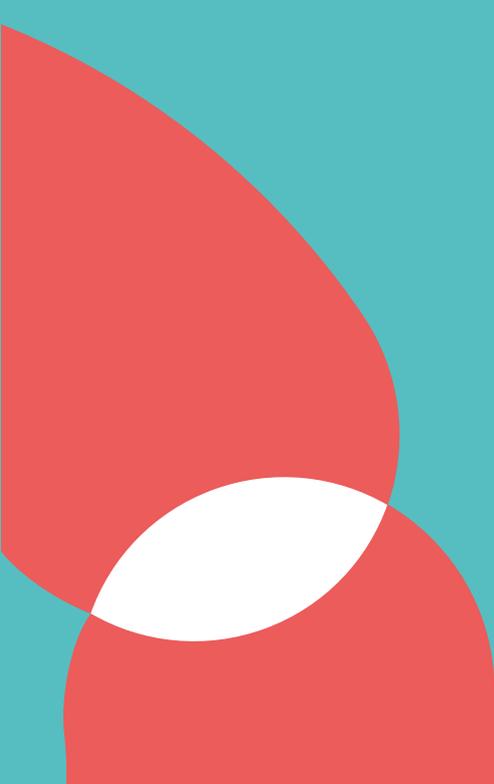




NVAO • NETHERLANDS

ADVISORY REPORT
EINDHOVEN UNIVERSITY OF TECHNOLOGY
INSTITUTIONAL QUALITY ASSURANCE
ASSESSMENT

6 FEBRUARY 2020



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1 Summary advisory report

It is Eindhoven University of Technology's mission to push knowledge-intensive industries and social sectors to grow with a high or rapidly evolving technological intensity by turning research into successful innovations and by encouraging students and staff to opt for entrepreneurship. In its vision on education, Eindhoven University of Technology aims to educate engineers for the future, equipping students to become experts in their area, with the knowledge, skills and attitude for being durably employable in an ever-changing world. Core elements of the current educational vision include active student learning, small-scale education, diversity, the connection between research and education and a multidisciplinary approach.

The current mission and vision originate from facing serious problems in 2011 due to the declining number of students and high drop-out rates as well as a lack of diversity within the student population, versus the increasing demands of the industry to educate T-shaped engineers. These circumstances led to a major educational reform in 2012 and 2015 by re-designing Eindhoven University of Technology's educational programmes by incorporating the bachelor's and master's programmes into a Bachelor College and a Graduate School, respectively. In the Bachelor College and Graduate School, students are the main focal point and are given the freedom to choose an individual programme that is tailored to personal goals and ambitions.

The current vision is widely supported in the university. Eindhoven University of Technology has defined ambitions in dialogue with internal and external stakeholders, which are realistic and where quality is paramount. The university's policies are in line with Strategy 2030 and developed via top-down as well as bottom-up procedures. Programmes develop their own annual plans, for which they have a high level of autonomy. They monitor the quality assurance instruments themselves, coordinate this with students, teachers, examination committees, programme committees, advisory boards and work field committees, and present the results to the department deans and the Deans Bachelor College (BC) and Graduate School (GS). The Deans BC and GS then inform the Executive Board. The study programmes, departments, deans and the Execution Board systematically inform their stakeholders on relevant policy developments and evaluation results.

Eindhoven University of Technology uses co-determination bodies to involve staff as well as students in the policy-making development within the institution. By closely involving teachers and students, Eindhoven University of Technology intends to be transparent and open in its quality control and to increase the common ownership and involvement in the processes of quality assurance. Because of the small-scale set-up of the organisation, there are direct lines of communication between teachers, students and management. Therefore, matters that arise are dealt with quickly within TU/e. The direct lines of communication are considered very valuable by all those involved.

The panel reviewed the university's quality systems and quality culture and finds that these are in line with the educational vision. The institution works in accordance with the institutional framework on quality assurance and the subsequent quality assurance plans in which faculty and support staff, and the Deans BC and GS use the quality cycle to check whether targets are being met. The quality cycle provides direction and input for monitoring policies and processes and improving them where necessary. To monitor and evaluate educational policies, various internal and external evaluation and assessment instruments are systematically used at various levels, with adequate involvement of students, teachers, and the professional field.

According to the panel, the TU/e's quality system is characterised as a very improvement-oriented system, with a strong and open quality culture. The panel observes that the institution keeps control of its processes in a very informal way and refers to an engineering sort of mentality, a 'no-nonsense mentality'. Staff and students indicated that they are motivated to constantly improve and do not

hesitate to try out new things. Because of the BS and GS structure, staff can easily share their experiences. The panel notes that the many developments within the institution are well supported. Changes are often implemented through short-cycle improvements. Larger improvements are included in improvement plans where the responsibility lies with the programme director.

Given the outcomes of the institutional audit the assessment panel charged with assessing Eindhoven University of Technology advises NVAO to take a positive decision.

The Hague, 6 February 2020

On behalf of the panel,

Prof. dr. R.A. Wessel
(Chair)

Y. Blom
(Secretary)

2 Introduction and justification

2.1 Purpose of the institutional audit

The institutional audit assesses whether an institution harbours a quality culture and a system of quality assurance which sufficiently guarantees that the education offered by the institution meets (inter)nationally accepted standards and demands. The institutional audit takes the ambitions, vision and choices formulated by the institution as point of departure, but requests the institution to account for the realisation of these ambitions. Thereby, it is centred around four contiguous central questions:

1. Are the vision and policies of the institution regarding the quality of education in a broad sense sufficiently accepted and supported, and have there been adequate consultations on the vision and policies, both internally and externally?
2. How does the institution realise its vision on quality?
3. How does the institution monitor the realisation of the vision on quality?
4. How does the institution approach improvement?

Participation in the institutional audit is not compulsory for institutions. The audit functions alongside the assessment and accreditation of individual study programmes. Passing the institutional audit gives institutions the right to have their programmes assessed on the basis of the framework for the Limited Programme Assessment. When an institution fails the institutional audit, its programmes need to be assessed according to the standards for the Extensive Programme Assessment.

In the first round of institutional audits which was held from 2011 to 2016 35 institutions passed the audit. These comprise around 80% of the total number of programmes in Dutch higher education.

NVAO appoints a panel of experts ('peers') for the institutional audit, who have no ties with the institution or any other kind of conflict of interest. The panel comprises leading expertise on the management of institutions, as well as educational expertise in the field of higher education, and expertise on the conduct of audits and/or the design and efficiency of systems of quality assurance. Students and the work field are also represented in the panel. The panels are being trained before conducting the audit. The report is drafted by a qualified and independent secretary who is also trained by NVAO.

NVAO drafts a model text which can be extended and modified by the secretary to the panel.

2.2 Composition of the audit panel

The audit panel is composed of:

- Ramses Wessel, chair, Professor International and European Law and Governance and Co-director of the Centre for European Studies, University of Twente; Former Dean and Vice-rector, University of Twente.
- Miriam Luizink, member, director Roessingh Research & Development (RRD), previous director Strategic Business Development University Twente
- Wim van Petegem, member, professor KU Leuven, Professor and Policy Coordinator Learning Technologies, Faculty of Engineering Technology, KU Leuven
- Nico de Rooij, member, professor Emeritus of Microengineering at EPFL and previous Vice-President of CSEM SA and Head of the Sensors, Actuators and Microsystems Laboratory (SAMPLAB)
- Diana van Wanrooij, student-member, student master programs: International and European Law and Law and Technology, Tilburg University.
- Yvet Blom, secretary
- Frank Wamelink, NVAO process coordinator

The resumes of the panel members have been included in Appendix 1.

2.3 Procedure observed by the panel

2.3.1. General procedure observed by the panel

For Eindhoven University of Technology (TU/e), the ITK consisted of an orientation and an in-depth visit. The content of the visits has been discussed prior to the visits taking place, together with the organisation, the chair of the panel and the process coordinator. The entire schedule of the visits, including the topics of conversation can be found in appendix 3.

The TU/e has written a full comprehensive self-evaluation report to prepare for the ITK. In this evaluation the organisation explains how it feels that it complies with the four ITK assessment-framework standards. As groundwork for the first visit, the panel reviewed the self-evaluation report and its appendices. After reviewing the provided information, the panel shared their first impressions, findings and questions with the process coordinator and the secretary.

The panel got together with the process coordinator and the secretary on 9 October, 2019 to prepare for the first visit. During this meeting the panel's impressions, findings and questions were discussed between the panel members. Then the panel members conducted a list of questions for the various meetings that would take place on the days of the orientation visit.

The orientation visit took place on 10 and 11 October and can be described as an exploratory visit. During the various meetings with people from different layers within the organisation the panel obtained additional information. The panel acquired enough information from the self-evaluation and the first visit to form the in-depth visit audit trails. At the end of the orientation visit the chair of the panel presented its initial findings and proposed audit trails.

The panel formulated different topics for a total of three audit trails. A vertical trail that focussed on the past performance of two university bachelor programmes and two horizontal audit trails in which it took a closer look at the realisation of growth and small-scale education, and diversity.

The trails were set up by the organisation, the process coordinator and the chair of the panel. These parties together also finalised the content of the in-depth visit. The organisation then provided the panel with additional information for the selected audit trails and invited the different stakeholders to be present during the in-depth visit. Appendix 4 contains an overview of the information that was supplied to the panel.

