

TU/e INSTITUTIONAL PLAN 2020-2025

LEADING THE CHANGE

TU/e

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UNIVERSITY OF
TECHNOLOGY

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CONTENTS

06	<i>Preface</i>
08	1 TU/e profile
12	2 Strategy 2030 - Drivers of change
16	3 A joint effort
18	4 Strategic Priorities 2025: Leading the Change
26	5 Talent
27	5.1 Education
32	5.2 Research
36	6 Cooperation
37	6.1 Reputation
38	6.2 Regional cooperation
40	6.3 National cooperation
41	6.4 International cooperation
42	6.5 Impact
44	7 Resilience
45	7.1 Good facilities
45	7.2 Professional processes
48	8 Implementation, reporting and monitoring

Preface

In the academic year '17/'18, our university went on expedition to explore its desired profile, roles and responsibilities for the year 2030. What developments will drive changes in society and industry in the coming decade? What kind of students will apply for education at TU/e? What will our student population look like? Which research focus will we have?

During ample discussions with departments, services, employees, students and partners, we identified a number of economic, social, societal, technological, and educational 'drivers of change'. In the light of changing learners' needs, convergence of disciplines and accelerating innovation, we need to adapt to new demands from students, staff and industrial and societal stakeholders.

We believe that universities should not stand by but lead the change when it comes to three major challenges we identified: sustainability, the technological revolution and the increasing impact of technology. These require universities to be responsive toward multiple topics: student learning needs; industry needs for new knowledge and talent that enable new solutions; regional needs to act as innovation hubs with global impact, and the need of society to benefit from a technological revolution to enhance the welfare of its people.

While formulating our thoughts on how to translate the resulting '[Strategy 2030 - Drivers of Change](#)' into an implementation plan, covid-19 hit the world.

This worldwide crisis required us to re-examine and prioritize our goals for 2020 and the next couple of years; it has forced us to speed up certain developments like digitization; and has urged us to think about where we need to temporize the ambitions of Strategy 2030.

This Institutional Plan 2020-2025 describes our implementation agenda for the first five years of our new strategy, with the side note that we consider it to be a rolling agenda. After all, to this day it remains uncertain in what way the covid-19 pandemic and its aftermath will fundamentally alter our personal lives, our society, and the role universities play in providing education, conducting research, and translating the latter into meaningful innovations together with industry. For the coming years, we aim to proactively translate these developments into new practices in order to live up to our ambitions to lead the change and realize our Strategy 2030.

In 2021, TU/e is 65 years young. We want to celebrate this lustrum - one way or another - with all our students, employees and partners. Not only because we think you are the heart and soul of our university, but also because we strongly believe that, even in times of (periodic) social distancing, true progress can only be achieved in close collaboration with all of you. We warmly invite you to get involved: let's shape a better and brighter future together!

The Executive Board,
Robert-Jan Smits, president
Frank Baaijens, rector magnificus
Nicole Ummelen, vice-president

#1

TU/e profile

TU/e is a top-ranking Dutch university that educates students and advances knowledge in science & technology for the benefit of humanity. We aim to be an internationally defining academic institution that pushes the frontiers of science & technology. We educate engineers of the future who combine in-depth knowledge about technology with the skills to address challenges out in the world. We create responsible innovations and contributions to societal challenges in tight-knit collaborations with society and industry. And we have a strong and recognizable voice in the academic and public debate about technology and its merits.

■ Spirit of collaboration

TU/e is a young university, founded in 1956 by industry, local government and academia. Today, their spirit of collaboration is still at the heart of the university community. We foster an open culture where everyone feels free to exchange ideas and take initiatives.

■ Personal attention and room for talent

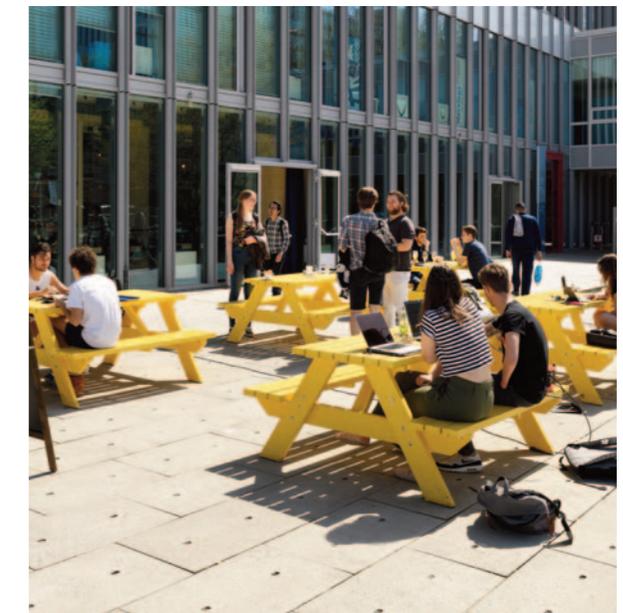
TU/e offers academic education that is driven by fundamental and applied research. Our educational philosophy is based on personal attention and room for individual ambitions and talents. Our research meets the highest international standards of quality. We push the limits of science, which puts us at the forefront of rapidly emerging areas of research.

■ Scientific curiosity with a hands-on mentality

TU/e combines scientific curiosity with a hands-on mentality. Fundamental knowledge enables us to design solutions for the highly complex problems of today and tomorrow. We understand things by making them and we make things by understanding them.

■ TU/e and Brainport: a thriving ecosystem

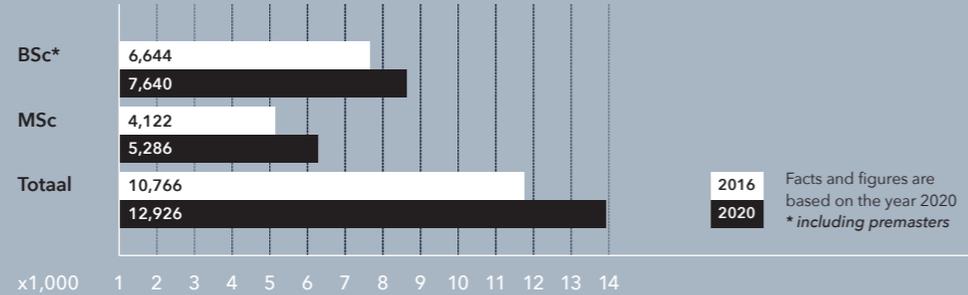
Our campus is in the center of one of the most powerful technology hubs in the world: Brainport Eindhoven. Globally, we stand out when it comes to collaboration with advanced industries. Together with other institutions, we form a thriving ecosystem with one common aim: to improve quality of life through sustainable innovations.



