferencing facilities are available. Staff members work with high-quality and up-to-date hardware and software at their disposal. There is a Print Accounting System for students offering printing and copying services at cost price. Study materials can be purchased at the Lecture Notes Sales Point and in the University Bookshop. In addition, students have access to discount book sales (10% discount) through their student association Industria.

Assessment

During the site visit, the committee received a guided tour of the School to get an impression of the facilities that are available. Based on this tour and on the interviews with students, the committee concludes that the material facilities are sufficient and enable the students to realize the final qualifications. Whilst the building gives a somewhat aged impression, it is well-maintained and equipped with the modern teaching facilities. Lecture rooms used for tutorials are spacious and the number of project rooms is sufficient. Furthermore the amount of study areas both for study in silence and in discussion is quite considerable. The lavish use of space of the original design now provides ample space for the School’s community and even provides an in-house bar which is frequented by both students and staff contributing to the sense of community that motivates to perform.

The committee is positive about the electronic services provided by the TU/e library as well as the support for the use of notebooks. Students of the three programmes can make use of a large number of workstations, wireless internet, and a more than sufficient number of facilities for printing and scanning.

Bachelor’s programme Technische Bedrijfswetenschap: the committee assesses this standard as satisfactory.
Master's programme Operations Management & Logistics: the committee assesses this standard as satisfactory.
Master's programme Innovation Management: the committee assesses this standard as satisfactory.

**S16: Tutoring**

| Tutoring and information provision for students are adequate in view of study progress. |
| Tutoring and information provision for students correspond with the students' needs. |

**Description**

Students of the School have a student counsellor at their disposal, who supports both individual students and groups during their studies. S/he also passes important course and programme information on to the students. S/he operates within a university-wide network of counsellors and can refer students to the Educational and Student Service Centre (STU). Here expertise is available in areas such as study and finance, study and handicap, and career advice. The centre also provides all sorts of courses in the area of study choices and study skills.

According to the self-evaluation report, coaching in the P-phase is intensive and supported by a mentoring system involving senior students. These student mentors receive special training before they are appointed for a group of first-year students. In the first semester, the first year students meet their student mentors once a week, starting with group sessions and later continuing on an individual basis. In these meetings, motivation, coping with the switch from secondary school to university, acquiring the right study skills, finding the balance between study and extracurricular activities are regularly discussed topics. The mentors provide the student counsellor with feedback from these meetings. In addition, the counsellor regularly talks to the students about the possible consequences of a wrong choice of programme, poor study planning and illness. The student counselling aims to make students fully aware of the consequences of their decisions in relation to the programme, particularly with respect to postponing courses to the next semester with the inevitable result of less time for subsequent courses.

Students who lag behind, or are in danger of lagging behind, are asked to attend a progress review within the first semester by the study counsellor. The counsellor and student discuss the situation, and the student receives specific advice. The counsellor may have the student enrol in a course to improve study skills. The counsellor may also make it clear that both the student and the programme are best served if the student switches to a different programme. Coaching in the PP-phase is less intensive. However, many students visit the study counsellor on their own initiative to discuss their progress and planning.

The self-evaluation report points out that not only poorly performing students or those encountering problems with their study receive coaching. The student counsellor or student mentor has at least one consultation with every student in the first year. Excellent students are monitored with respect to whether the programme is challenging enough for them. The option of the TU/e honours programme is brought to their attention.

**BSA**

In 2009, TU/e introduced a binding recommendation on the continuation of studies for all bachelor’s programmes (BSA). This means that at the end of the first year of the bachelor’s programme, students are assessed on their results. Students who do not pass all their courses but obtain a minimum of 30 EC may receive a positive recommendation if they have passed
at least three courses in Mathematics/Statistics, at least one course in Engineering, and at least two courses in Industrial Engineering.

If students obtain more than 40 EC, they will receive a positive recommendation. Students who obtain between 30 and 40 EC, and have met the additional requirements for their bachelor’s programme, will also receive a positive recommendation. At the same time, these students will receive extra support from the counsellor in the form of a study contract (see also standard 7). This is an agreement between the student and the counsellor to plan their second year. The intention of the contract is to help students with their studies.

If students obtain less than 30 EC in their first year, or manage to obtain 30 - 39 credits but fail to meet the additional requirements of the bachelor’s programme, they will receive a negative recommendation. The recommendation is binding: this means that students will be unable to continue their bachelor’s programme and will be unable to enrol in this specific TU/e bachelor’s programme for the next three years.

In the pre-master’s programme, an individual study recommendation is given to each student at the end of the first semester. Students with a positive study recommendation can take master’s courses, along with the remaining pre-master’s courses.

As described under standards 4 and 11, master’s students are closely supervised by a staff member in the research area where they are planning to do their master’s thesis. Staff members coach these students where necessary. In addition, all other student support facilities are also available to master’s students.

The School annually registers (1) the number of credits obtained by students in the first year (P-phase), (2) the number of EC obtained for P-phase courses in the second year by students who have not yet obtained their P-diploma, (3) general study progress in the PP phase and (4) study progress in the complete programme. Twice a year, all students receive a review of their progress, and in addition, all students can acquire information with respect to their progress at any time via their notebooks. An overall report about the study progress in the School’s programmes is produced once a year. The report influences policymaking and may result in remedial actions.

Information provision
Freshmen are informed at the beginning of each period about the structure and content of courses and the programme in a special collective meeting. The student association Industria also plays an important role in providing information about courses to students. Moreover, Industria also mediates in the purchase of textbooks, archives old exams, makes them available to its members, and takes the lead in the organization of the introduction days for freshmen. The student mentors play an important role in helping the new students in finding their way in the programme throughout the first year.

Immediately after enrolment, each student is given access to the Department education site (http://onderwijs.ieis.tue.nl). This site contains the lecture and exam timetables, the agenda for the academic year and the course agenda. Using this site, the student can also retrieve information on his/her study results and study subject-related information, and can register for or withdraw from tests and examinations. In addition, each student is given an e-mail address and can then send and receive electronic mail via Studyweb.
A copy of the study guide is handed out to first-year bachelor’s and master’s students on an USB stick. The most important information about the programmes including the Education and Examination Regulations (OER) and the Rules and Regulations of the Board of Examiners is available on this stick. Printed information about the international semester and thesis work for instance is also available and handed out at information meetings. An annual newsletter with up-to-date practical information is sent to all students and available at the Education Office.