The in-depth visit took place on 25, 26 and 27 November, 2019. Prior to this visit, the panel members met to discuss the topics of the audit trails and to further prepare for the audit. Throughout the visit the panel has put its impressions to the test in the different stakeholder sessions. Amongst themselves, the panel members then discussed the information they gathered before and during their visits. Their findings were finalised and reflected on in light of the assessment framework. The in-depth visit came to a close with the panel verbally sharing its conclusions with stakeholders from both visits.

A draft report was outlined by the secretary, based on the panel's findings and considerations. This draft report was then handed to the panel members for comments, after which the final report was confirmed by the chair of the panel.

2.3.2 Procedure observed by the panel with regard to the audit trails

As already outlined above, the panel's second site-visit consisted of an in-depth site visit where the panel carried out the following audit trails:

Audit trail 1 – The vertical trail focused on the past performance of quality control within two programmes. In this trail, the panel looked at the quality assurance of the education and the consistency of the different quality assurance tools of each of the following programmes: the Bachelor and Master programmes of the Department of Architecture, Urbanism and Building Sciences of the Department of Built Environment, and the Bachelor Electrical Engineering of the Department of Electrical Engineering. The panel looked more closely at the quality cycle of the programmes by focusing on monitoring and improving the quality of education, the various roles and responsibilities, and the interaction between the different layers within the organisation. For this purpose, the panel looked at documents relating to the quality assurance of the organisation in general and the two programmes in particular. Six interviews with representatives of each of the two programmes provided the panel with additional information.

Audit trail 2 – The horizontal trail Growth and small-scale education. This trail focused on a more detailed evaluation of the way in which the university secures small-scale education, one of the core elements of TU/e, within a context of increasing number of students. To achieve this, the panel interviewed students, teachers, programme directors, department directors, deans and board members and analysed the effects of policy measures on the university bachelor's and master degree programmes in Mathematics and Computer Science, Mechanical Engineering, Industrial Engineering and Innovation Sciences, Applied Physics, plus the Bachelor College and the Graduate School.

Audit trail 3 – The horizontal trail Diversity. This trail was a review of the way in which the university implements, evaluates and follows up on diversity, another key element of TU/e, according to the quality cycle. During this trail, the panel met with students, teachers and programme directors from three departments: Biomedical Engineering, Chemical Engineering & Chemistry and Industrial Design.

2.4 Structure of the advisory report and the chapters

Chapter 3 contains general information regarding TU/e plus a number of key figures. Subsequently, in chapter 4 the panel presents its judgement regarding the institution's quality assurance in relation to each standard of the assessment framework. For each standard, the panel's findings are listed, followed by its considerations. In each case, the findings based on the audit trails serve as casuistic evidence for the manner in which the quality assurance system as a whole functions within TU/e. The findings, therefore, do not comprise an assessment of the programmes or curriculums involved in the audit trails but rather certain aspects of them on the basis of which the panel has been able to find answers to the central questions. Chapter 5 provides recommendations for improving the quality assurance system. The report concludes with a summary table of the judgements regarding the institution's quality assurance.

In addition, the report comprises five appendices with:

- An accreditation portrait
- Data on the composition of the panel
- The schedule for the site visits
- An overview of the documents perused
- A list of abbreviations

3 Profile of the institution

3.1 General data

| | |
|---------------------------|------------------------------------|
| Country | Netherlands |
| Institution | Eindhoven University of Technology |
| Locations | Eindhoven |
| Status of the institution | Publicly funded |

3.2 Profile of the institution

Eindhoven University of Technology (TU/e) characterises itself as a leading, international university specialising in science and technology. The university contributes to advancing the engineering sciences by providing high-quality research and thus the development of technological innovations. TU/e aims to push knowledge intensive industries and social sectors to grow with a high or rapidly evolving technological intensity by turning research into successful innovations and by encouraging students and staff to opt for entrepreneurship. The TU/e campus is located in the centre of one of the most powerful technology hubs in the world: Brainport Eindhoven. The TU/e forms a thriving ecosystem which, together with likeminded organisations, has one common goal: to improve the quality of life through sustainable innovations. In short, the TU/e portrays itself as the university where innovation starts and people matter.

The educational philosophy is based on the idea of providing personal coaching plus room for individual ambitions and talents to grow. With the objective to educate the engineers for the future, TU/e started a major educational reform in 2012 and 2014. The bachelor's and master's programmes have been incorporated into a Bachelor College (BC) and a Graduate School (GS), respectively. Students have the option to create their own individual education based on their personal goals and needs. Within BC, TU/e is currently offering 12 BSc programmes, consisting of a total of 15 majors. In the GS, TU/e is offering 15 graduate programmes that each focus on one specific research domain. The 15 graduate programmes comprise a total of 23 master's degree programmes. GS also includes Professional Doctorate in Engineering (PDEng) and doctorate (PhD) programmes. Nearly all master's programmes are in English and thirteen of the majors in the bachelor's programmes are offered in English. In 2018-2019, over ten percent of the bachelor students (including pre-master students) and more than twenty percent of the master students were international students.

The TU/e collaborates with a large number of national and international higher education institutions on an organisational, departmental as well as on an individual programme level, for instance: the joint bachelor's and master's programme and a matching PDEng programme in Data Science with Tilburg University and the Jheronimus Academy of Data Science, the Strategic Alliance Eindhoven- Utrecht-Wageningen¹, the 4TU Federation², and the EuroTech Universities Alliance³. These partnerships include collaboration in the areas of both research as well as education to be able to offer students a wide range of educational programmes.

The TU/e has a highly developed organisational structure for the university as a whole. The highest level is formed by the Executive Board. The Executive Board oversees the organisation and is accountable to the Supervisory Board. In addition, a BC and a GS have been set up at the university level. The Deans BC and GS are responsible for the development and realisation of institution-wide policy and guidelines with regard to the undergraduate and graduate levels of education, the quality assurance at the institutional level, and innovation and strengthening of undergraduate and graduate education. Support

¹ Consisting of Utrecht University, the University Medical Center Utrecht and Wageningen University & Research

² The cooperation mechanism of the Dutch universities of technology, including Wageningen University & Research

³ A strategic partnership of six leading European universities of science and technology

services are also organised at the university level. The TU/e has eleven service entities,⁴ including Education and Student Affairs (ESA), which is the central point at the TU/e to offer education support services. The ESA director is ultimately responsible for the quality of the entire educational support chain. The university has defined a number of chains⁵ that ensure coordination and alignment with the relevant themes of educational quality, from the programme to the central level.

Education is provided by the departments. The TU/e has nine departments⁶. The final responsibility rests with the Department Board. The daily management in the area of education is mainly in the hands of the dean of the department, the (graduate) programme directors and the ESA manager. The department deans and (graduate) programme directors have final responsibility for one or more programmes, and the ESA manager is responsible for providing educational support at the department level. The ESA manager also operates at the central level and takes responsibility for one or more of the chains. The Deans BC and GS work closely with the department deans and the (graduate) programme directors within the agreed frameworks laid down by the Executive Board. The frameworks adopted for education are strongly anchored in the governance structure as a result of this organisation.

At the university, BC and GC, department and programme levels, there are formal participation bodies that possess the right of approval on certain issues in educational policy as defined by law and the right to provide counsel. At the institutional level, this body is the University Council, at the BC and GS level the Joint Programme Committee, at the department level the Department Council, and at the programme level the Programme Committee.

The institution warrants quality assurance through the use of a regular planning and control cycle and an educational quality cycle. The education quality cycle is structured via a matrix setup that consists of four horizontal and five vertical lines. The horizontal lines are: 1. the preparation of education, evaluation and improvement plans; 2. monitoring and reflection; 3. communication, and 4. support. These processes are ensured by the vertical lines at the course, programme, department, BC and GS, and institution levels.

3.3 Key figures (2018)

| | | |
|-----------------------------|---------------------------------|--------|
| Student numbers | Total number of students | 11,985 |
| | Bachelor's students | 7,588 |
| | of which international students | 773 |
| | Master's students | 4,397 |
| Programmes | of which international students | 906 |
| | Total number of programmes | 35 |
| | Bachelor's programmes | 12 |
| | - Majors | 15 |
| | Graduate programme's | 15 |
| | - Master's programmes | 23 |
| English-language programmes | 33 | |

⁴ Communication Expertise Center, General Affairs, Financial and Economic Affairs, Real Estate Management, Internal Affairs, Personnel and Organisation, Equipment & Prototype Center, Information Management & Services, Information Expertise Center, Innovation Lab, Education and Student Affairs.

⁵ 1. student guidance and coaching, 2. educational rules and regulations, 3. international admissions, 4. international student experience, 5. education/examinations, fraud and planning, 6. educational planning and scheduling, 7. study progress, 8. teacher support, 9. quality assurance, 10. employability, 11. inflow and outflow of students, 12. language skills, 13. educational policy

⁶ Applied Physics, Built Environment, Biomedical Engineering, Electrical Engineering, Industrial Design, Industrial Engineering and Innovation Sciences, Chemical Engineering and Chemistry, Mechanical Engineering, Mathematics and Computer Science.

| | | |
|-----------------|--|---------------|
| Degrees awarded | Bachelor's | 1,240 |
| | Master's | 1,318 |
| Staff | Total scientific and support staff (fte) | 3,025 |
| | Number of employees | 3,340 |
| | Of which scientific staff | 712 |
| | Full professors | 146 |
| | Part-time professors (paid) | 40 |
| | Part-time professors (unpaid) | 98 |
| | Special professors (bijzonder hgl) | 1 |
| | Assistant professors | 293 |
| Financial data | Total budget | 378.1 million |

4 Review per standard

4.1 Standard 1: Philosophy and policy

Standard 1: The institution has a broadly supported educational philosophy and pursues a corresponding policy focused on the internal quality assurance of its education.