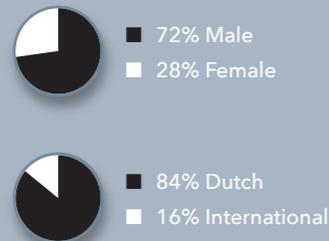
TU/e at a glance



Student growth



Engineers for the future



More than **95** NATIONALITIES

3,270 AWARDED DEGREES

BSc 1,484 / MSc 1,436
PDEng 106 / PhD 244

12,926 total number of STUDENTS

46,069 ALUMNI
84% Male, 16% Female

92% of the graduated students finds a **JOB** within 6 months (+54% compared to 2012)

Reference date education 1st October 2020. Alumni: 1st January 2021, unique persons

#2

Strategy 2030 Drivers of change

Three major societal challenges and five drivers of change underly our Strategy 2030:

Challenges

■ the strive for a sustainable world.

Our world faces major societal challenges, which are addressed by the 2015 UN Sustainable Development Goals (SDG's). The SDG's are a key guideline for TU/e. Special attention is paid to global warming, which is taking place at an alarming rate. It poses an unprecedented threat to our world and urgently calls for sustainable solutions. TU/e is committed to this via its education, research and operations.

■ the technology revolution.

Technology is becoming more complex and interdisciplinary, erasing the borders between the physical, digital and biological worlds. Technological developments in emerging disciplines are increasing the speed of innovation and the rate at which society and economy are changing.

■ the increasing impact of technology on society.

In the future, technology will not only be around us, but also inside us. Engineers will be able to 'engineer' nature with unprecedented accuracy. With this increasing impact comes increasing responsibility.

Drivers of change

■ Engineers of the future need to approach technology development not only from the perspective of technology, but also that of users and systems.

■ The 2030 generation of students will be more diverse in age and background. As a result, these students will have very diverse learning styles, ambitions and educational needs.

■ The world of research has changed, from monodisciplinary, individual pursuits to a reality in which public-private consortia cooperate in large international research programs with a focus on complex societal problems.

■ The interaction between research, education, industry and society will intensify further, and new ways of cooperation will be established.

■ The fourth industrial revolution is expected to amplify the trend from linear to accelerated and concurrent innovation. Industry is increasingly looking to universities to explore the frontiers of knowledge, while private R&D professionals mostly look for application opportunities.

These challenges, trends and developments call for universities to take the lead in educating future generations of students; realizing new breakthroughs in basic science; creating solutions together with industry; and contributing to societal challenges. We will take up this task by transforming our education, research, impact and organization as follows:

Research-based learning

In our research-based education, we will transform from teaching to learning, with Challenge-based Learning projects and a strong on-campus character. To serve diverse learners, we will enable our students to pursue their individual interests and ambitions, while providing rigorous academic engineering education.

Future frontier research

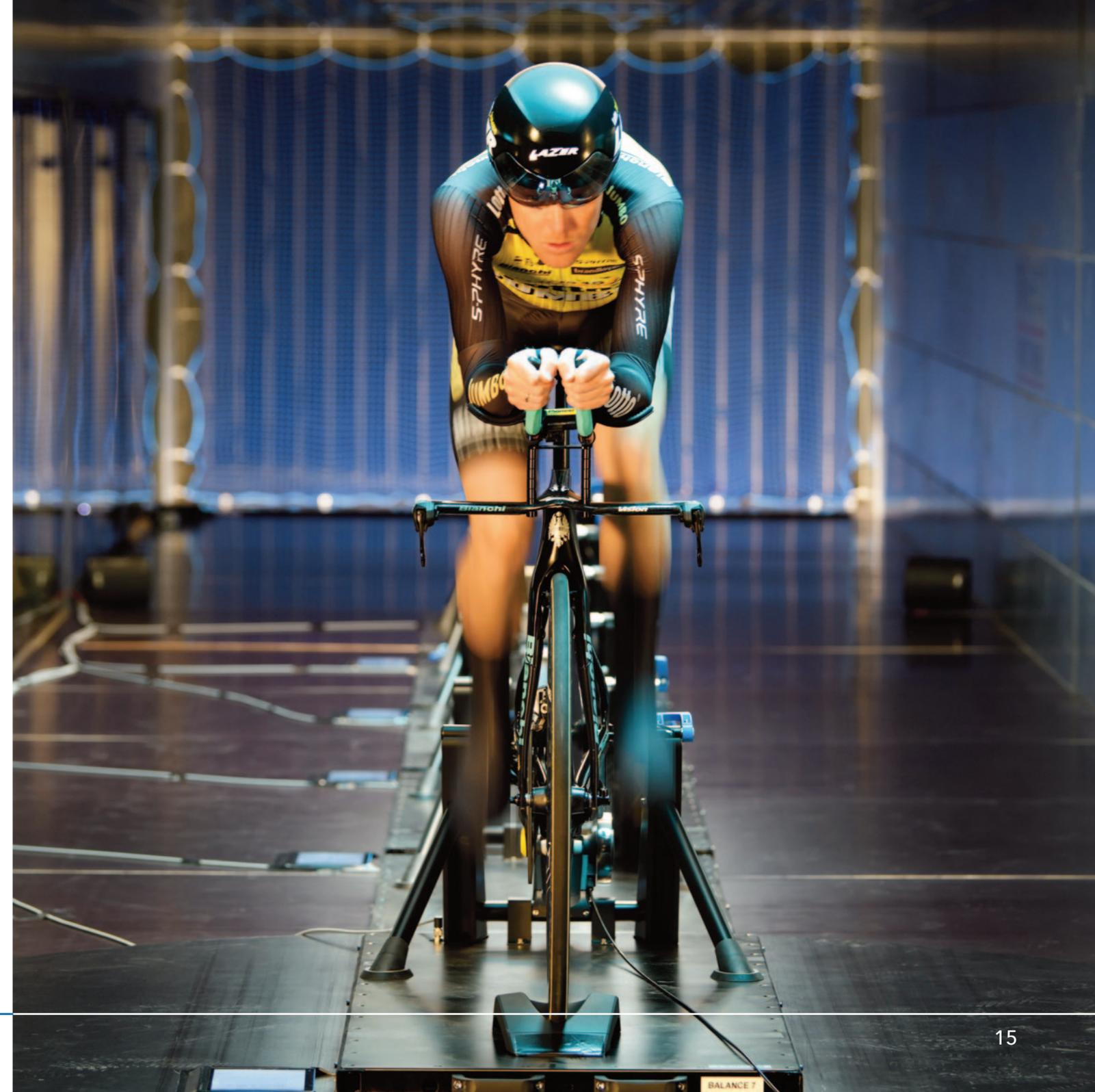
In the coming decade, we will strengthen our foundations in basic research, invest in individual research talent and develop leadership in the cross-disciplinary research institutes i.e. the Institute for Complex Molecular Systems (ICMS), the Eindhoven Artificial Intelligence Systems Institute (EAISI), and the Eindhoven Institute for Renewable Energy Systems (EIRES).