The self-evaluation report mentions that as of 2010, the TU/e’s new education portal will come into operation throughout the university. From then on, all the information in OWInfo, Studyweb, the library, etc., can be accessed through this single portal. Students (and staff members) therefore only need one user name and one password to access all of the different systems. The portal will eventually evolve into a digital learning and working environment for students and lecturers.

Assessment
The committee established that the tutoring for both the TBK bachelor’s programme and the OML and IM master’s programmes is more than adequate. It notes that the student counsellor, who plays a central role in tutoring and information provision, is very active and committed and that students highly appreciate her activities, involvement and accessibility. The committee greatly values the activities of the student mentors and is positive about the teamwork between the mentors and the student counsellor. The committee already expressed its appreciation of the study contract, which is drawn up for second-year students who received a positive recommendation but face substantial delay.

The committee notes that all students are invited for a meeting with the student counsellor at least once during their first year and that their study progress is carefully monitored. In addition, students meet their mentor once a week in the first few weeks of their course. The committee values this ‘double’ approach, which is considered a very good way to reach all students and provide them with sufficient guidance in their first year.

The committee took note of the focus groups and the student committees chaired by the education officer of the student association Industria. The committee is impressed by the involvement of Industria in information provision, student guidance and quality control. It furthermore thinks that Industria functions as important link between students and all other parties involved.

The committee concludes that the information provision is well thought out and accurate. In particular, Studyweb provides extensive information on course content and schedules, as well as individual study results. Based on the interviews with the students, the committee concludes that the information provision is in line with the students’ needs.

On the basis of these considerations, the committee assesses this standard as ‘good’ for all three programmes.

**Bachelor’s programme Technische Bedrijfskunde:** the committee assesses this standard as **good**.

**Master’s programme Operations Management & Logistics:** the committee assesses this standard as **good**.

**Master’s programme Innovation Management:** the committee assesses this standard as **good**.
Assessment of the theme Services

The committee comes to an overall assessment of the theme Services on the basis of its assessments of the separate standards. In the case of the bachelor’s programme Technische Bedrijfskunde, it assesses this theme as satisfactory. In the case of the master’s programme Operations Management & Logistics, it assesses this theme as satisfactory. In the case of the master’s programme Innovation Management, it assesses this theme as satisfactory.

1.1.5. Internal quality assurance system

S17: Periodical evaluations
The curriculum is periodically evaluated in the light of verifiable objectives and other measures.

Description
The self-evaluation report states that the School’s internal quality assurance entails a sequence of actions in which systematic attention is paid to the various phases of quality improvement: preparation, the quality measurement itself, interpretation of the measurements, and the planning and execution of improvement measures. The self-evaluation report claims that it not only results in careful monitoring of the education process, but also responds to changes in the relevant national and international environments.

Every year, students evaluate all the compulsory courses and new courses. Tailor-made review processes are set up for negatively assessed courses. Furthermore, groups can take the initiative to request an assessment of a specific course, for instance as part of the process of developing BKO portfolios, or to get rapid feedback on course changes. If actions are deemed necessary, a number of steps are taken by the Director of Education, which are then followed up by the group chair and lecturers. To monitor the improvement process, the Director of Education and group chair discuss the results of the course evaluations twice a year. If required, the lecturer - in consultation with the evaluation officer and the Director of Education - commits to making specific improvements. Course evaluations are made public and become part of the lecturers personnel file. The effects of the improvement actions are checked after the course has been taught again.

The student association Industria, and in particular Industria’s Education Officer, also contributes to maintaining and improving the quality of education in a number of ways. The Education Officer organizes and chairs consultations in the so-called P (first-year students), bachelor’s (second- and third-year students, with a separate council for the IE track for healthcare), master’s and pre-master’s student councils. These councils meet every few weeks to monitor the education programmes and other education-related issues and suggest improvements to lecturers and the Director of Education. A regular lunch meeting between representatives of Industria and the Director of Education, a biweekly meeting with the assistant Director of Education and regular meetings with the Programme Directors of the master’s programmes structure the consultations between student representatives and the education management. According to the self-evaluation report, the informal atmosphere during these meetings leads to an effective exchange of ideas and to speedy reactions when required. As a result, the councils are important ‘sensors’ for the Departmental Director of Education.

In addition to the student councils, there are formal student focus groups; a number of students who take a class are asked to discuss positive and negative aspects with their lecturer.
directly after class. Industria’s Education Officer stays in close contact with these students and discusses general issues with the education management.

Along with the evaluation of courses, programme objectives and the relationship between programmes and objectives are evaluated annually on the curriculum level. In addition, as mentioned under standard 11, the programme management recently carried out an evaluation of the quality of the supervision and assessment of the bachelor’s theses. According to the self-evaluation report, evaluation and reformulation of objectives are also based on input from alumni and the professional field. Objectives are regularly reviewed in the light of new information gathered and amended when deemed necessary.

The self-evaluation report points out that the quality criteria the School uses encompass the goals and content of the programme, the teaching facilities, and the qualifications of the teaching staff, the courses and the study yields. Furthermore, the School considers it important to monitor the results of actions aimed at improvement of the programmes and the recruitment of students. Therefore, the evaluation questions are grouped into two categories: operational results and appreciation of education by those involved. For instance, the first category includes criteria for the alignment of content to the goals and the availability of adequate learning facilities. The second category includes the evaluation of courses, programmes and graduates by students, alumni and employees.

Assessment
The committee took note of the internal quality assurance system, which encompasses a clear description of evaluation approach. Compulsory courses and the curriculum as a whole are evaluated in different ways in a pro-active manner as a matter of course. Based on the information provided in the self-evaluation report, the inspection of evaluation reports and discussions with students and the Programme Committee during the site visit, the committee established that courses are evaluated in a proper and consistent manner. The committee established that the School phrased clear evaluation questions. However, the committee feels that verifiable criteria could be more clearly defined in connection with these evaluation questions.