Explanation: The institution holds a well-defined view of good education which is shared in all its departments. Teachers and students support this philosophy, and develop it in mutual consultation and in concert with external stakeholders. Periodical coordination with the relevant (changing) environment ensures the topicality of this philosophy. The educational philosophy has been translated into explicit points of departure for quality assurance. In accordance with the ESG, the educational philosophy is student oriented (student-centred learning).

A. Findings

In 'TU/e Strategy 2030', TU/e has outlined its vision on the university of the future in the areas of education, research and valorisation. In its vision on education, TU/e builds on previously formulated ambitions from the educational vision of 2013 'Engineers for the future. An essay on education at TU/e in 2030'. In its Strategy 2030, TU/e describes several 'drivers of change' that will have an impact on education at TU/e, such as the sustainability challenge, the growing impact of technology on society, the wide availability of information and the quickly evolving industry. TU/e wants to prepare students for these developments through its educational programmes. This means that students will be experts in their area, with the knowledge, skills and attitude for being sustainably employable in an ever-changing world. Core elements of the current educational vision include active student learning, small-scale education, diversity, the connection between research and education and a multidisciplinary approach.

The current mission and vision originate from facing serious problems in 2011 due to the declining number of students and high drop-out rates as well as a lack of diversity in TU/e's student population. In that same period, TU/e also noticed an increasing demand for academic engineers with a broader understanding on the role of technology in society. The declining student numbers, high drop-out rates and the increasing demands of the industry, led to a major educational reform in 2012 and 2015 by redesigning TU/e's educational programmes with the objective to educate 'engineers for the future'. This was done by means of incorporating the bachelor's and master's programmes into a Bachelor College (BC) and a Graduate School (GS), respectively, including a support structure in terms of an Education Student Affairs (ESA)⁷ service unit. In the BC and GS structure, students are the main focal point and are given the freedom to choose an individual programme that is tailored to personal goals and ambitions.

In order to explore a specific educational matter such as the realisation of TU/e's Strategy 2030 or the implementation of the BC and the GS, the TU/e generally establishes a task force with representatives from the departmental and institutional levels. These task forces prepare a recommendation or proposal which is subsequently discussed by all relevant actors, such as the Executive Board and department deans, programme directors, students, staff, the Joint Programme Committee (JPC), the University Council, external stakeholders and so on. Their comments are used to improve the final wording of the policy or vision at hand, which is then adopted by the Executive Board, the deans and the department boards.

Thus, after the Executive Board initiated the drafting of the TU/e Strategy 2030 in 2017, a task force was set up. Throughout the development process of the Strategy 2030, students and staff, organisation-wide participation councils, alumni, and representatives of the professional field were invited to contribute.

⁷ The reorganisation of ESA took place in 2015-2017

The proximity to the Brainport ecosystem allows TU/e to be in regular contact with the future employers of their talented students. They shared their insights regarding the requirements of the industry during formal and informal meetings. According to the Executive Board, these extensive meetings have contributed to an educational vision which is well aligned with the needs of the professional field.

The Executive Board specifies that, in order to safeguard the continuity of the organisation, it has regular discussions with the Supervisory Board, management, department staff, support staff, and students. Through interviews with members of the Supervisory Board, the panel was made aware that the Supervisory Board is in close contact with members of the Executive Board, students, teachers, and deans. The Supervisory Board and the Executive Board gather six times a year to discuss the strategic process, including the framework of the educational vision. The Supervisory Board also maintains an ongoing dialogue with the Executive Board, schedules quality meetings with students, and consults the University Council regarding integrity, education and workload once a year. In addition, the Supervisory Board sets up meetings with deans and is approached by teachers when issues arise that require attention.

TU/e's policies are in line with Strategy 2030 and are developed via top-down as well as bottom-up procedures. The panel has seen several of these top-down procedures and bottom-up approaches during the in-depth visit. Since the implementation of the BC, student numbers started to grow drastically. As TU/e strives to provide small-scale education, the panel wanted to examine how TU/e provides small-scale education whilst receiving a growing number of students. The growing student population is a central theme and main challenge in the quality of education. The Executive Board, the deans, the departments and the University Council are of the opinion that future engineers will benefit from small-scale education, but they experienced difficulties to find scientific staff in the technical sciences. As a result, the institution has been unable to compensate with staff for the growing number of students in recent years. To overcome this academic staff shortage, a top-down procedure was developed to invest in 'Teaching Assistants' (graduate master's students, PhD students or postdocs), 'Teacher Assistants' (bachelor's or master's students), and 'Hybrid teachers' (work field professionals). An example of a bottom-up approach is the way in which several departments have implemented certain processes in order to cope with the expanding student population. After consulting the professional field, some Bachelor programmes, for example, have introduced a Numerus Fixus to manage the growing intake. Representatives of the BSc programmes which have such a Numerus Fixus, view it as a temporary solution. Some BSc programmes even have already removed the Numerus Fixus, following the expansion of teaching staff and/or stabilising student numbers.

In its self-evaluation report, TU/e describes several policies aimed to increase internationalisation, without explaining explicitly the underlying principles. Therefore, the panel asked TU/e to elaborate on this topic. The interviewees explained that the university has a strong focus on students gaining experience abroad and is stimulating its students on doing an exchange programme, or an internship abroad. TU/e aims at promoting internationalisation so that 90% of the students have an experience abroad. TU/e also focuses on incorporating education where students learn to work within international, multidisciplinary teams, that require English speaking and writing skills.

Programmes develop their own annual plans, for which they have a high level of autonomy. They monitor the quality assurance instruments themselves, coordinate this process with students, teachers, examination committees, programme committees, advisory boards and work field committees, and present the results to the department deans and the Deans BC and GS. The Deans BC and GS then inform the Executive Board. The study programmes, departments, deans and the Executive Board systematically inform their stakeholders on relevant policy developments and evaluation results.

TU/e uses co-determination bodies such as the University Council, the Joint Programme Committee, department councils, programme committees, and ad hoc committees, to involve staff as well as

students in the policy-making development within the institution. By closely involving teachers and students, TU/e intends to be transparent and open in its quality control and to increase the common ownership and involvement in the processes of quality assurance. Because of the small-scale set-up of the organisation, there are direct lines of communication between teachers, students and management. Therefore, matters that arise are dealt with quickly within TU/e. The direct lines of communication are considered very valuable by all those involved.

B. Considerations

The panel notes that TU/e has a clear vision on education and the quality of education and that Strategy 2030 is well embedded within the organisation. The current vision builds on the previous vision and is widely supported by the interviewees with whom the panel has spoken. TU/e has defined ambitions in dialogue with internal and external stakeholders, which are realistic and where quality is paramount. The panel appreciates that the Executive Board spent a significant amount of time involving its stakeholders during the development of the university's new vision. According to the panel, the extensive support for the educational vision has led to a culture with shared ambitions and shared values. The panel had forthright discussions with staff and students during the site visits and is impressed by the commitment of staff, students and the strong connection to the professional field. Everyone seems to be working intensively to serve the organisation's collective interest. In the opinion of the panel, the extensive support for the vision was also partly achieved by the supporting role of ESA which contributes to the small-scale setup throughout all levels within the university.

The panel notes that the current educational vision does not identify which students TU/e wants to attract. Specifying and describing the typical TU/e student can contribute to study performance and success. Therefore, the panel recommends to further strengthen the vision on education, by including a clear description of the typical TU/e student.

The panel is positive about the implementation of important policy topics which TU/e adopts in order to shape its vision on education. The use of top-down and bottom-up approaches, both in the area of development as well as within the implementation processes, work well. In this context, according to the panel, the organisation has taken forward actions to address the issues of growth and small-scale education, such as setting up Numerus Fixus. Setting up Numerus Fixus has been a clearly communicated discussion both internally and externally. Partially as a result of good communication with regard to the proposed actions, they are well received and complied within the organisation.

The panel finds that in some areas, such as the topic of internationalisation, policies were less detailed. The panel asked questions regarding the explicit underlying principles of this topic. The interviewees explained that TU/e has a strong focus on gaining experience abroad. According to the panel, the university has not been able to provide sufficient arguments as to which explicit principles it applies to internationalisation and advises to further develop its internationalisation policy.

The quality assurance system and the quality culture are noticeably present. TU/e has a detailed communication structure and sufficient quality assurance instruments to realise the vision and the associated ambitions. The panel notes that TU/e focuses a lot on qualitative monitoring in the form of interviews. According to the panel, this method offers the advantage of enabling the organisation to have a more substantial discussion about quality improvement. TU/e has a strong quality assurance system and monitors developments thoroughly, although some indicators lack a clear objective. The panel therefore recommends specifying what the TU/e aims to achieve.

Based on the findings and considerations, the panel comes to the conclusion that the TU/e has a widely supported educational vision and an associated policy targeted at the internal quality assurance of its education.

C. Judgement

In the opinion of the panel, Eindhoven University of Technology meets standard 1, Philosophy and policy.

4.2 Standard 2: Implementation

Standard 2: The institution realises its educational philosophy in an effective manner, which is demonstrated by appropriate policy actions and processes, particularly relating to staff, student assessment, services and facilities, and students with a functional impairment.