Impact

We will further our collaboration with industry and society. With the launch of the Gate in 2021 we extend our support for the development of new businesses. The Gate is the platform for tech startups in the Brainport region in the first stage of their existence. To accelerate innovation, we have established the Eindhoven Engine: a new type of public-private partnership where interdisciplinary teams of people from multiple organizations work together in specific projects to bridge the gap between scientific findings and commercial development.

A connected university

To increase both our scientific and societal impact, we will connect with partners and focus on select academic, industrial and triple-helix partnerships in the Brainport region, at national and international level. Key to every aspect of this vision are the people that together create TU/e, its community and its outstanding achievements. TU Eindhoven is a human-centered employer, providing opportunities for talent - in both scientific and professional staff - for personal development and to engage the challenges of tomorrow together.



#3

A joint effort

The Institutional Plan 2020-2025 serves as the implementation of Strategy 2030 towards 2025. It is an inspiring, enthusing and framing document for the entire TU/e. Its implementation aims to ensure a lively, transparent and cohesive process. In addition, each department, service and individual is invited to consider how our mission, vision and strategic goals can be translated into actions within their own practice. The strategic cycle enables a 'rolling agenda', in which we can continuously improve and update the direction and speed of our strategy implementation.

We will evaluate at least on an annual basis whether the ambitions are realistic in view of our workload, budget and relevant external developments. Given the pace of global developments, this evaluation will include trend watching and scenario planning.

In our expedition towards Strategy 2030, we travelled together with our staff, students, external experts, and everyone otherwise involved with our university. Since people always have been and always will be the heart and soul of TU/e, we invite everyone to actively take part in shaping our education, our research, our impact and our organization toward 2030.



#4 Strategic Priorities 2025: Leading the Change

Strategic priorities 2025



The TU/e Strategy 2030 sets out a wide range of measures to ensure implementation in the coming years. Since we cannot do everything at once, in 2019 a prioritization was made based on the most urgent topics with the most needed impact: Talent, Cooperation and Resilience. This Institutional Plan 2020-2025 provides clarity about these strategic priorities towards 2025 and how we want to achieve the related strategic goals and objectives.

■ **Talent** is what makes or breaks our university. We need the very best professors, researchers and students. And we need to enable them to develop their talent in education, research and in their capacity to realize cooperation and innovations.

■ **Cooperation** is at our core. TU/e is a frontrunner in the global rankings for co-publishing and cooperating with industry and is by far the biggest supplier of engineers to the Brainport region: around 80% of all 4TU engineers that are educated in the Netherlands and find their first job in the Brainport region, are graduates from our university. We want to strengthen this important role TU/e has even further, with the ambition to be an international university, firmly rooted in the region.

■ **Resilience** is key to being capable of dealing with changes. To enable our ambitions with respect to education, research, valorization and cooperation, changes in organization and services are required. Especially because we see a growth in students and staff, a high workload, and a need for further professionalization of the administrative and support processes.

This chapter lists the goals and objectives we want to achieve up till 2025. Subsequent chapters describe how we intend to do that.

TALENT

LONG TERM GOALS (2025)



MAIN OBJECTIVES



In our research-based education students will be fully engaged in active learning, in particular via Challenge-based programs with a strong on-campus presence.



- Implement Challenge-based learning addressing real-life challenges
- Our graduates are engineers of the future, T- or n-shaped engineers
- Accommodate diverse learners both in (regional) background and learning styles
- Develop a life-long learning ambition of our graduates and develop life-long learning programs in collaboration with our ecosystem
- Provide our students with rigorous academic engineering education, with sufficient flexibility to choose their personal learning path
- Increase both the quality and capacity of our education programs

Scientists will be recognized and rewarded for their talents in different areas: education, research, impact, and leadership.



- Enable diversified and dynamic career paths for academic staff (room for talent)
- Introduce an appraisal for team performance
- Recognize and reward excellence in Education, Research, Impact and Leadership
- Develop leadership at all levels, from young academic to established investigators

We will have a diverse, international workforce, with a special focus on improving the gender balance in science.



- Establish an internationally attractive diverse and inclusive academic culture
- Recruit female scientists via the Irène Curie Fellowship program

We will have strengthened our foundations in science, invested in individual research talent and developed leadership in cross-disciplinary research.



- Strengthen the disciplinary foundations
- Stimulate cross-disciplinary research by establishing four institutes
- Increase our leading role and participation in large-scale NL-consortia for research and innovation
- Work with 4TU.Federation to strengthen science & engineering in the Netherlands

TU/e research infrastructure will improve as a stimulating research environment that enables TU/e researchers and attracts researchers from different countries, regions and disciplines.