The results of the course evaluations are made public for both lecturers and students through Studyweb. The committee considers the public availability of the evaluation results important, both as an expression of the significance attached to them and because it motivates lecturers to improve their teaching and students to fill in evaluation forms. The committee highly appreciates the written comments of the lecturers on the outcomes of the evaluation of their module. Students indicated that they are content with the evaluation procedures and that they feel free to bring up issues and problems that occur. In short, students feel they are able to influence the quality of their education.

The committee has already mentioned its appreciation of the student education councils. During the site visit the committee was informed that 6 - 7 students are represented on these councils. In addition to the bachelor’s and master’s councils, separate councils are installed for the first-year students and the pre-master students. The councils are chaired by the Industria Educational Officer. Based on the discussion with students, the student counsellor and the programme management, the committee established that these councils are effective and a valuable addition to the regular course questionnaires.
During the site visit, the committee was informed about the evaluation of the bachelor’s projects. Students confirmed that close attention was paid to the evaluation of the supervision and the possibilities of obtaining a suitable assignment within a company.

Based on these considerations, the committee concludes that the three programmes more than sufficiently meet the criteria for this standard.

*Bachelor’s programme Technische Bedrijfskunde*: the committee assesses this standard as **good**.

*Master’s programme Operations Management & Logistics*: the committee assesses this standard as **good**.

*Master’s programme Innovation Management*: the committee assesses this standard as **good**.

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<thead>
<tr>
<th>S18: Measures for improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>The outcomes of the evaluation form the basis of verifiable measures for improvement that contribute to the achievement of the objectives.</td>
</tr>
</tbody>
</table>

**Description**

The self-evaluation report provides examples of measures for improvement, based on the outcomes of the evaluations described in the preceding section. In the following, a summary of these measurements is provided.

In the past year, actions were started on the following subjects: the connection between secondary school and university; fine-tuning of the contents of related courses; producing high-quality teaching materials (for instance, study guides); improvement of the quality of the research in the master’s programmes; an examination of the weekly workload of students in the first year of the bachelor’s programme; and monitoring and, if necessary, improving the quality of exams. The last project will eventually lead to an IE School examination policy (see standard 11). In addition, over the last few years, the Programme Committee has initiated quality improvement actions regarding the distribution of the study load in the master’s programmes; the match between the bachelor’s programme and the master’s programmes; and internationalization of the master’s programmes.

The self-evaluation report notes that in the past few years, the educational approach has evolved from mainly mass lectures to a combination of lectures, tutorials and group work. Modifications of the learning facilities have accommodated this change. For example, the number of small group workrooms has greatly expanded.

Several discussions have taken place between the staff members of the School regarding the Master’s Thesis Preparation. These discussions have led to standards for assessing the academic level of master’s thesis assignments. An instruction manual has been drafted for the preparation of the theses, including regulations with respect to supervision, grading, etc. In addition, a second assessor is appointed by the Board of Examiners to grade the thesis. As described under standard 11, this second assessor should preferably be a qualified member of the research school and is generally affiliated to another chair than that of the mentor.

With respect to fostering high study yields, the School is taking several measures. Student counselling in the first year has been intensified, and exit interviews with students who dropped out from the bachelor’s and the pre-master’s programmes have been introduced. Moreover, in 2009, the School started a Bachelor Entrance Study (BEST) project. Its overall goal is to examine students’ reasons for dropping out or continuing in the bachelor’s programme. In the project, the antecedents of academic performance are analyzed in detail.
on different levels (individual, group, organizational level). Of specific interest are the causal relations, including stable factors such as student’s intelligence and workload, and variable factors such as learning and coping strategies.

**Assessment**

The committee believes that the quality assurance system adequately responds to outcomes of evaluations in order to improve the programmes. The committee took note of several projects that have been initiated to improve the quality of the programmes. The committee believes that the School is very pro-active in uncovering crucial factors for study success, for instance by means of the BEST project. The committee highly appreciates the measures taken regarding the bachelor’s and the master’s theses and the design of a course guide format.

During the site visit, students confirmed that most lecturers react adequately to their comments on the structure of the programme, not only through the Industria student councils, but also through student focus groups and on an individual basis during the course.

The committee therefore assesses the standard related to the measures for improvement as ‘good’ for all three programmes.

*Bachelor’s programme Technische Bedrijfskunde:* the committee assesses this standard as **good**.

*Master’s programme Operations Management & Logistics:* the committee assesses this standard as **good**.

*Master’s programme Innovation Management:* the committee assesses this standard as **good**.

**S19: Involvement of staff, students, alumni and the professional field**

Staff, students, alumni and the relevant professional field will be actively involved in the internal quality assurance system.

**Description**

The responsibility for the education programmes, and hence their quality, is shared between the Director of Education, the Programme Directors of the master’s programmes and the chairs of the groups. The Directors are responsible for the programmes as a whole, while the chairs are responsible for the contributions of the staff members belonging to the groups. The chair of a group has the final responsibility for the quality of the content and level of the courses in a specific discipline or a specific cluster of disciplines. Based on the developments within a given discipline or cluster, the chair of a group suggests necessary changes in courses or new courses to the Director of Education. In the presence of the Dean, its Managing Director and the Director of Education, the chairs of the various groups of the Department meet on a regular basis to discuss education policy.

The Director of Education is supported by the staff of the Education Support Offices. In addition, the following parties are involved in the quality assurance system:

**Quality Assurance and Education Innovation Unit**

In close collaboration with the staff, the Quality Assurance and Education Innovation Unit evaluates courses and parts of programmes on a regular basis. The self-evaluation report states that the perceived importance of this unit by the Department is reflected in the full-time equivalents of its staff (1.6 fte). On the one hand, the unit directs and supports ongoing evaluation activities, and on the other, it initiates and monitors quality improvement projects. An employee at the central TU/e level is responsible for operational tasks, such as checking draft questionnaires with the lecturers, mailing students, and asking the lecturers for their
reaction to evaluation scores (0.5 fte). The functioning of the quality assurance system, and hence the evaluation unit, is facilitated by Pollweb, a web-based evaluation system.

Programme Committee
The IE Programme Committee consists of an equal number of members from the teaching staff and students and gives advice on the education programmes, the Teaching and Examination Regulations (OER), and all other matters concerning education, also in connection with the research done by the staff. In addition, the Programme Committee judges the way the OER is implemented once a year. It aims to contribute to the development of the education programmes by considering new concepts at a high level and by assisting with further content-related implementation.