Explanation: The philosophy has been appropriately translated into concrete policy actions and processes. The institution has processes in place for the design, recognition, and quality assurance of its programmes in keeping with the European Standards and Guidelines, and demonstrates the effectiveness and application of such processes by means of a track record. Students and staff co-own the policy and contribute to its realisation on the basis of the shared philosophy. This commitment demonstrates how the institution realises its intended quality culture.

Implementation is consistent with the philosophy: staff, student assessment, and services and facilities further the accessibility and practicability of the education provided.

A. Findings

The educational vision of TU/e has been reflected in policy, the realisation of which takes place both at central and decentral level. With the TU/e Strategy 2030 as a foundation, each year the study programmes draft their own annual plans in which they outline how to meet the basic principles of the educational vision. The (graduate) programme directors and the Deans BC and GS are responsible for the implementation of institution-wide policies. Proposed new institutional policies are generated together with students, teachers, the professional field and employee participation and are generally tried out on a programme level through the use of experiments or pilots. Those are then evaluated and modified when required, and are shared as best practices between departments during various official and unofficial meetings. TU/e has also set up an annual 'call for innovation', where departments get the opportunity to apply for a grant for innovative educational projects which are in line with Strategy 2030. Current policy-related actions and processes relate to improving the Bachelor College and Graduate School, diversity, assessment, educational facilities, and human resources.

Improving the Bachelor College

One of the most significant steps taken by TU/e is the reform of the bachelor's and graduate's programmes in a BC and GS structure. Within the BC, each bachelor's programme consists of four elements: major courses, generic courses, User Society Enterprise courses (USE) and elective courses. Students follow courses with the same amount of ECs (5 EC per course). Students are assigned a mentor during the bachelor's programme who, amongst other things, assists students in their course selection process. As a result, students feel more ownership of their learning process. TU/e specifies in its self-evaluation report that its proposed goals of upping the number of students, reducing drop-out rates, increasing study success, and implementing institution-wide courses such as USE courses and electives, have been accomplished more than expected.

Following an extensive evaluation by an external consultancy agency, TU/e is working on improving the Bachelor College by implementing the proposed recommendations. Boosting the BC consists of balancing out the growing number of students, improving the consistency of the curriculum's four elements,⁸ and promoting small-scale education. In order to cope with growth, the institution focuses on differentiating its education by improving its infrastructure and the equipment in classrooms, and by

⁸ The four elements of the curriculum are the major courses, generic courses, User Society Enterprise courses (USE) and elective courses.

introducing the streaming of lectures to allow students to 'be present' without having to physically attend the lectures. Improving the coherence of the curriculum focuses on streamlining the four elements of the curriculum by adjusting the USE learning lines and the generic courses. Stimulating small-scale education includes restructuring courses in a way that students get the opportunity to work on real world engineering challenges which they could face in the future.

Students have stated in TU/e's self-evaluation report that their programmes do not connect adequately with the professional field. Therefore, during the visit, the panel enquired about students' experience regarding this topic. The panel found out from master students (who have also done the bachelor programme at TU/e) that TU/e mostly focuses on the connection between their programmes and the professional field during the master programme and less during the bachelor programme. The panel learned on the other hand that TU/e organises a large number of career activities via the student associations. These activities are supported and financed by TU/e although, according to the Executive Board and teachers, students do not often realise that the career activities organised by the student associations, receive (financial) support from TU/e. An example of a career activity is the career day that was initiated by the University Council and organised by the student associations. The career day allows students an early insight into their future career opportunities, and gives students the chance to visit different companies. The career day was held in 2019 and will be a recurring yearly event.

Improving the Graduate School

Implementing the Graduate School took place in 2015, three years after the implementation of the BC. This allowed the first lot of graduate bachelor students to receive education in a similar type of structure as they got during the BC. The GS has modified and aligned the different master and doctorate programmes. The TU/e has recently appointed a community manager to strengthen the GS community. The GS includes a skills lab, where master students can work on their professional and personal skills.

Various projects have been initiated within the GS since it was launched. One of those projects involves the launch of the My Future platform, which enables master students to better familiarise themselves with current employment opportunities. Another project is the realisation of the International Experience programme aimed at promoting students studying abroad. The rising number of students for the BC are also reflected in the GS, including the increase of diversity amongst the student population in terms of gender, ambitions, goals, needs and wishes. Whilst TU/e's student population has become more diverse, the percentage of international students has remained stable at 20%. The GS aims to increase this number to 35% and create an international classroom which will contain a mix of national and international students and teachers. The evaluation of the GS structure including all its experiments and projects is planned for 2020.

Diversity policy

During the in-depth visit, the panel has had the opportunity to assess TU/e's diversity procedures which are aimed at enhancing diversity, inclusiveness and gender equality within TU/e. In order to achieve this TU/e has appointed a Chief Diversity Officer who has the authority to develop a diversity plan including related actions where the officer sees fit. The Diversity Committee is tasked with submitting proposals to the Executive Board which will increase diversity and gender equality within the organisation. An example is the newly introduced rule to prioritise female candidates for faculty roles in an effort to balance the gender mix amongst academic staff. At the time of the panel's visit, students, support and teaching staff clarified to the panel that the organisation is developing a general diversity policy, which is to be introduced at the end of 2019. This general policy has to unify all the different rules and regulations that exist now into one overall document.

One of the diversity policies of the TU/e is the Honours Academy. The Honours Academy offers ambitious and motivated Bachelor students, who obtained 60 EC in their first year, the opportunity to gain new personal and professional skills in a 30 EC programme on top of their regular bachelor programme. A quarter of the students who qualify for the Honours Academy choose to apply. Students

who are admitted to one of the so-called excellence tracks of the Honours Academy work in multidisciplinary teams to tackle challenges in the field of energy, health and smart mobility. The Honours Academy has proven itself to be a breeding ground for innovation by introducing concepts such as the Innovation Space and Challenge-Based Learning (CBL, standard 4).

TU/e's language policy and the international classroom policy are two other policies that were set up to meet TU/e's objective to train 'Engineers for the future'. These policies address the increasing demand from the professional field for engineers who are prepared for the international labour market in academia or industry. TU/e's language policy was adopted in 2018 and outlines that, as of January 2020, English is the official working language throughout the whole organisation. This means that everything, including all formal reports, will be in English. The international classroom policy incorporates international and multicultural collaboration, language skills, and strives to encourage students to gain international (working) experience.

Prior to the in-depth visit, the panel noticed that there is a significant difference between the anticipated and actual percentage of students with an experience abroad. During the visit, the panel enquired about this difference and found that students do not always view going abroad as a necessity, partially because of the excellent internship opportunities in the Netherlands. In the Netherlands, interns are often paid and also have a reasonable chance that they will get offered a permanent position after a successful internship. Future architects have an even more significant reason not to study (a semester) abroad. They need Dutch working experience to obtain their registration as an architect and going abroad will only result in study delays.

TU/e has requested the 'Expertise Center Handicap & Study' to do a scan honing in on studying with a disability. The scan has resulted in new targets⁹ to improve TU/e's policy on studying with a disability. The idea is to formulate a plan to improve in these areas before the end of 2019. The TU/e also intends to sign the UN's declaration of intent on the Rights of Persons with Disabilities.

Assessment policy

The TU/e assessment policy is centrally organised, including test matrices the formats of which are the same for each course. Tests are used as a tool to stimulate learning, for example, by using mid-term tests. These are intended to motivate students, offer immediate feedback on where students stand in terms of knowledge on the course material and enable students to better prepare for the final exam. During the vertical trail, the panel got an insight into TU/e's assessment policy for the Electrical Engineering and Architecture, Urbanism and Building Sciences programmes and found that the execution knows subtle differences. The Architecture, Urbanism and Building Sciences programme for example has installed a dedicated testing committee while the Electrical Engineering programme uses an ad hoc committee to check the assessment forms and test matrices.

Educational and student facilities policy

TU/e has adopted several policies regarding its educational support and its facilities. In 2017, educational support for teachers and students changed from being organised at the departmental level, to having unified educational support services at the departmental and institutional levels by means of chains. Each department has been appointed an ESA manager who is responsible for his or her own department as well as for one or more of the thirteen chains¹⁰. The aim is to improve the quality of

⁹ These targets are: information, physical accessibility, guidance, expertise, learning routes, assessment and examination, internship and work, and assurances for quality and continuity.

¹⁰ 1. student guidance and coaching, 2. educational rules and regulations, 3. international admissions, 4. international student experience, 5. education/examinations, fraud and planning, 6. educational planning and scheduling, 7. study progress, 8. teacher support, 9. quality assurance, 10. Employability, 11. inflow and outflow of students, 12. language skills, 13. educational policy

educational support for students, departments, and university management, and to improve cooperation between the departmental and institutional levels.

The growing number of students combined with providing small-scale education offers a number of challenges, such as ensuring the number of classrooms to offer workgroups, or the number of study areas which, according to the students with whom the panel spoke, are scarce around the examination periods. TU/e has created several scenarios involving varying student numbers, resulting in the decision not to grow beyond a maximum of 15,000 students. With this number, according to the Executive Board, TU/e can guarantee quality and maintain its small-scale education. In addition to setting a maximum, TU/e has drawn up a 'Campus 2030 policy' to tackle the growth challenges. In Campus 2030, the institution outlines that the campus, in 2030, will consist of modern study facilities, sufficient study areas, and an Innovation Space (standard 4). During the tour, the panel saw examples of these facilities in the recently renovated library and the Innovation Space.