- Establish high-quality and internationally visible shared infrastructures for research, education and impact, enabling cross-disciplinary research, strengthening research-based education and connecting to partners on- and off TU/e Campus

We value Open Science. As a societal organization, TU/e will have a strong focus on generating and disseminating knowledge.



- Develop an Open Science agenda

COOPERATION

LONG TERM GOALS (2025)



MAIN OBJECTIVES



We will have strengthened our reputation and visibility as an excellent education and research university at both European and global level.



- Create effective tools to assess and monitor our reputation
- Modernize our website and increase our reach by increasing our social media presence
- Develop branding guidelines and ensure they are used by the entire TU/e staff
- Professionalize our internal communication
- Strengthen our external and internal relations by implementing relationship management
- Communicate our societal relevance and highlight our success stories to the outside world
- Develop rankings management to ensure that we arrive at a fitting position on the key lists
- Intensify communications alignment with Brainport for all our key messages
- Develop a robust alumni strategy

We will have strengthened our cooperation with key partners in the region.



- Contribute to the implementation of the multi-annual Agenda of the Brainport Foundation, in the areas of technology, innovation and human capital
- Increase our long term strategic cooperation with industry and knowledge institutes through 'flagship projects' and the Eindhoven Engine
- Intensify our cooperation with Fontys, Summa and Avans to ensure that each student has access to the right study and can cooperate across institutes
- Further develop, together with TiU, the City of Den Bosch and Province, the Jheronimus Academy for Data Science in terms of data-driven entrepreneurial education and research as well as business incubator and accelerator activities

We will have significantly increased the cooperation with strategic partners in the Utrecht - Wageningen - Eindhoven alliance, and with other NL universities notably in the context of 4TU.



- Intensify the UU-UMCU-TU/e-WUR alliance, in the areas of life sciences, artificial intelligence, education, innovation and societal challenges

As an internationally recognized excellent university, we will have increased our cooperation at European and global level with top partners from science and industry and we will be actively participating in major (funding) initiatives and programs.



- Strengthen EuroTech as a main vehicle for cross-border European cooperation on the basis of a roadmap with the development of a EuroTeQ Engineer program as a key deliverable
- Increase the participation of TU/e in European Research & Innovation policy development and programs, notably Horizon Europe and EUREKA
- Extend global university-industry relationships, similar to the Brainbridge program with Zhejiang University, to at least 2 other continents
- Develop a TU/e framework for internationalization with clear rules of engagement and IPR provisions
- Strengthen our cooperation with industry (notably Brainport region) and as such reassure our number one position in global rankings

We will have increased our impact on our region and on society as a whole, through our researchers, graduates and research results.



- Strengthen a culture of entrepreneurship inside our university
- Increase the involvement of industry and the business community in ensuring a high quality of our education

RESILIENCE

LONG TERM GOALS (2025)



MAIN OBJECTIVES



The TU/e Campus will be a vibrant, attractive hotspot for students, scientists, entrepreneurs, researchers and companies where people feel safe, welcomed and inspired.



- Realize the objectives for the period 2020-2025 of the plan "Campus 2030 real estate strategy". Real estate fits the demands. Square meters are effectively used at responsible costs
- Campus TU/e is a vibrant attractive hotspot for students, scientists, entrepreneurs, researchers and companies
- In each real estate initiative sustainability is covered. Implementation depends on individual decision making in each initiative

Our digital facilities will be secure, state of the art and innovative. Digitization makes it possible to realize high ambitions for education and research.



- Chain processes are supported by best practice business applications
- The innovative learning environment supports Challenge-based learning and individual learning paths and is enhanced with integrated AR/VR tooling and continuously improved through predictive learning analytics
- TU/e is leading in research data management

We will have a seamless support for our primary processes and empower our professional staff



- We organize seamless, efficient and effective support for our primary processes
- We establish a culture of collaboration across professionals in user-centred service chains
- We have an accessible, engaged, and competent professional staff empowered to solve multidisciplinary issues.

Our service departments will deliver their services from within a quality culture of continuous improvement and customer oriented approach.



- All services rate at least 8 on a 10 point scale
- We create a quality culture
- We are continuously improving our services

Our leadership will reflect our DNA and is capable of leading the change towards 2030. We will have strengthened true partnership between scientific and professional staff in which expertise and added value is acknowledged as a prerequisite to realize our mission.



- We have developed TU/e leaders, who are characterized by enabling an agile and future-proof network organization to achieve strategy 2030

We will have established a safe and open academic culture for all students and employees compliant with rigorous ethical standards that minimizes the risk of all forms of harassment.



- We have a strong culture of dialogue
- We have improved the system for signaling and handling of complaints

#5

Talent

5.1 Education

The engineers we educate are not only excellent engineers, but also strong communicators, who understand that users and society are to be taken into account when designing solutions and developing products. Our students are wanted, not only in the Brainport region, but also globally. Young alumni, driven by challenges, find their way into companies, or create their own. They are the next generation, wholeheartedly motivated to work on large societal transitions and problems, and educated to play the part.

By 2025, we expect the following to be characteristic elements of education at TU/e:

- Challenge-based learning at the center of TU/e education
- rigorous knowledge in an agile system
- diverse learners
- diverse and personalized learning paths
- interrelatedness of research and education
- students develop professional identity & sustainable employability
- cooperation with our ecosystem: learning in the innovation hub

Towards education 2030: consolidate and innovate

TU/e Bachelor College and Graduate School are instrumental in our ambition to educate engineers for the future, who get the opportunity to shape a career path that matches their profile, personality and drive. The Bachelor College and the Graduate School provide the system in which students can develop rigorous knowledge, and in which research and education are closely intertwined. In Bachelor College and Graduate School, the characteristic elements of education at TU/e are realized. In 2020, we have undertaken a re-evaluation of the Bachelor College and Graduate School in light of our new strategy and vision for 2030. Based on this evaluation, we will implement improvements to the Bachelor College and Graduate School model, especially to further develop innovative and relatively young educational components such as the USE learning lines and basic courses.