Students
Students are represented on the Programme Committee and on the Industria student councils (see standard 17). The Industria Education Officer participates in the Board meetings. For the evaluation of courses, students fill in questionnaires, and a selection of students participate in focus groups for the evaluation of courses.

Board of Examiners
The Board of Examiners consists of a chair, two lecturers selected from the groups and a secretary. The Board of Examiners decides whether a student fulfils the requirements for the various diplomas. In this context, the committee must apply the OER, which are endorsed by the Department Council.

The self-evaluation report claims that in all improvement projects, staff members and members of the Education Management and the support offices work closely together. Proposals for changes in the education programmes or in courses can come from any of the groups, the Programme Committee, the Programme Directors or the Director of Education. Proposals supported by the Education Management are submitted to the Programme Committee that advises on educational issues. Change proposals supplemented by the Programme Committee’s advice are submitted to the Department Board for approval.

Alumni
The Vice-Dean and Director of Education occasionally discuss programme changes and other relevant education issues with alumni. This happens at the invitation of the VBI (Association of Business Management Engineers, Eindhoven) or at the initiative of the Education Management. Moreover, the TU/e Alumni Office facilitates, supports and stimulates the relations between TU/e and its alumni, e.g. by conducting alumni surveys. The information collected includes data on the sectors in which the graduates work, the academic level of the positions they hold, their career histories and periods of unemployment. The self-evaluation report notes that an update of the alumni survey has been somewhat delayed (the last survey was conducted in 2003). The TU/e alumni office intends to conduct a new alumni survey in the autumn of 2010.

Employers
The self-evaluation report claims that the strategic fit between the programmes and the market and society is safeguarded by means of a carefully composed Advisory Council with representatives from the industrial and service sector. In 2009, the members of the Advisory Council were interviewed about the alignment of the master’s programmes with the labour market and the quality of the graduates of the IE School. Furthermore, researchers of the IE
School have contact with employers on a regular basis. The self-evaluation report further notes occasional employer surveys, identifying their opinion on the quality of IE graduates.

**Assessment**

The committee established that staff members and students contribute to the internal quality assurance in the usual way, via the Programme Committee, the Board of Examiners, the evaluations of the courses and the programmes. The committee highly appreciates the active involvement of a large number of students, not only in the Programme Committee, but also in the student councils and the focus groups. During the site visit, the committee learned that student mentors also have a signalling function regarding impediments in the curriculum of the first year. Via the student counsellor, these signals are picked up by the Programme Committee as well. The committee noted that the Programme Committee is pro-active and launches initiatives on the basis of themes aimed at improving the quality of the programmes. These themes often involve detailed evaluation of education-related aspects, for instance the comparability of the literature studies in the master’s programmes or the supervision of the bachelor’s final projects.

Whilst the committee appreciates the active approach of the Programme Committee and the strong commitment of the Director of Education, it observed that only a small number of the staff members is actively involved. The committee feels attention is necessary to enhance the support and commitment of a larger number of staff members to the quality assurance of the programmes.

The committee notes that the involvement of graduates in the programmes is less prominent, but adequate. The School uses its contacts with graduates mainly to gather information (through surveys). In addition, some graduates are involved in the supervision of bachelor’s projects or the provision of real-life cases. In the committee’s view, the School has good contacts with the professional field. The committee advises inviting HRM professionals to the meetings of the Advisory Council.

On the basis of these considerations, the committee assesses this standard as ‘satisfactory’ for all three programmes.

*Bachelor’s programme Technische Bedrijfskunde:* the committee assesses this standard as **satisfactory**.

*Master’s programme Operations Management & Logistics:* the committee assesses this standard as **satisfactory**.

*Master’s programme Innovation Management:* the committee assesses this standard as **satisfactory**.

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**Assessment of the theme Internal quality assurance system**

The committee comes to an overall assessment of the theme Internal quality assurance system on the basis of its assessments of the separate standards. In the case of the bachelor’s programme Technische Bedrijfskunde, it assesses this theme is **satisfactory**. In the case of the master’s programme Operations Management & Logistics, it assesses this theme as **satisfactory**. In the case of the master’s programme Innovation Management, it assesses this theme as **satisfactory**.
1.1.6. Results

**S20: Achieved learning outcomes**
The achieved learning outcomes correspond with the aims and objectives regarding level, orientation and subject-discipline-specific requirements.

**Description**

Students complete their bachelor’s programme by writing a bachelor’s thesis. The thesis is an individual report of a research project, in which students should demonstrate they meet the objectives of the programme. The self-evaluation report notes that the School believes the achieved learning outcomes of the bachelor graduates correspond to the objectives if the graduates are able to successfully complete subsequent specializations and related master’s courses. Students in the master’s programmes must demonstrate that they are capable of doing independent academic research.

According to the self-evaluation report, a recent study revealed that students and employers are both very satisfied with the level and content of the programmes. Graduates work in a wide range of jobs, as researchers, production or quality managers, ICT, logistics planners, strategic advisors, commercial managers, management consultants or entrepreneurs in a wide ranch of commercial and non-profit organizations. The self-evaluation report furthermore claims that the position of engineers on the job market is good and that the unemployment rate of graduates in the Technology sector, including Industrial Engineering, is the lowest of all sectors.

The WO monitor, an evaluation among recent graduates (1 to 2 years after graduation) reveals that IE graduates are truly positive about their preparation for the labour market (score 7.8, range 2-10) and that they are reasonably satisfied with the jobs they are eligible for after graduation (score 6.6, range 2-10).

Prior to the site visit, the committee studied a number of theses (and their accompanying assessment forms) completed by students who recently graduated from one of the programmes, namely six bachelor’s theses and six theses of each master’s programme. The committee assessed this standard based on this review and on discussions with alumni of the master’s programmes during the site visit. It discussed its findings with the programme management and the members of the Board of Examiners.

**Assessment**

The committee established that the level and the quality of the TBK bachelor’s programme theses are at least satisfactory and sometimes good. However, the committee notes that two of the theses it assessed were written in a colloquial, everyday style, with too many spelling errors and many non-academic conclusions. In addition, these theses lack a clear definition of terms and notions. The committee established that the theses were graded consistently.