TU/e's IT policy also aims to provide solutions for the problems experienced by the growing number of students. To guarantee small-scale education, TU/e invests in improving educational logistics and the digital learning environment. This has led to acquiring a new Student Information System (SIS) and a new Learning Management System (LMS). The purpose of these systems is to improve the services provided to both students and teachers and to improve the quality of education. In addition, an important step has been taken in digitising students' learning process which includes digital testing, learning analytics and automated feedback. ESA supports the implementation of these ICT applications.

Human resources policy

The human resources policies are targeted to encourage teaching staff to shape and achieve their career goals. One of these policies is 'Excellent People Attract Excellent People: The Next Generation' which includes development tracks for assistant professors who want to become an associate professor. Another policy involves motivating the professional development of TU/e's teaching staff on pedagogic skills, via the University Teaching Qualification (UTQ) which is mandatory for new staff, and, on a more advanced level than the UTQ, the Advanced University Teaching and Innovation Qualification (AUTIQ). Faculty staff has also been offered the opportunity to participate in Utrecht University's Learning Trajectory in Educational Leadership.

B. Considerations

The panel is of the opinion that the educational vision of TU/e is adequately being realised through the institution's goals. TU/e has established clear indicators and steers its policy accordingly. The BC/GS structure and the chain approach of ESA have played a fundamental role in the current success of the university. Student numbers have increased significantly and feasibility has improved. TU/e consists of a tightly knit network in which the BC/GS structure, the annual plans, meeting schedules and short lines of communication ensure unity between the faculties. The faculties, together with deans and the Executive Board, make well-thought-out decisions when it comes to managing the organisation. TU/e does not hesitate to take decisive action in response to findings from the task forces that provide thorough research into specific educational matters. TU/e succeeds in setting up effective policies and joining them together. Because the views of the Executive Board and the faculties largely align, the process of policy making and implementation runs smoothly.

During the vertical and horizontal trails, both staff and students showed clear commitment to the creation and implementation of policies. They spoke very enthusiastically about their involvement which they attribute to the small-scale education and short lines of communication. The panel observed that the degree of autonomy available to departments means that there are differences in the way in which departments implement the educational vision and the pace at which they do so. Therefore, the panel appreciates the fact that programmes and departments are constantly seeking the connection with each other and the professional field in order to achieve the ambitions as described in TU/e's Strategy 2030.

During the site visits, the panel talked a lot about study success. Prior to the implementation of the BC, only a small percentage of students obtained their bachelor's degree in three years. The panel found that the TU/e has taken several steps to improve study success. TU/e offers students a wide range of opportunities for the development of their personal and professional ambitions and/or their international aspirations. Together with the institution, the panel determines that some of the students still do not graduate within three years, but that TU/e is currently creating the right conditions to enable nominal graduation. The coaching of students, for example, is good. Students are effectively supported by well-trained supervisors. TU/e offers students tailor-made education and assists them in their choice process. When a student struggles with something, the problem is resolved with a student counsellor.

The panel is very impressed by the student participation and the many activities organised by the student associations. However, the panel also finds that there is a lot of dependency on the study associations and wonders how much TU/e should outsource to the associations. The panel asks to pay careful attention not to delegate too many tasks to the study associations.

The panel finds that within the area of diversity, many projects are bottom-up initiatives that are being set up and implemented. The students and staff with whom the panel spoke stressed that there is a clear need for these projects. Following the increasing need among students and staff for a diversity policy, the panel appreciates that TU/e is developing a centralised policy around this topic. The panel considers the suggestion of students to talk about well-being instead of diversity, to be a nice nuance, since, according to the panel, well-being has a more inclusive character than diversity.

Based on the discussions, the panel found that TU/e is taking care of supporting students with the excellence tracks from the Honours Academy. Students are coached by teachers who have had extra training to assist students using the CBL method. The diversity policy where special attention is paid to gender equality is also reflected in the decision to attract more women, which according to the panel, is a very clear and daring policy. The panel also finds that the facilities for students with disabilities are properly arranged and that students are quickly referred to the right people.

During the vertical trail, the panel learned about the centralised testing policy that departments can define themselves. The panel saw examples of the implementation of centralised and decentralised policies and notes that the implementation of policies at both levels works well.

The study facilities that the panel saw during the campus tour are in good shape. Students can use study areas and laboratories with state-of-the-art equipment. During the site visits there was a lot of discussion about the possible problems regarding the growing number of students. The panel notes that TU/e recognises the problems and tries to find solutions for both the short and long term, such as setting a maximum number of students, implementing a system for booking rooms, adjusting timetables, electronic testing, and live streaming. The panel appreciates the steps that are taken to stabilise growth in order to maintain its small-scale education and improve the feasibility of TU/e programmes.

The panel appreciates the institution's extensive support and recognition of teachers within TU/e, and the many actions taken by TU/e in relation to its human resources policies, such as reducing the workload by introducing TA's, and increasing teachers' didactic skills through UTQs and AUTIQs.

The panel's conclusion is that the educational vision has been adequately translated into specific policies, for which both staff and students feel responsible and contribute to their realisation.

C. Judgement

In the opinion of the panel, the Eindhoven University of Technology meets standard 2, Implementation.

4.3 Standard 3: Evaluation and monitoring

Standard 3: The institution systematically evaluates whether the intended policy objectives relating to educational quality are achieved. Relevant stakeholders are involved in this process.

Explanation: The institution organises effective feedback that supports the realisation of its policy. To that end, it initiates appropriate evaluation and measurement activities that are stably embedded in the institution. These tools provide insightful information that can be used for the formulation of desired quality development. The tools comprise a transparent method for identifying and reporting risks, taking action where needed, with a focus on improvement. Reflection on the output forms part of the organisational model, and provides sufficient insight into the effectiveness of the policy implementation in all tiers of the organisation and staff participation.

Since the measurement and evaluation activities revolve around effectiveness, they do not need to be uniform across the entire institution. Students, staff, alumni and experts from the professional field are actively involved in the evaluations. The institution publishes accurate, up-to-date and accessible information regarding the evaluation results.

A. Findings

TU/e has an extensive system for evaluating and monitoring objectives and the quality of education. The institution measures the effectiveness of the implementation of policies and then reflects on this by using the quality cycle, management reports and regular consultations at various levels within the organisation. The quality cycle is in line with Strategy 2030, the institutional framework on quality assurance, the quality assurance plans at a departmental and programme level and the annual plans. Within the parameters of Strategy 2030 and the institutional framework, programmes outline their own strategic direction in the quality assurance plans and the annual plans. The department deans receive the annual plans of the individual programmes.

The quality cycle consists of two circles at different levels of aggregation; an institutional level and a programme and departmental level. Within these cycles, TU/e integrates the assurance of educational quality with business operations that provide direction and input to improve policies and processes.

Deans and (graduate) programme directors share core responsibilities for the quality of education and meet regularly in the Programme Director Council and the Graduate School Consultative Meeting to discuss issues relevant to quality development. At the level of educational support services, the director and managers of the central ESA service meet with the managers of the ESA department teams in the MESA meeting. Major institutional quality issues and risks are discussed in TU/e's Education Board, consisting of both Deans and the ESA director.

Monitoring and evaluating educational policies is done on the basis of a range of different instruments which departments and teachers are free to choose from. In order to monitor the extent to which TU/e achieves its objectives, TU/e uses both qualitative and quantitative data. Data are collected from management information, internal and external audits and surveys under students, staff, alumni and the professional field. The three major information systems used to conduct surveys are Evasys, the Business Intelligence tool, and the Kwazo-SharePoint¹¹. Evasys is a system for formal course and curriculum evaluation. The Business Intelligence tool (BI tool) generates data on a number of indicators to measure the impact of activities. The Kwazo-SharePoint gathers information for employees involved in quality management.

Each programme drafts an annual plan that entails the details of which courses will be reviewed. For each individual course, students are asked for their opinions via surveys and other types of feedback.

¹¹ Kwazo stands for Kwaliteitszorg, Dutch for Quality Assurance

The survey support system Evasys is used to conduct these surveys at the end of a course. The standard policy is to assess all new courses and courses given by new teachers. Existing courses are assessed at least once every three years. The results of the different surveys are shared with the individual programme directors or, in case of institution-wide courses, with the Dean. The results are then analysed and discussed with teachers and students. Based on the outcome of the analyses, teachers draft improvement plans with the help of colleagues and the programme director. Simple improvements take place on a short-cycle basis. More complex changes are submitted to the programme committee and Department Council and included in the annual plans of the programme.

In order to enable quick adjustments to be made if necessary, various of the panel's discussion partners talked about initiatives to monitor the quality of education. Examples that were given are asking students for their opinions during the course through monitoring groups and lecture follow-up groups. Monitoring groups consist of 'student programme commissioners', who meet and discuss the results of the student surveys every quarter. The results then go to the department deans and the Deans BC and GS. Lecture follow-up groups are organised by the study associations, consisting of five students who give their feedback on the lectures after just 3 weeks.

Other examples to monitor the quality of education, were given by the representatives of the Electrical Engineering programme. The programme specified during the panel discussions that they use so-called 'year councils'. In these councils students and teachers of the programme can discuss educational matters. Another initiative within the Electrical Engineering programme was initiated by the students themselves and involves the use of Trello. Trello is a digital bulletin board that allows students to post comments relating to courses which enables teachers to quickly identify problems.

Each programme notifies its students differently regarding changes that have been made based on gathered survey results. Many programmes announce recent changes during lectures by telling the students and via lecture sheets. Other ways to communicate changes include email and course manuals.