In order to educate engineers for the future, serve diverse learners, enabling personalized learning, and transform from teaching to active learning, TU/e will explore the merits and demerits of Challenge-based Learning. Within the context of the Bachelor College and Graduate School, this educational model helps students also to acquire skills that prepare them for future careers. TU/e started a Challenge-based Learning program to study and implement this concept. The core elements of Challenge-based Learning are:

- focus on relevant real-life open-ended challenges, which can be mono- and multi-disciplinary
- active learning
- students can acquire knowledge “just-in-time”
- involvement of science, industry and the societal context
- multidisciplinary CBL helps students to learn to work in a team
- reflection on the learning process and development of students

Although these elements are used to characterize Challenge-based Learning, TU/e looks for the best way to shape this within the university. Therefore, a Task Force is installed that provides, before the end of 2024, a well-founded advice on the TU/e-wide application of the Challenge-based Learning concept. Furthermore, TU/e Innovation Space plays a central role in the development and wider implementation of challenge-based learning at TU/e, by developing frameworks based on

empirical evidence from best practices and means for achieving teacher involvement and professionalization, and by implementing new insights and focusing on dissemination. In TU/e Innovation Space our students and staff work together with companies on challenges, they learn in the innovation hub.

Current day students are at the heart of the digital transformation we see in society. As the covid-19 crisis made clear, digital transformation offers opportunities for new forms of education. Many of our students and teachers are rapidly becoming expert users of online learning platforms. We aim to capitalize on this trend with our **BOOST!** (Be the Owner of your Own Study) program. This program focusses on educational innovations with ICT. Through this program, TU/e aims at more flexible and modular education, in which a diversity of students can choose their own learning path and in which cooperation between students and between companies and institutions is made possible.

Strategy 2030 emphasizes that in the coming years TU/e will focus on promoting and facilitating the internal use of ICT in education, such as blended learning, digital testing, online feedback and peer learning. Not only do our students expect such modern didactics, but easy accessible and online learning can also help TU/e to continue working on a small scale with growing numbers of students: the deployment of more various scalable techniques enables teachers to save time and to give personal attention to students. Digitization

of education can also be considered as one of the prerequisites for the further introduction of Challenge-based Learning. Online modules and other digital tools in combination with highly developed self-regulated learning skills give students the opportunity to ensure that knowledge is acquired just-in-time for application in challenges. The emergence of different learning paths makes use of learning analytics necessary to monitor and guide the personal development of students.

International, diverse and inclusive learning environment

TU/e is a university that embraces diversity of perspectives, students and staff. For education, this means that we strive for an international, diverse and inclusive learning environment, in which students can develop their personal learning paths.

In the coming years, we will continue to work on the development of inclusive education, including a number of new programs.

Cooperation with our ecosystem, and with our (inter)national partners requires that we pay attention to external open and online education, in order to share our knowledge with the world and, among other things, to facilitate lifelong learning. TU/e starts a lifelong learning program as a way to teach an ever greater diversity of learners. In this program we work, together with our industrial and societal partners, on continuous education for professionals TU/e needs an international classroom in order to become truly international as stated in the TU/e Strategy 2030. Therefore, in addition to engaging in international networks and partnerships, the international orientation of the TU/e ‘at home’ will be strengthened. This is done by attracting non-Dutch students and staff, creating an international and



diverse community and raising appreciation of the international dimension of present-day challenges. The long-term objective is to provide students with an appropriate profile for an international labor market and/or career and contribute to the high (local) demand for qualified engineers. The internationally oriented industry in our ecosystem requires people to collaborate in an international setting. And international cooperation and diversity in teams stimulates research excellence. An international community and classroom help to create the required context for education and research. The classroom of 2030 will therefore be a diverse and international classroom, resembling the make-up of the high-tech labor force. This diversity is an indispensable element of the quality of learning.

The sustainable employability for students' program aims to bring together and align the existing activities to enhance student employability in a program that is recognized as a coherent whole by students and staff. Where necessary, it aims to optimize elements such as coaching and professional skills and to develop elements that are not yet in place, such as a digital system that allows students and coaches to track the developments and activities undertaken to enhance employability.

Of all students in higher education, 30% have a functional impairment; and 11% of university students say they are actually hindered by a functional impairment during their studies. As the number of students at TU/e increases, so too does the number of those with a functional impairment.

TU/e is keen to help its students. As a starting point for its new Study+ policy, TU/e has decided to align itself with the UN convention, indicating its wish to be an inclusive institute of education. Project and implementation plans have been made that describe how TU/e seeks to make a positive contribution to accessible and inclusive education for all its students.

The TU/e campus is home to numerous student associations, from sports and culture to 'gezelligheids' and study associations. They create a vibrant student life with strong communities. Academic training takes more than acquiring and applying knowledge. Academic graduates must also be able to reflect on their performance, learn from past experiences, have a critical attitude and act with care. Strong communities of peers are of vital importance to enable this academic education. These communities can only flourish on a lively campus, with active student associations that are valued, stimulated and facilitated by the university. TU/e encourages participation in relevant extra-curricular activities and continues to invest in them by making resources available. The resources are intended to support associations, teams and initiatives that match our mission, and stimulate talent development and training of an (international) community.



5.2 Research

Cross-disciplinary institutes

To focus our research activities, in our Strategy 2030 we have formulated six cross-disciplinary research themes which we collectively consider important for the future of our university. While developing these research themes, a number of synergy and collaboration opportunities emerged. These led us to focus our investments in a limited number of domains and to establish cross-disciplinary research institutes as platforms for collaboration in these domains. Three institutes have been established so far. The plans for a fourth institute are in the making.