The other four bachelor’s theses the committee assessed are of good quality. The chosen methods and techniques are adequate and applied correctly and show an elaborate understanding of the main literature in the field of the subject.

The committee established that the level and the quality of the OML and IM master’s theses are satisfactory. The committee found that the OML theses were graded consistently. Three IM theses were of such high quality that according to the committee the supervisor’s grades were rather low. The theses had clear problem definitions and demonstrated an adequate use of research methods and the literature. Conclusions, discussions as well as structure and
readability were considered adequate. As a result, the committee concludes that the theses show that the graduates of both programmes have attained the final qualifications.

In addition, the committee noted that graduates of the bachelor’s programme move on to a master’s programme smoothly and without any problems. Graduates of the master’s programmes find a position on the labour market with ease, and they consider themselves sufficiently prepared for their first jobs. Therefore, the committee concludes that the actual competencies which students acquire in the course of the programmes correspond sufficiently to the intended learning outcomes, which conform to the demands of the discipline and the professional practice.

On the basis of these considerations, the committee concludes that the learning outcomes of the programme are fulfilled at a sufficient level.

**Bachelor’s programme Technische Bedrijfskunde:** the committee assesses this standard as **satisfactory**.

**Master’s programme Operations Management & Logistics:** the committee assesses this standard as **satisfactory**.

**Master’s programme Innovation Management:** the committee assesses this standard as **satisfactory**.

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**S21: Study progress**

Target figures that are comparable to other relevant programmes are formulated to express the expected success rate. The programme’s success rate complies with these target figures.

**Description**

To improve study yields in the bachelor’s programme, the School formulated the following objectives:

1. At least two-thirds of the students earns a positive study recommendation after the first year of study;
2. Most students who have earned a positive study recommendation after the first year obtain their bachelor’s degree within four years.

The actual results obtained in the period 2005-2010 have been measured against these yield targets, and are reported in the subsections below. The self-evaluation report stresses that yield targets should be viewed in the wider context of the overall quality of education. The programme management first strives to obtain the desired final quality level of the programmes and their components; quantitative yield targets are considered subordinate to programme quality targets. The Department has drawn up an action plan regarding study yields (see standard 18).

The self-evaluation report mentions that since TU/e cannot pre-select students, the P-phase has a selective function. The School wants to ascertain as early as possible in the programme which students are likely to be sufficiently able to obtain a bachelor’s degree successfully within the time specified. The self-evaluation report argues that on the one hand this enables the School to concentrate most of its efforts on capable students; and on the other hand, for non-capable students it creates the opportunity to reconsider their choice of programme at the earliest possible stage. The self-evaluation report provides a table which shows that approximately 40 % of the vwo intake drops out of the bachelor’s programme. A very small part of these students completed the propaedeutic phase. This means that most students who
drop out do so in an early stage of the programme; this is in accordance with the School’s policy.

The self-evaluation report provides the following table which shows that the first objective (at least two-thirds of secondary school intake earns a positive (conditional) study recommendation after the first year of study) is not achieved.

<table>
<thead>
<tr>
<th>Cohort</th>
<th>Intake vwo</th>
<th>Positive</th>
<th>Positive (conditional)</th>
<th>Negative</th>
<th>No BSA*</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>81</td>
<td>19</td>
<td>13</td>
<td>40</td>
<td>9</td>
</tr>
<tr>
<td>2005</td>
<td>85</td>
<td>30</td>
<td>21</td>
<td>22</td>
<td>12</td>
</tr>
<tr>
<td>2006</td>
<td>121</td>
<td>44</td>
<td>29</td>
<td>44</td>
<td>20</td>
</tr>
<tr>
<td>2007</td>
<td>165</td>
<td>49</td>
<td>40</td>
<td>35</td>
<td>41</td>
</tr>
<tr>
<td>2008</td>
<td>125</td>
<td>27</td>
<td>45</td>
<td>26</td>
<td>27</td>
</tr>
<tr>
<td>2009</td>
<td>179</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

*Mostly students dropping out before the study recommendation is given.

The second yield objective (most students with a positive study recommendation should obtain their bachelor’s diploma within four years) is also below target. Some 17% of the 2004 cohort gained their degree within four years, and in 2005 this number increased slightly to 24%. The self-evaluation report explains that this is mainly caused by the fact that bachelor’s students are permitted to start taking master’s courses after they have achieved 160 EC. Furthermore, the TU/e started to collect these figures only three years ago.

The programme management has also defined a target figure for the success rates of the master’s programmes: 100% of the students should complete their programme within the time allotted (i.e. two years). The self-evaluation report provides a table which shows study yields in the master’s programmes for specific categories of students. The self-evaluation report explains that these are only preliminary figures, since the programmes just started in 2005. Moreover, since most students start taking courses in the IM or OML programmes while still finishing the bachelor’s programme; it is difficult to determine the percentage of students with a TBK bachelor’s degree who complete their master’s programme in 2 years. The self-evaluation report notes that TBK graduates complete one of the master’s programmes in approximately 2 - 3 years.

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OML</td>
<td>IM</td>
</tr>
<tr>
<td>All students</td>
<td>29.7</td>
<td>31.6</td>
</tr>
<tr>
<td>TU/e TBK graduates</td>
<td>31.8</td>
<td>33.5</td>
</tr>
<tr>
<td>BEng Dutch polytechnics</td>
<td>30.4</td>
<td>31</td>
</tr>
<tr>
<td>BSc national, non-TU/e</td>
<td>-</td>
<td>31.8</td>
</tr>
<tr>
<td>BSc international</td>
<td>23.6</td>
<td>-</td>
</tr>
</tbody>
</table>

Assessment
The committee established that the programme management has set target figures for the success rates of the bachelor’s programme and that these target figures are realistic and sufficiently ambitious. They have clearly not been met, however. The committee is concerned about this state of affairs. On the other hand, the committee also recognizes that the success rate can only be influenced by the programme management to a limited extent, and low success rates are a general problem in the Netherlands. The committee highly appreciates the persistent efforts taken to improve the success rates, in particular the BEST project. Furthermore, it supports the selective function of the P-phase, and the introduction of exit-interviews with students who dropped out from the bachelor’s and the pre-master’s programmes.
The committee established that the programme management has set target figures for the success rates in the master’s programme which are very ambitious. These figures have not yet been met. However, the committee observes that the success rates of the master’s programmes are reasonable in comparison with other relevant programmes.