During the in-depth location visit, the panel asked questions about the low student response rate for course evaluations. Interviews with students revealed that they often report problems related to a course in other ways, such as via the lecture follow-up groups, the year council or Trello. Students indicate also that surveys take up too much time to complete, and that students mainly use the surveys when there are major problems with the course or when a course is particularly good. The Executive Board informed the panel that the institution will take actions to improve the system of collecting feedback.

In addition to course evaluations, programmes and departments have instruments that measure the quality of education at a programme level, including curriculum surveys, professional skills audits, study progress analyses, transition surveys, first year BSc surveys and drop-out surveys.

At the departmental level, TU/e uses the BI tool, the National Student Survey (NSE), the National Alumni Survey (NAE) and the TU/e Alumni Monitor. Departments review their strategy and progress twice per year with the Executive Board using the BI tool with regard to the objectives set in the annual plans. The BI tool provides an overview of performance indicators and is leading for both the Executive Board and the departments in keeping track of results and finances. The BI tool is used to monitor, in particular, the intake, diversity of incoming students, study progress, teacher-student ratio and the international experience of master's students.

At the institute level, the university utilises policy research, workload analyses and the evaluation of the educational support services. Policy research is carried out by (external) experts to evaluate specific education policies. Examples are the large-scale TU/e Bachelor College evaluation in 2015 and the intended TU/e Graduate School evaluation in 2020. Results of this type of evaluation are thoroughly discussed with internal stakeholders and are used by the responsible dean to draft plans for

improvement and further development. Workload analyses have been conducted using the Risk Inventory and Evaluation survey since 2015. And since 2018, the TU also conducts in-depth workload analyses.

B. Considerations

The panel reviewed TU/e's quality systems and quality culture and finds that these are in line with the educational vision. The institution works in accordance with the institutional framework on quality assurance and the subsequent quality assurance plans in which faculty and support staff, and the Deans BC and GS use the quality cycle to check whether targets are being met. The quality cycle provides direction and input for monitoring policies and processes and improving them where necessary. To monitor and evaluate educational policies, various internal and external evaluation and assessment instruments are systematically used at various levels, with adequate involvement of students, teachers, and the professional field. TU/e monitors the actions it takes, such as the implementation of the BC and GS structure, and the Numerus Fixus, and adjusts those actions where necessary.

The panel found clear indications that TU/e is acting adequately with respect to evaluation results. The BI tool is considered to be a valuable instrument for recording and processing information. Students clarify that improvements are being implemented while the course is still running. The programmes the panel has spoken to have taken various improvement measures in response to the NVAO accreditation and the institution has also acted on the findings of the latest institutional quality assurance audit.

The panel looked at the governance structure of the organisation. TU/e uses a matrix structure which is complex, but seems to work well. The panel was also positively surprised by the way in which TU/e involves relevant stakeholders in evaluating the quality of programmes. Employees, students and external parties are very engaged and appreciate the short lines of communication between employees and management, students and teachers, industry professionals and programmes. According to students, changes are quickly and adequately implemented and communicated. The panel agrees with the institution that the short lines of communication contribute to achieving its goals and maintain the organisation's small-scale education.

The panel appreciates the fact that TU/e is not talking in terms of risks but of solutions. These solutions usually consist of actions tested using scenarios which are calculated and analysed. The panel talks about a solution-oriented organisation that not only looks at quantitative data, but focuses also on gathering qualitative data by frequently interviewing its stakeholders.

The panel comes to the conclusion that TU/e has a solid quality assurance system that measures and evaluates in various ways, implements changes effectively and facilitates the realisation of policies.

C. Judgement

In the opinion of the panel, Eindhoven University of Technology meets standard 3, Evaluation and monitoring.

4.4 Standard 4: Development

Standard 4: The institution has a focus on development and works systematically on the improvement of its education.

Explanation: Feedback and reflection on output constitute the basis for measures targeted at reinforcing, improving, or adjusting policy or its implementation. Following up on measures for improvement is embedded in the organisational structure. The development policy pursued by the institution encourages all the parties concerned to contribute to innovation and quality improvement. Internal and external stakeholders have been informed regarding the developments that are primed on

the basis of the evaluation outcomes. The institution pursues continuous improvement, adapts to the (changing) circumstances, and conforms to the expectations of students and employers.

A. Findings

In Strategy 2030, TU/e pictures a transformation from teaching to learning, thereby striving to create a diverse and flexible learning environment. After graduating, students will be prepared to not only combine deep disciplinary knowledge with systems thinking but also have the ability to communicate and cooperate with a variety of other disciplines. Students will also acquire a clear understanding of the professional identity they want to develop and know how they can obtain knowledge and skills to tackle future challenges and problems.

The Deans BC and GS are responsible to align Strategy 2030 with the programmes and the experiments being conducted. Programme development and improvement is a core responsibility of (graduate) programme directors. Programmes and their Examination Committees produce Annual Reports in which they reflect on possible additional improvements. Experiments are constantly being evaluated. The results of curriculum evaluations and surveys are discussed and converted into actions for improvement. These results are published in six-monthly reports and experiments are discussed as a result of those reports. The JPC also plays a vital role in this process because current pilots and best practices are reviewed within the Joint Programme Committee.

According to the interviewees, the campus culture can be classified as a collaborative culture with good relations between staff and students. The implementation of the BC and GS has helped to create a more collective and inclusive community. Since the GS includes a wider variety of graduate programmes, such as master programmes and doctorates, the TU/e has accelerated the aligning of the graduate programmes by appointing a GS community manager. The BC and GS community adds to departments by sharing courses and methods with each other. Staff members have underlined the vital role that ESA plays in harmonising the BC and GS structure, since it is being set up both centrally as well as decentrally.

USE

One of the recurring topics during the site visits was the implementation of the USE (User Society and Enterprise) learning lines¹² in 2011. Students and the Joint Programme Committee reflected on the USE learning lines in the self-evaluation, mentioning that 'some of the USE courses are less appreciated by students'. In addition, the Executive Board also reflected on the USE learning lines, identifying these courses as one of TU/e's challenges since 2012.

USE was a key part of the original educational philosophy of the BC. When USE was introduced, the goal was to implement the learning lines within a year's time. It turned out, however, that students were struggling to embrace USE since the USE courses deal with more social and ethical issues, which are generally less easy subjects for technical people. From the moment that USE was introduced it has been slightly altered each year to better accommodate TU/e's engineering students.

The results of the USE learning lines evaluations are improving year after year. By interviewing both junior and senior students the panel noticed a distinct difference in students' USE experiences. Senior students specified to understand the importance of USE, but said that the subjects are often too far from their programme. The students like the idea of USE, but feel the execution requires close attention. First and second year students seem more satisfied with how the USE learning lines are set up now. However, these students do stress that they were not aware of the content of most USE learning lines and that they missed proper assistance while selecting USE learning lines.

¹² A USE learning line consists of three coherent USE courses

Reflecting on the implementation of USE, the Executive Board and (teaching) staff explained that USE was implemented too quickly without adequately consulting teachers during the development process. As a result of this lack of consultation, teachers showed little support for USE. According to the interviewees, TU/e has learned from the difficult implementation process. As a result of the BC evaluation in 2015 that recommended to adjust the USE learning lines, the institution is currently involving the departments more closely by letting each department create at least one USE learning line. For the academic year 2019-2020, five new USE learning lines have been developed by the departments and launched at the same time. TU/e is also looking at a possible revision of the USE courses. A task force and a support group have been set up to realise this revision.

Challenge-Based Learning (CBL)

Another recurring topic during the site visits was one of TU/e's core objectives to incorporate CBL in its education. The CBL concept was introduced by the Honours Academy, where students and teachers were working with the concept in the Innovation Space. The Innovation Space is a centre of expertise that allows students and researchers to work together on creating innovative, science-based solutions to real world challenges with industry professionals, academia, and society as a whole. TU/e considers CBL as a best practice and is stimulating programmes to implement CBL. Until 2024 programmes have the opportunity to introduce CBL projects to experiment with this new type of learning method. CBL differentiates itself from methods such as Design-Based Learning (DBL) and Problem-Based Learning (PBL), in the sense that CBL includes open-ended, project-driven challenges, whereas DBL and PBL have set answers to certain well-defined problems.

Representatives of the professional working field, with whom the panel spoke, like the idea of CBL because students are encouraged to come up with solutions for problems that even their teachers don't have solutions for. A CBL course starts with a company that presents a challenge that the company is facing. Students have the opportunity to come up with a very wide range of different ideas which challenge them to learn by doing. After coming with one or multiple possible solutions, the students provide the company with a report which outlines their ideas. The institution assesses the CBL process and passes on the professional evaluation to the company in question. Students with whom the panel spoke stress that they are very excited about working with CBL.

B. Considerations

According to the panel, TU/e's quality system is characterised as a very improvement-oriented system, with a strong and open quality culture. The panel observes that the institution keeps control of its processes in a very informal way and refers to an engineering sort of mentality, a 'no-nonsense mentality'. The panel has taken note of the many improvements and innovations that have been introduced in recent years. The large number of projects set up within TU/e made it difficult for the panel to grasp each project. During the in-depth visit though, the panel was able to observe where the responsibilities lie for the many projects.

TU/e's improvements and innovations are prompted by the large-scale educational reform towards the BC/GS structure, the more stringent objectives laid down in TU/e Strategy 2030, and the introduction of the quality cycle. The appointment of a community manager to strengthen the GS community within TU/e is a unique and positive move in the eyes of the panel.