■ Institute for Complex Molecular Systems

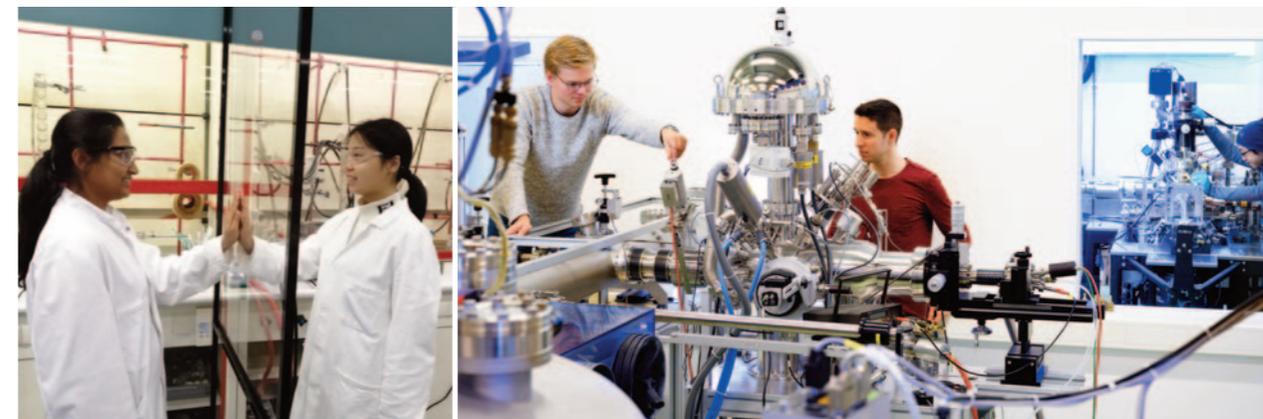
Since its inception in 2008, the Institute for Complex Molecular Systems ([ICMS](#)) has been a cross-disciplinary institute *avant la lettre*. Driven by the ambition to advance the fundamental understanding of complex molecular systems in materials science, energy, mobility, health, and life, this interdisciplinary TU/e institute for research and education in the area of molecular complexity addresses research challenges and pushes the boundaries of science by unifying basic principles of chemistry, biomedical sciences, engineering, physics and mathematics.

In particular, two major goals are pursued. First, the focus is on the design and synthesis of smart materials for the creation of molecular devices. Secondly, ICMS uses its expertise to unravel the molecular complexity of living systems and to develop biology into an engineering science. TU/e research in Complex Molecular Systems thrives thanks to alliances with industry and research institutions, both nationally and internationally. These provide meaningful input, enhance the research relevance and strengthen TU/e's efforts in mastering complexity.

■ Eindhoven AI Systems Institute

While exploring the three research themes Data driven Intelligent Systems, Complex High-Tech Systems, and Human Centered Systems & Environments, it became clear that in one way or the other, plans developed within these CRTs all gravitated towards Artificial Intelligence (AI). In 2019, TU/e therefore decided to join forces and make a big push for AI. This has materialized in the Eindhoven AI Systems Institute ([EAISI](#)). The scientific mission of this institute is to collect and analyze data, and to make real time decisions in safety-critical situations based on that data.

We will build on disciplinary strengths in data science, human-AI and High Tech Systems. The key application areas that we foresee are 'Intelligent Machines', 'Digital Health', and 'Mobility'. These applications really set us apart from other AI initiatives in the Netherlands and Europe and resonate well in our ecosystem. The current TU/e organizations Data Science Center Eindhoven,



High Tech Systems Center Eindhoven as well as the Strategic Area Smart Mobility will be embedded in EAISI.

EAISI seeks to connect a large number of existing and newly hired faculty across all departments. As much as possible of the AI related education will be scheduled in the institute's building as well.

■ Institute for Renewable Energy Systems

In the Eindhoven Institute for Renewable Energy Systems ([EIRES](#)), TU/e is consolidating its research on sustainable energy. EIRES will work on technology capable of converting and storing sustainably produced energy. The institute combines insights, expertise and knowledge from different disciplines, and from both fundamental and applied research, in research programs that focus on energy transformation themes.

The four focus areas are: Chemistry for sustainable energy systems; Engineering for sustainable energy systems; Systems integration; and Systems for sustainable heat.

NWO institute DIFFER, located on the TU/e campus, is an important research partner and contributes its expertise on solar fuels. TU/e and DIFFER established a shared research group and initiated the Center for Computation Energy Research (CCER). Furthermore, the current activities of the Strategic Area Energy will be incorporated in EIRES. In addition, there are close relations between the EIRES and research groups focusing on technologies and activities that enable energy conversion and storage processes, such as: data driven modelling, control and optimization of dynamic systems, electromechanics, power electronics and motion systems and grid connected converters. These groups can build the equipment used for electricity conversion and storage, and systems to transform electricity to any required voltage level, shape and frequency, or to control power flow and balance energy production and consumption.

Research infrastructure

At TU/e we have many top-notch facilities, resources and related services used by the scientific community to conduct top-level research in their respective fields. By 2030, TU/e research infrastructure will act even more as a stimulating research environment that enables TU/e researchers and attracts researchers from different countries, regions and disciplines. Our objective is to establish high-quality and internationally visible shared infrastructures for research, education and impact, enabling cross-disciplinary research, strengthening research-based education and connecting to partners on- and off TU/e Campus.

As a first step, a roadmap will be drafted to gain common understanding of the needs of TU/e's scientific community, and to guide and support choices in investments and grant applications. This roadmap has a focus on shared infrastructures and large-scale facilities that transcend the needs and budgets of one department, are at the forefront of scientific excellence, have a potential for national embedding, and contribute to the uniqueness of our university.

The main goals of this roadmap are:

- To make TU/e attractive to researchers, students, companies, and talent.
- To strengthen and benchmark TU/e's research position of scientific excellence through key enabling technologies.

- To embed research infrastructure within an excellent and transparent support structure.
- To provide access to multiple user bases.
- To maintain and strengthen our position, competitiveness and profile in the respective areas.

Recognition and rewards

Following the 2019 position paper 'Room for everyone's talent; towards a new balance in recognizing and valuing scientists', we have an ambition to modernize the system of recognition and rewards. We want to fully acknowledge individual talents and excellence of our academic staff, next to the contribution an individual makes to a team. We want more diversification of career paths, so that excellence in each of the core areas education, research, impact, and leadership is promoted, not necessarily all by one individual, but as a team of people with complementary expertise and skills. And we want to emphasize the quality of work, not just quantitative results. A dedicated taskforce has been formed, that considers the current assessment systems in place in departments as well as other assessment practices from outside the institution and the ongoing national debate in general. Each of the four core areas education, research, impact, and leadership is addressed separately to determine how to balance these four pillars to ensure a recruitment and promotions framework that removes the pressure to achieve the highest levels of team excellence in all four areas and

values individual contributions more broadly and fairly. With a group of junior, mid-career and senior scientists, plans are made to adjust our recognition and reward system, and in particular our mindset, to enable diversified career paths. A stakeholder analysis will be held in order to facilitate dialogue with academic staff from across the university and to test assessment methods and framework criteria in different departments.