The committee thinks that having a clear separation between the bachelor’s and the master’s programmes can be effective in improving the success rate. The possibility for current students to enter a master’s programme while still finishing their bachelor’s programme is considered an unfortunate choice. The committee supports the measures taken to monitor students more closely during their final thesis project. As mentioned under standard 7, the committee advises introducing mid-term assessments for all first-year modules, in view of the requirement for students to complete five modules within one quarter.

Given the attempts by the programme management to improve success rates, and the acceptable rates for both master’s programmes, the committee assesses this standard as ‘satisfactory’ for all three programmes.

**Bachelor’s programme Technische Bedrijfswede:** the committee assesses this standard as **satisfactory**.

**Master’s programme Operations Management & Logistics:** the committee assesses this standard as **satisfactory**.

**Master’s programme Innovation Management:** the committee assesses this standard as **satisfactory**.

### Assessment of the theme Results

The committee comes to an overall assessment of the theme Results on the basis of its assessments of the separate standards. In the case of the bachelor’s programme Technische Bedrijfswede, it assesses this theme as **satisfactory**. In the case of the master’s programme Operations Management & Logistics, it assesses this theme as **satisfactory**. In the case of the master’s programme Innovation Management, it assesses this theme as **satisfactory**.
Overview of the committee's assessment

Bachelor's programme Technische Bedrijfskunde:

<table>
<thead>
<tr>
<th>Theme</th>
<th>Assessment</th>
<th>Standard</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Aims and objectives</td>
<td>Satisfactory</td>
<td>1. Subject-/discipline-specific requirements</td>
<td>Satisfactory</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Bachelor and master level</td>
<td>Satisfactory</td>
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<tr>
<td></td>
<td></td>
<td>3. Academic orientation</td>
<td>Satisfactory</td>
</tr>
<tr>
<td>2. Curriculum</td>
<td>Satisfactory</td>
<td>4. Requirements for academic orientation</td>
<td>Satisfactory</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Correspondence between the aims and objectives and the curriculum</td>
<td>Satisfactory</td>
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<tr>
<td></td>
<td></td>
<td>6. Consistency of the curriculum</td>
<td>Satisfactory</td>
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<td></td>
<td></td>
<td>7. Workload</td>
<td>Satisfactory</td>
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<td></td>
<td></td>
<td>8. Admission requirements</td>
<td>Satisfactory</td>
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<td></td>
<td></td>
<td>9. Credits</td>
<td>Complies</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10. Coherence of structure and contents</td>
<td>Satisfactory</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11. Learning assessment</td>
<td>Satisfactory</td>
</tr>
<tr>
<td>3. Staff</td>
<td>Satisfactory</td>
<td>12. Requirements for academic orientation</td>
<td>Satisfactory</td>
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<tr>
<td></td>
<td></td>
<td>13. Quantity of staff</td>
<td>Satisfactory</td>
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<tr>
<td></td>
<td></td>
<td>14. Quality of staff</td>
<td>Satisfactory</td>
</tr>
<tr>
<td>4. Services</td>
<td>Satisfactory</td>
<td>15. Facilities</td>
<td>Satisfactory</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16. Tutoring</td>
<td>Good</td>
</tr>
<tr>
<td>5. Internal quality assurance system</td>
<td>Satisfactory</td>
<td>17. Periodical evaluations</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18. Measures for improvement</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td></td>
<td>19. Involvement of staff, students, alumni and the professional field</td>
<td>Satisfactory</td>
</tr>
<tr>
<td>6. Results</td>
<td>Satisfactory</td>
<td>20. Achieved learning outcomes</td>
<td>Satisfactory</td>
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<tr>
<td></td>
<td></td>
<td>21. Study progress</td>
<td>Satisfactory</td>
</tr>
</tbody>
</table>
### Master's programme Operations Management & Logistics:

<table>
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<tr>
<td>1. Aims and objectives</td>
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<td>21. Study progress</td>
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### Master's programme Innovation Management:

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<td>5. Correspondence between the aims and objectives and the curriculum</td>
<td>Satisfactory</td>
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<td></td>
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<td>6. Consistency of the curriculum</td>
<td>Satisfactory</td>
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<td></td>
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<td>7. Workload</td>
<td>Satisfactory</td>
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<td></td>
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<td>8. Admission requirements</td>
<td>Satisfactory</td>
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<td></td>
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<td>9. Credits</td>
<td>Complies</td>
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<tr>
<td></td>
<td></td>
<td>10. Coherence of structure and contents</td>
<td>Satisfactory</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11. Learning assessment</td>
<td>Satisfactory</td>
</tr>
<tr>
<td>3. Staff</td>
<td>Satisfactory</td>
<td>12. Requirements for academic orientation</td>
<td>Satisfactory</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13. Quantity of staff</td>
<td>Satisfactory</td>
</tr>
<tr>
<td></td>
<td></td>
<td>14. Quality of staff</td>
<td>Satisfactory</td>
</tr>
<tr>
<td>4. Services</td>
<td>Satisfactory</td>
<td>15. Facilities</td>
<td>Satisfactory</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16. Tutoring</td>
<td>Good</td>
</tr>
<tr>
<td>5. Internal quality assurance system</td>
<td>Satisfactory</td>
<td>17. Periodical evaluations</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18. Measures for improvement</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td></td>
<td>19. Involvement of staff, students, alumni and the professional field</td>
<td>Satisfactory</td>
</tr>
<tr>
<td>6. Results</td>
<td>Satisfactory</td>
<td>20. Achieved learning outcomes</td>
<td>Satisfactory</td>
</tr>
<tr>
<td></td>
<td></td>
<td>21. Study progress</td>
<td>Satisfactory</td>
</tr>
</tbody>
</table>

The committee’s overall assessment of the bachelor’s programme Technische Bedrijfskunde and the master’s programmes Operations Management & Logistics and Innovation Management

The committee concludes on the basis of its assessments of the themes and standards from the assessment framework:

- that the bachelor’s programme Technische Bedrijfskunde **fulfils** the formal requirements which are a prerequisite for accreditation,
- that the master’s programme Operations Management & Logistics **fulfils** the formal requirements which are a prerequisite for accreditation, and
- that the master’s programme Innovation Management **fulfils** the formal requirements which are a prerequisite for accreditation.
Appendix A: General academic skills

1. Researching and designing: Methodologically responsible behaviour and attitude.
Definition: To be capable of formulating a problem, selecting and processing information and formulating and judging the worth of conclusions, under the supervision of lecturers, using relevant methods and techniques, independently and in a group.