During the site visits, the panel met with dedicated staff and students who spoke with excitement about the possibilities offered by TU/e to develop ideas by means of experiments. Staff and students indicated that they are motivated to constantly improve and do not hesitate to try out new things. The panel notes that the many developments within the institution are well supported. Changes are often implemented through short-cycle improvements. Larger improvements are included in improvement plans where the responsibility lies with the programme director. Because of the BC and GS structure, staff can easily share their experiences during the experimental phase.

During the orientation visit a lot of things were said about the USE learning lines. When introducing USE in 2011, the institution's goal was to implement USE in one year. However, it has taken almost ten years to properly implement USE. Now that USE falls under the responsibility of the faculties, the panel sees improvements of students' appreciation regarding the learning lines. Following the comments of the students with whom the panel spoke the panel advises improving communications regarding the content of the USE learning lines and the options students have.

In a response to the panel's observations regarding the slow implementation process, the Executive Board stated that they have learned from USE. The institution now allows itself more time and wishes to experiment for four years with new initiatives before implementing an initiative at full scale. The panel has become acquainted with CBL and likes the notion if it, but recommends to closely assess the didactic side of CBL.

In conclusion, the panel believes that TU/e is working in a development-oriented and systematic way to improve its education.

C. Judgement

In the opinion of the panel, Eindhoven University of Technology meets standard 4, Development.

4.5 Final conclusion

TU/e's mission is to offer personal and small-scale education in science and technology. Students, staff and external stakeholders have worked intensively together on the development of the educational vision. As a result, there is extensive support for the vision. The panel has noticed a multitude of changes that have been embedded in the institution in recent years. One of these changes is the implementation of the BC and GS structure, a structural change that was partly prompted by the decline in student numbers and the below average student success. The large-scale educational reform has resulted in an opposing trend, comprising exponential growth in student numbers and increased study success.

Strategy 2030 is leading in the educational policy. Policy initiatives often come from the bottom up. Faculties and study programmes are given the freedom to tailor experiments to their own preferences within the frameworks set out in Strategy 2030. Tightly-knit communication structures appear to be experienced as an informal organisation. TU/e carries out systematic evaluations and assessments. The different organisational levels have quality cycles with varying lead times. The programmes, ESA and the Executive Board, systematically report on relevant policy developments and evaluation results.

The annual plans and evaluations steer the improvement of education and the quality assurance system. Because of the institution's small scale and personal approach, staff and students are actively involved in the development of education and ensuring quality.

In the opinion of the panel, the final conclusion of the institutional audit of Eindhoven University of Technology is positive.

5 Recommendations

Based on its audit findings, the panel recommends that TU/e implement the following improvements:

- The panel observed that TU/e has a clear vision on education, although the vision does not identify which students TU/e wants to attract. Specifying and describing the typical TU/e student can contribute to study performance and success. Therefore, the panel recommends to further strengthen the vision on education, by including a clear description of the typical TU/e student.
- The panel found that in some areas, such as the topic of internationalisation, policies were less detailed. According to the panel, the university has not been able to provide sufficient arguments as to which explicit principles it applies to internationalisation and advises to further develop its internationalisation policy.
- The panel observed that TU/e has a detailed communication structure and sufficient quantitative and qualitative quality assurance instruments to realise the vision and the associated ambitions. The panel did note, however, that some indicators lack a clear objective. The panel therefore recommends specifying what TU/e aims to achieve.

Overview of the advice

The table below reflects the panel judgement regarding each standard as presented in chapter 4.

| Standard | Judgement |
|---------------------------|--------------------|
| Vision and policy | Meets the standard |
| Implementation | Meets the standard |
| Evaluation and monitoring | Meets the standard |
| Development | Meets the standard |
| Final conclusion | Positive |

Appendix 1: Accreditation portrait

Het accreditatieportret geeft een overzicht van alle NVAO besluiten over de afgelopen zes jaar, waarvan het definitief besluit is verstuurd voor 1 juni 2019. Daarmee wordt de periode 2013 tot het moment van het opmaken van dit accreditatieportret in beeld gebracht.

De besluiten worden chronologisch gepresenteerd. Omdat besluiten en niet de opleidingen de ingang vormen, kunnen opleidingen twee maal voorkomen. Bijvoorbeeld bij toekenning herstelperiode en vaststelling realisatie herstel.

Aangezien de Technische Universiteit Eindhoven op 6 mei 2014 de Instellingstoets kwaliteitszorg met een positief resultaat heeft doorlopen is het NVAO beoordelingskader voor de beperkte opleidingsbeoordeling en beperkte toets nieuwe opleiding van toepassing.

In het overzicht is in combinatie met het accreditatiebesluit ook het eindoordeel opgenomen. Het eindoordeel bij bestaande opleidingen kan zijn: Onvoldoende, Voldoende, Goed of Excellent. In geval van tekortkomingen die binnen maximaal twee jaar hersteld kunnen worden, kan de NVAO een herstelperiode toekennen. Onder opmerkingen wordt gemarkeerd of het een besluit betreft na herstel. In die gevallen wordt na de herstelperiode vastgesteld of het herstel is gerealiseerd en wordt indien van toepassing een positief accreditatiebesluit afgegeven. Voor de toets nieuwe opleiding luidt het eindoordeel: Positief, Positief onder voorwaarden of Negatief. In geval de NVAO voorwaarden oplegt, worden na maximaal twee jaar beoordeeld of de voorwaarden vervuld zijn. Onder opmerkingen wordt gemarkeerd of het een besluit betreft na voorwaarden.

In de periode 2013 tot mei 2019 heeft de Technische Universiteit Eindhoven 39 aanvragen ingediend, waarvan 38 accreditatieaanvragen.

Er werd 1 aanvraag voor een Toets Nieuwe Opleiding (joint degree met Tilburg University) ingediend waarbij de TU/e penvoerder was.

Bij één TNO aanvraag (eveneens een joint degree met Tilburg) was Tilburg University penvoerder. Die aanvraag is niet in de telling en wél in het overzicht opgenomen.

Voor één opleiding is in de gerapporteerde periode geen besluit genomen. Dat betreft de master Science and Technology of Nuclear Fusion. Deze opleiding heeft na een positieve Toets Nieuwe Opleiding in 2012 inmiddels verlenging voor de heraccreditatie gehad.

Bijlage 1 Tabel Overzicht eindoordelen per procedure

Bijlage 2 Tabel Besluiten chronologisch

Bijlage 1 Tabel overzicht eindoordelen

| | |
|-----------------|---|
| Naam instelling | Technische Universiteit Eindhoven |
|-----------------|---|

| Som van Aantal | | Jaar besluit | | | | | | Eindtotaal |
|----------------------------------|---------------------------|-----------------|------|------|------|------|-----------------|------------|
| Soort dossier | Eindoordeel en besluit | 2013 | 2014 | 2016 | 2017 | 2018 | 2019 | |
| Accreditatie NL | Goed | 3 | 1 | | 1 | | 1 | 6 |
| | Herstelperiode | | | | 1 | | | 1 |
| | Voldoende | 9 | 9 | | 6 | 2 | | 26 |
| | Positief ¹³ | | | | | | 5 ¹⁴ | 5 |
| Totaal Accreditatie NL | | 12 | 10 | | 8 | 2 | 6 | 38 |
| Toets Nieuwe Opleiding NL | Positief | | | 1 | | | | 1 |
| Totaal Toets Nieuwe Opleiding NL | | | | 1 | | | | |
| Eindtotaal | | 12 | 10 | 1 | 8 | 2 | 6 | 39 |

¹³ Kader 2018 'Beoordelingskader accreditatiestelsel Hoger Onderwijs Nederland'

¹⁴ Waarvan één positief besluit na herstel

Bijlage 2 Tabel Chronologisch overzicht besluiten

| Jaar besluit | Naam opleiding CROHO | Accreditatie | | Bijzondere procedures |
|--------------|---|--------------|------------------------|-----------------------|
| | | ISAT | Eindoordeel en besluit | |
| 2013 | B Biomedische Technologie | 56226 | Voldoende | |
| | B Bouwkunde | 56951 | Voldoende | |
| | B Scheikundige Technologie | 60437 | Goed | |
| | B Werktuigbouwkunde | 56966 | Voldoende | |
| | M Architecture, Building and Planning | 60434 | Voldoende | |
| | M Biomedical Engineering | 66226 | Voldoende | |
| | M Chemical Engineering | 60437 | Goed | |
| | M Construction Management and Engineering | 60337 | Voldoende | |
| | M Mechanical Engineering | 60439 | Goed | |
| | M Medical Engineering | 60344 | Voldoende | |
| 2014 | M Science Education and Communication | 68404 | Voldoende | |
| | M Systems and Control | 60359 | Voldoende | |
| | B Industrial Design | 50441 | Voldoende | |
| | B Technische Informatica | 56964 | Goed | |
| | B Technische Natuurkunde | 56962 | Voldoende | |
| | B Technische Wiskunde | 56965 | Voldoende | |
| | M Applied Physics | 60436 | Voldoende | |
| | M Automotive Technology | 60428 | Voldoende | |
| | M Business Information Systems | 60432 | Voldoende | |
| | M Computer Science and Engineering | 60438 | Voldoende | |
| 2017 | M Industrial and Applied Mathematics | 60347 | Voldoende | |
| | M Industrial Design | 60441 | Voldoende | |
| | B Electrical Engineering | 56953 | Voldoende | |
| | B Technische Bedrijfskunde | 56994 | Herstelperiode | |
| | B Technische Innovatiewetenschappen | 56265 | Voldoende | |
| | M Electrical Engineering | 60353 | Voldoende | |
| | M Human-technology Interaction | 60431 | Voldoende | |
| | M Innovation Management | 60430 | Voldoende | |
| | M Innovation Sciences | 66265 | Voldoende | |
| | M Operations Management and Logistics | 66430 | Goed | |
| 2018 | M Embedded Systems | 60331 | Voldoende | |
| | M Sustainable Energy Technology | 60443 | Voldoende | |
| 2019 | M Systems and Control | 60359 | Goed | |
| | M Construction Management & Engineering | 60337 | Positief | |
| | B Biomedische Technologie | 56226 | Positief | |
| | M Medical Engineering | 60344 | Positief | |

| Jaar besluit | Naam opleiding CROHO | ISAT | Eindoordeel en besluit | Bijzondere procedures |
|-------------------|----------------------------|-------|------------------------|-----------------------|
| 2019 | M Biomedical Engineering | 66226 | Positief | |
| | B Technische Bedrijfskunde | 56994 | Positief | Na Herstel |
| Eindtotaal | | | | |