To develop leadership at all levels of the organization, a representative group within TU/e has been interviewed to establish the current situation, values and mindset about leadership. The next step will be to draft an advice on the best way to develop the right leadership skills. A diversified set of leadership development programs will be developed and implemented for academics in different stages of their careers. This will include a set of HR instruments that enable leaders to express the necessary behavior and stimulate the same in their teams. Furthermore, enrollment into leadership programs will be promoted and facilitated for scientific staff members.

Diversity and Inclusion: A strong Focus on gender equality

Education and research are enriched by the presence of diversity in perspectives, and a diverse and inclusive working and learning environment ensures that our talent can be optimally utilized. In an inclusive organization,

everyone can participate fully and on an equal footing in the organization and decision-making process. In the TU/e community, openness and cooperation are central, and diversity, inclusiveness and equality are a prerequisite. We want to be among the leading universities in science & technology and make a valuable contribution to society. Society is diverse, and as science serves society it should also be diverse. In the TU/e community of students and staff, we therefore strive for diversity.

In July 2019 we announced to participate in the [Irene Curie Fellowship](#) program and only hire female scientific staff in order to restore our gender balance. Since the Committee Human Rights ruled that our measure was not proportionate, we are now adjusting our policy, while remaining committed to the cause of gender equality. In the upcoming years we will expand our policies in this field, develop an action plan, showcase examples and become a thought leader when it comes to restoring the gender balance, notably in technical universities.



#6

Cooperation

Our university is well known for its intense cooperation with industry, knowledge institutes and governments. Brainport's Triple Helix cooperation has become an example for regions across the globe. This proven way of cooperation drives our partnerships on local, national and international level and is the foundation of our university's societal impact and our reputation across the globe.

6.1 Reputation

In 2030 we not only want to be a top university, but we want the world to know us for it. TU/e aspires to join the leaders of change with regards to societal challenges. This is only possible if we are widely known, and stand for what we believe. Our new communication vision aims to bring our reputation up to speed with our identity while we join the universities that offer thought leadership to our society. We feel responsible for personal and meaningful contact through listening to our friends and partners. At all times we must be a learning organization following the language of our counterparts while treating others the way we want to be treated ourselves. In short, we will be accessible and our communication will be authentic.

We actively seek new audiences in our research communication, and in the upcoming years will enhance the outreach by our scientists. Through all available channels (social media, online campaigning) we strengthen our reputation as an internationally leading university, strongly embedded in the region. With employer branding we work on awareness, with student marketing we showcase the advantages of Challenge-based learning in the Brainport region where jobs are almost guaranteed. We focus on the connection with our alumni and friends through community building and building a reciprocal relationship based on "time, talent, treasure". Through that bond, alumni contribute to research, education and talent development." In the upcoming years we will further intensify these activities, to protect and further expand our reputation.



6.2 Regional cooperation

With a third of TU/e graduates finding their first workplace in the Brainport region, TU/e is a crucial engine behind innovation in this Dutch mainport. The region's need for highly skilled engineers is high and has been on the rise for many years. This not only underlines the success of the high tech ecosystem and the quality of our students, but also poses challenges on our education.

The Brainport region not only requires graduates, but also knowledge. TU/e's Strategy 2030 aims at narrowing the technology readiness gap between industry and academic research. The number of knowledge projects with industry and the number of part-time professors (28%) we employ from the Brainport region demonstrate that TU/e is the linking pin between both worlds.

This knowledge chain is challenged though. As a new multipolar world order is emerging we need to intensify cooperation with our partners in the Brainport region. Next to ongoing geopolitical and economic changes, covid-19 has proven global economic value chains to be vulnerable. Local coalitions and economic measures, meant to protect national economic and safety interests, are gaining momentum. Companies are forced to rethink their geopolitical dependencies and are taking measures to shorten their knowledge supply lines by emphasizing the development and retention of their own R&D over global R&D

ecosystems. The Brainport innovation ecosystem is very well equipped to confront these challenges thanks to its well-developed triple helix cooperation.

As a pivot in this innovation system, we will further team up with our Brainport partners to realize the ambitions as formulated in Brainport's multiannual agenda, issued during the summer of 2020. This agenda contains three main lines: further increasing the region's innovative power; ensuring that sufficient well-qualified talent is available; and improving the living and business climate in the region.

We will address the need for shortening global knowledge supply chains in combination with major societal challenges in sustainability, security, healthcare, nutrition and mobility. To do so we will establish strategic R&D roadmaps with industry and knowledge institutes in our region as a way forward to jointly develop new technology-

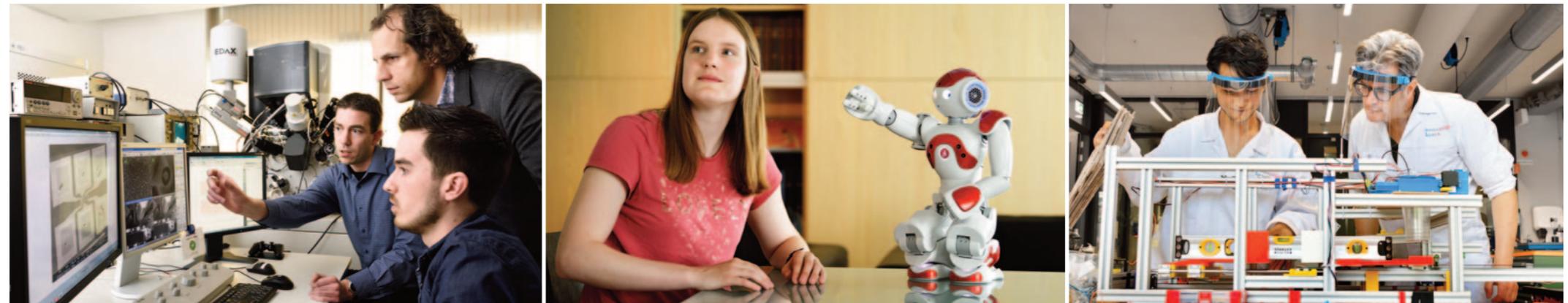
market combinations based on our world class competences in advanced manufacturing, system engineering, renewable energy systems, integrated photonics and artificial intelligence. This ambitious agenda requires new forms of cooperation and innovation.