1.1 Systematic approach
• Is capable of following a design or research cycle in a planned and structured manner.
• Is capable of using and developing theories, models and interpretations.
• Has insight into the nature of science and technology.
• Has insight into scientific practice.

1.2 Structuring/defining a problem
• Is capable of bringing structure to an unstructured problem.
• Is capable of redefining a problem, and employs system limits and limiting conditions to do this.
• Pays attention to the various aspects of a problem.
• Is capable of judging societal and social effects and can relate these to a choice of research approach.

1.3 Using literature
• Is capable of differentiating between scientific and non-scientific literature.

1.4 Describing/modelling
• Is capable of describing a situation.
• Is capable of describing a situation in a model.

1.5 Applying research techniques
• Is capable of applying various research methods and techniques (observation techniques, data collection techniques, analyzing techniques).

1.6 Analyzing and interpreting
• Is capable of using knowledge to analyze (operating) processes.
• Is capable of using knowledge to analyze (company) performance.
• Recognizes most multidisciplinary or interdisciplinary (design) problems.
• Is capable of drawing on all relevant factors/stakeholders for analyses.

1.7 Synthesizing
• Is capable of developing design alternatives.
• Is capable of using existing tools and developing new ones.

1.8 Judging and justifying research quality
• Is capable of judging research on its scientific value.
• Is capable of methodologically justifying procedures used in research or design processes.
• Is capable of judging societal and social effects and involving them in the choice of research approach and (re)design.
1.9 Research attitude
- Is alert and capable of discovering new viewpoints.
- Is capable of handling changes in the course of a design process.
- Has an attitude of life-long learning.

1.10 Recognizing the relationship between technology, man and society
- Is capable of recognizing the relationship between technology and operating procedures.
- Is capable of including internal and external factors in analyses.

1.11 Multidisciplinary methods
- Possesses an interdisciplinary or multidisciplinary attitude.

1.12 Adequate reporting and advisory skills
- Is capable of reporting on research results in a scientific manner.
- Is capable of translating scientific results into useful contributions.

2. Academic attitude
Definition: To be capable of systematically and critically reflecting on thinking and procedures in research and design.

2.1 Reflecting on procedures and attitude
- Is capable of reflecting on own experience and competencies.
- Is capable of reflecting on development within the field.
- Is capable of reflecting on own field and its relationship to other fields.
- Is capable of reflecting on the field and its relationship to the social environment.

2.2 Reasoning
- Is capable of logical reasoning.
- Recognizes various manners of reasoning in the field.

2.3 Critical attitude
- Is alert and capable of discovering new points of view.
- Is capable of asking critical questions.
- Has a constructive critical attitude when solving (simple) problems in the field.
- Is capable of relating claims and insights in the field to social and ethical developments.
- Is capable of relating claims and insights in the field to currents standards and values.

3. Communicating and cooperating
Definition communicating: To be capable of communicating professionally in writing and verbally in an organizational context, while using relevant terminology and technical jargon.
Definition cooperating: To be capable of cooperating professionally and in a result-oriented manner in various social contexts, while recognizing individual interests, positions, and values.

3.1 Cooperating
- Is capable of working in a multidisciplinary team.
- Is capable of working in an international team.
3.2 Written and verbal presentation

- Is capable of presenting research and design results to professionals and scientists verbally.
- Is capable of presenting research and design results to professionals and scientists in writing.
- Is capable of debating research and design results with professionals and scientists.

3.3 Functioning professionally

- Is capable of independent work.
- Is capable of planned and structured work.
- Is capable of working in an international environment.
- Is capable of combining professional work and social interaction.
- Is capable of handling various interests and stakeholders.
Appendix B: Curricula vitae of the committee members

Prof. dr. ir. L.F (Ludo) Gelders (chair) is emeritus professor of Industrial Management at the Faculty of Engineering at the Katholieke Universiteit Leuven (KU Leuven), Belgium. He holds master's degrees in Electromechanical Engineering (Ghent University) and Industrial Management (KU Leuven). He studied management at the MIT-Sloan School (USA) and was awarded a PhD in Industrial Management at KU Leuven. After work experience in jet engine manufacturing, he took up an academic career. He served as chairman of the Department of Mechanical Engineering and as chairman of the Center for Industrial Management, both at KU Leuven.

He has published 10 books and over 200 papers on logistics, production, and maintenance and quality management and holds editorial positions on several international journals in Operations Management. He has been active in different private and public companies, as a consultant or director. He was chairman of the Board of the Flemish Water Supply Company (VMW) and vice-president of Hasselt University. He is a former chairman of KVIV (Royal Flemish Engineering Society). Currently, he is chair of the Division of Technical Sciences of the Royal Belgian Academy (KVAB).

Prof. dr. J. (Jan) Kratzer holds the chair for Entrepreneurship and Innovation Management and is director of the Center for Entrepreneurship at the Technical University, Berlin. He studied sociology and management science at the University of Leipzig and received his PhD from the Interuniversity Center for Social Science Theory and Methodology in the Netherlands. He has published in the Journal of Consumer Research, Research Policy, and Journal of Product Innovation Management. His major interests lie in the field of social networks, innovation marketing, social entrepreneurship as well as the creative performance of new product teams and projects.

Prof. dr. J. (John) Grin is a full professor of Policy Science, especially System Innovation, at the Department of Political Science of the University of Amsterdam. He is a member of Perform, an interdisciplinary research team on new democratic practices. In addition, he is co-director of the Dutch Knowledge Network on System Innovations (KSI), specifically responsible for the KSI subprogramme on governance studies, as well for its interface between research and practice, organized through the Competence Centre for Transitions (CCT). He is responsible for a postgraduate course for practitioners engaged in system innovation. During 2006-2009, he was scientific director of the Amsterdam School of Social Research (ASSR), in which political scientists, sociologists and anthropologists cooperate. The constant throughout his career has been an interest in the relationships between science, technology, society and politics.