Toets nieuwe opleiding

| Jaar besluit | Naam opleiding CROHO | ISAT | Eindoordeel en besluit | Bijzondere procedures |
|-------------------|--|-------|------------------------|-----------------------|
| 2016 | B Data Science (joint degree met Tilburg) | 55018 | Positief | |
| 2016 | M Data Science and Entrepreneurship (joint degree met Tilburg) | 65018 | Voorwaarden | |
| 2017 | M Data Science and Entrepreneurship (joint degree met Tilburg) | 65018 | | Na voorwaarden |
| | | | Positief | |
| Eindtotaal | | | | |

Appendix 2: Composition of the panel

- Ramses Wessel, chair, Professor International and European Law and Governance and Codirector of the Centre for European Studies, University of Twente. Former Dean and Vice-rector, University of Twente.
- Miriam Luizink, member, director Roessingh Research & Development (RRD), previous director Strategic Business Development, University of Twente
- Wim van Petegem, member, professor KU Leuven, Professor and Policy Coordinator Learning Technologies, Faculty of Engineering Technology, KU Leuven
- Nico de Rooij, member, professor Emeritus of Microengineering of EPFL and previous Vice-President of CSEM SA and Head of the Sensors, Actuators and Microsystems Laboratory (SAMLAB)
- Diana van Wanrooij, student-member, student master programs: International and European Law en Law and Technology, Tilburg University.
- Yvet Blom, secretary
- Frank Wamelink, NVAO process coordinator

All panel members have filled in and signed a declaration of independence.

Appendix 3: Schedules of the site visits

Orientation visit

Day 1 – Thursday 10 October 2019

09.00 – 12.00 Preparatory meeting panel

12.00 – 13.00 Session 1 – Meet and greet between panel members and TU/e staff and students

13.15 – 14.00 Session 2 – Meeting with the Executive Board

Meeting with the Executive Board, secretary of the Executive Board, and Deans Bachelor College and Graduate School

14.15 – 15.15 Session 3 – Standard 1: Philosophy and policy

Meeting with representatives of various levels of the university: the Dean Bachelor College, department deans, programme directors, service director, teaching staff, students, co-determination, TU/e fellow

15.30 – 16.30 Session 4 – Supervisory Board

Meeting with the chair and one member

16.45 – 17.45 Session 5 – Standard 2: Implementation

Meeting with representatives of various levels of the university: the Dean Graduate School, department dean, programme directors, service directors, teaching staff, student

Day 2 – Friday 11 October 2019

09.00 – 10.00 Preparatory meeting panel

10.00 – 11.00 Session 6 – Standard 3: Evaluation and monitoring

Meeting with representatives of various levels of the university: department deans, programme directors, service management, teaching and support staff, students, policy advisor, alumni

11.15 – 12.15 Session 7 – Standard 4: Development

Meeting with representatives of various levels of the university: department dean, programme director, scientific and support staff, students, professional field

12.15 – 13.15 Session 8 – Lunch with students

9 students of various programmes about Diversity

13.30 – 14.30 Internal panel meeting

14.30 – 15.00 Session 9 – Extra meeting with the Executive Board

15.00 – 16.30 Internal panel meeting

16.30 – 17.00 Session 10 – Feedback panel on the orientation visit

In-depth visit

Day 1 – Monday 25 November 2019

Audit trail: Past Performance

09.00 – 10.00 Preparatory meeting panel

10.00 – 10.25 Session 1: Presentation of TU/e's Quality Assurance policy

Meeting with the Deans Bachelor College and Graduate School

10.30-11.15 Session 2 – Bachelor and Master Architecture, Urbanism and Building Sciences

Meeting with management and teaching staff

11.30 – 12.15 Session 3 – Bachelor and Master Architecture, Urbanism and Building Sciences Meeting with students

12.30 – 13.00 Session 4 – Bachelor and Master Architecture, Urbanism and Building Sciences

Meeting with exam committee programme committee, evaluation committee, curriculum committee

13.00 – 13.45 Lunch and panel meeting

13.45-14.30 Session 5 – Bachelor and Master Electrical Engineering
Meeting with management and teaching staff
14.45 – 15.30 Session 6 – Bachelor and Master Electrical Engineering
Meeting with students
15.45 – 16.30 Session 7 – Bachelor and Master Electrical Engineering
Meeting with exam committee programme committee, evaluation committee, curriculum committee
16.45- 17.15 Session 8 – Debrief on Quality Assurance
Meeting with department deans and the person responsible for Quality Assurance chain
17.15 – 18.45 Internal panel meeting

Day 2 – Tuesday 26 November 2019

Audit trail: Growth and small scale

09.00 – 10.00 Preparatory meeting panel
10.00 – 10.45 Session 9 – Mathematics and Computer Science, Mechanical Engineering, Industrial Engineering & Innovation Sciences, and Applied Physics
Meeting with students
11.00 – 11.45 Session 10 – Mathematics and Computer Science, Mechanical Engineering, Industrial Engineering & Innovation Sciences, and Applied Physics
Meeting with management, teaching staff and ESA managers
12.00 – 12.45 Session 11 – Bachelor College and Graduate School *Deans and department deans*
12.45 – 14.00 Lunch and panel meeting

Audit trail – Diversity

14.00 – 16.00 Session 12: Biomedical Engineering, Chemical Engineering & Chemistry, Industrial Design
Campus tour by the community officer TU/e and a student
14.15-14.45 Meeting with international students, teaching staff and the person responsible for the international experience chain
14.50-15.20 Meeting with honours students and teaching staff
15.30-16.00 Speed dating with students about sports, culture, Compass (LGBTQ+) and Studying +
16.00 – 16.45 Session 13 – Biomedical Engineering, Chemical Engineering & Chemistry, Industrial Design
Meeting with the Dean Graduate School, the department deans and the community manager
17.00 – 18.00 Internal panel meeting

Day 3 – Wednesday 27 November 2019

16.30 – 16.45 Feedback panel on the institutional audit

Appendix 4: Overview of the documents perused

Prior to the assessment, the following documents have been provided to the panel:

SELF-EVALUATION INSTITUTIONAL AUDIT QUALITY ASSURANCE 2019

Including:

- Appendix A. - Reflection on previous NVAO institutional audit
- Appendix B. - Decision-making, co-determination and consultation structure
- Appendix C. - Core competences of Eindhoven graduates
- Appendix D. - Positive Advice University Council on the Self Evaluation ITK

The following documents have been used for the management review and were available for inspection:

- TU/e Strategie 2030
- TU/e vision on education 2013
- Educational Vision for 2030: Concept Onderwijsvisie 2019 (concept)
- Erratum op de zelfstudie

During the site visits the following platforms have been available for the panel

- BI-tool en de share-point site kwaliteitszorg

On request:

- Beleidsnotitie Studeren + (concept) oktober 2019
- Implementatieplan 2020-2025 Studeren +
- Stand van zaken Studeren+, 10 oktober 2019

The following documents have been provided for the audit trails:

Both from the programmes Electrical Engineering and Built Environment

- Annual reports programme
- Annual reports Examination Board
- Some recent examples of the minutes of the Programme Committee

Minutes of the meetings in 2018 and 2019 between Dean Bachelor College and Dean Graduate School with (graduate) programme directors.

Confidential minutes of bi-annual meetings between Executive board and Departments Electrical Engineering and Built Environment

Factsheet Diversity

Factsheet Growth and Small Scale Education

Appendix 5: List of abbreviations

| | |
|---------|--|
| AUTIQ | Advanced University Teaching and Innovation Qualification |
| BI-tool | Business Intelligence tool |
| Ba | bachelor's degree |
| BC | Bachelor College |
| BSc | Bachelor of Science |
| CBL | Challenge-Based Learning |
| ESA | Education and Student Affairs |
| EC | European Credit point |
| GS | Graduate School |
| JPC | Joint Programme Committee |
| LMS | Learning Management System |
| MSc | Master of Science |
| NAE | National Alumni Survey |
| NSE | National Student Survey |
| NVAO | Accreditation Organisation of the Netherlands and Flanders |
| PDCA | Plan, Do, Check, Act |
| PDEng | Professional Doctorate in Engineering |
| PhD | Doctor of Philosophy |
| SIS | Student Information System |
| TU/e | Eindhoven University of Technology |
| USE | User, Society and Enterprise |
| UTQ | University Teaching Qualification |