Ir. J.R. (Hans) Wierda holds a degree in Mechanical Engineering and design from the University of Twente and started his career in 1978 with Shell. During over 15 years he carried out several assignments as project engineer in a wide range of operating environments in both Shell and joint venture companies in Europe, the Middle East and the Far East and covered all project stages from scouting to commissioning and for both onshore and offshore projects. This was followed by leadership positions in the divestment of Shell’s EP interest in Turkey, Head of Recruitment of technically educated professional staff, business development in Russia and Indonesia, and Shell’s Project Management Office.

Between 2006 and 2010, Wierda was Head of the Shell Project Academy, responsible for the conceptualisation, operationalisation and optimisation of the competence development.
programme for Shell’s project management community. He led the Academy team consisting of academic staff from two international business schools, two technical universities and Shell staff. The programme included career development, mentoring/coaching, community development, assessment/accreditation and formal learning. He is currently self-employed as an advisor on competence development for centres of excellence.

Dr. C. (Cees) Terlouw is associate professor of Enrollment Management and Educational Transition at the Saxion University of Applied Sciences and director of a national expertise centre on educational transition for higher professional education. His research and teaching interests concern educational transition, instructional design, study choice, and problem-solving in different domains in secondary and higher education. Formerly, he was a teacher, researcher, and consultant at the University of Twente on such subjects as instructional development, problem-solving, ICT application in education, cultural diversity, and teacher training for the staff of the Faculty of Public Administration, the Educational Centre, the Centre of Higher Education Policy Science, and as a director of the Teacher Training Institute ELAN of the University of Twente. He has published with others several books and articles on these themes in national and international journals.

Drs. N.J. (Nynke Jo) Smit is Academic Registrar and Head of the Office of Educational Affairs at the International Institute of Social Studies (ISS) in The Hague. ISS is an international graduate school of policy-oriented critical social science that is part of Erasmus University Rotterdam. Before joining the ISS she worked as senior educational advisor Curriculum Development and Quality Assurance and as programme coordinator for Industrial Engineering and Management at the University of Twente in Enschede and as educational policy advisor at VSNU. She graduated in Psychology and Business Administration. Currently she is also a board member of the Dutch Association for Institutional Research (DAIR).

F. (Frank) Pijnenborg studies Systems Engineering, Policy Analysis and Management at Delft University of Technology with the specialisation Energy and Modelling, Simulation and Gaming. He is also finishing his bachelor’s degree in Technische Bestuurskunde (TB). In 2010 he studied for six months at the Keio University, Graduate School for System Design and Management, Tokyo. In 2005, Frank Pijnenborg was a member of the Faculty Student Council. Since then, he has been constantly involved in the quality assurance of the education at the TPM Faculty. He served as Commissioner of Bachelor Education on the Curius Board, the TB study association, and also as student member on the Faculty Management Team. He worked several times as student-assistant, and has acted as a mentor for first-year TB students for several years.

R.M. (Richelle) Rijntjes BSc studies Industrial Engineering and Management at the University of Twente with the specialization Health Care Technology and Management. She obtained her bachelor’s degree in Technische Bedrijfskunde at the same university. As part of the bachelor’s programme, she finished the Medical Physiology minor and a graduation project for the Information & Support Department at the municipality of Oldenzaal. She also has a job as a waitress in a small restaurant on the UT campus and has worked as a student assistant for a number of different courses, assisting for example at tutorials and practicals.
### Appendix C: Programme of the site visit at Eindhoven University of Technology

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Activity</th>
</tr>
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<tbody>
<tr>
<td><strong>14 April 2010</strong></td>
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<tr>
<td></td>
<td>19.00 – 22.00</td>
<td>Arrival committee members and preparatory meeting committee</td>
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<tr>
<td><strong>15 April 2010</strong></td>
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<tr>
<td>08.30 – 11.30</td>
<td>Preparatory meeting committee</td>
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<tr>
<td>11.30 – 12.30</td>
<td>Opening interview with the programme management</td>
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<tr>
<td>12.30 – 13.15</td>
<td>Interview with students of the bachelor’s programme Technische Bedrijfskunde</td>
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<tr>
<td>13.15 – 14.00</td>
<td>Lunch</td>
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<tr>
<td>14.00 – 14.30</td>
<td>Interview with students of the master’s programme Innovation Management</td>
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<tr>
<td>14.30 – 15.00</td>
<td>Interview with students of the master’s programme Operations Management &amp; Logistics</td>
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<tr>
<td>15.00 – 15.15</td>
<td>Break</td>
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<tr>
<td>15.15 – 16.00</td>
<td>Interview with lecturers</td>
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<td>16.00 – 16.30</td>
<td>Interview with alumni</td>
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<tr>
<td>19.00 – 22.00</td>
<td>Dinner with representatives of the IE School and the IE&amp;SE Department</td>
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<tr>
<td><strong>16 April 2010</strong></td>
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<tr>
<td>09:00 – 09:30</td>
<td>Interview with Programme Committee student members</td>
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<tr>
<td>09:30 – 10:00</td>
<td>Interview with Programme Committee staff members</td>
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<tr>
<td>10:00 – 10:30</td>
<td>Interview with Board of Examiners and Student Counsellor</td>
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<tr>
<td>10:30 – 11:00</td>
<td>Conducted tour IE building and library</td>
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<tr>
<td>11:00 – 11:30</td>
<td>Review by committee, preparation for final interview</td>
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<tr>
<td>11:30 – 12:30</td>
<td>Final interview with Department Board and Director of Education.</td>
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<tr>
<td>12:30 – 13:00</td>
<td>Lunch</td>
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<tr>
<td>13:00 – 16:00</td>
<td>Review by committee, draft of preliminary results</td>
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<tr>
<td>16:00 – 16:30</td>
<td>Oral presentation preliminary results</td>
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<tr>
<td>16:30 – 17:00</td>
<td>End of site visit, drinks.</td>
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</table>