Eindhoven Engine

We want to innovate innovation itself. Eindhoven Engine, located at our campus, will explore how to accelerate innovation in the Brainport region through Challenge-based research in a public-private research facility. Teams of our region's most talented researchers from industry, knowledge institutes and students cooperate in Eindhoven Engine research programs to deliver breakthrough technological solutions and bridge the gap between scientific findings and commercial development.

Eindhoven Engine is inspired by the successful TU/e student teams, which achieved bold ambitions in limited time and with limited budgets by working together across the boundaries of disciplines and organizations. An Engine project is of a different nature than a scientific project, since it combines engineering with systems thinking: new concepts, breakthrough technologies and taking user needs into account from the start. Such projects are always inspiring, promising, high-tech and relevant.

The Challenge-based research in the Eindhoven Engine mirrors the Challenge-based education in the TU/e Innovation Space, integrating ideas, knowledge and skills from all relevant industries and institutions in our ecosystem.



Cooperation with educational institutes in the region

For the period 2020-2025, we want to intensify our cooperation with the universities of applied sciences Avans, Fontys and SUMMA. The main aims of these collaborations are to:

- Realize the most adequate learning path for each individual student, by cooperating on recruitment campaigns and supporting near-seamless switches between educational programs.
- Flexibilize and innovate education, by acting as preferred partners for sharing best practices and expertise on educational innovations like life-long learning, digitization and implementation of 21st century skills.
- Improve connection of our education to changing demands of society and labor market.
- Develop joint added value for the region, the nation and the globe.

Jheronimus Academy for Data Science

For the Jheronimus Academy for Data Science (JADS), our joint initiative together with Tilburg University, we will develop a new strategy with an envisioned intake of 110 Msc students focusing on nature & agrifood, crime & safety, and social & digital entrepreneurship. Furthermore, we will establish a research program with about 20 PhD students, create a sound budget plan for the years 2020 till 2030 and will involve the City of Den Bosch to take responsibility for setting up the region's incubator activity.

6.3 National cooperation

For many years TU/e has cooperated successfully with our technology partners TU Delft, University of Twente and Wageningen University & Research (WUR) in the 4TU Federation, jointly creating the

fundament for technological solutions that our society needs to address challenges in many fields such as healthcare, mobility, food and energy. Together with Utrecht University (UU), Utrecht University Medical Center (UMCU) and Wageningen University & Research (WUR), we team up in a strategic alliance to directly engage important challenges in science and society. Together, we combine top-quality disciplines in humanities, social sciences, law, agri-food, life sciences, science and technology. With this combined expertise we create initiatives to have a world-wide impact in science, contribute with public and private partners to societal challenges, and provide excellent education for a future generation of experts and leaders.

This new cooperation builds on the successful strategic alliance Utrecht - Eindhoven and starts with a focus on Artificial Intelligence, Life Sciences and Education.

On national level we are also active in policymaking bodies with the aim to stress the importance of technology for our society and advocate its relevance.

6.4 International cooperation

As an internationally recognized excellent university, we will increase the amount of collaborations with top partners from science and industry at the European and global level and we will be actively participating in major (funding) initiatives and programs. In the period 2020-2025, we will focus first on improving our leadership, visibility and recognition in Europe. We will invest in a more pro-active attitude, a stronger presence and a more leading role in projects/programs, accompanied by enhanced communication and strategic partnering to strengthen our reputation.

The effort to achieve higher international rankings will be continued. Strategic alliances with excellent partners such as in the EuroTech University Alliance are used to improve our reputation and to broaden the scope of our industrial relationships.

To be successful in addressing European cooperation opportunities and the acquire the required funding, professional and effective support is needed. TU/e is investing in a Research Support Network at departments and institutes and offers dedicated support for the application of personal grants.



EuroTech Universities Alliance

The main vehicle for our international cooperation is the EuroTech Universities Alliance. The members are six leading European universities of science and technology: Technical University of Denmark (DTU), École Polytechnique Fédérale de Lausanne (EPFL), École Polytechnique (L'X), Eindhoven University of Technology (TU/e), the Israel Institute of Technology (Technion) and the Technical University of Munich (TUM).

The coming years, we are extending the collaboration for impact and education in an initiative called EuroTeQ Engineering University. This EuroTeQ Engineering University qualifies as a European University Network and is open not only to students enrolled at the partner universities, but also to engineers working in industry who are interested in life-long learning. The European Union funds this project with approximately five million euros for three years, probably extended with two million euros from the Horizon2020 program. The partners will establish a joint engineering sciences study program across different disciplines as well as across national and institutional boundaries, reaching well beyond individual technologies. The goal of the alliance is to look at technology developments on a holistic level. Students will be able to design their curricula in line with their learning objectives and career aspirations and will benefit from new digital formats.

Going global

Today, our university is active on all seven continents. Inspired by the success of our cooperation with Zhejiang University and Philips Research in the Brainbridge program, we will actively promote this type of programmed cooperation for our international partnerships across the continents. Our strive for a more sustainable world will be leading in this effort. In our global cooperation activities, special attention will be paid to protection of knowledge.

6.5 Impact

TU/e is about impact. Our partners, our staff, and our students together generate the societal impact that we strive for. An impact that will support the world into a more sustainable future. This starts with the way we organize our education, how we conduct our research and how we cooperate in partner networks. We always strive for solving the problem, making the change and creating meaningful impact.

Besides our research being intertwined with industry through joint projects and staff, also our education is increasingly organized in interaction with companies. TU/e has one of the largest communities of PDEngs (Professional doctorates in Engineering); a position that we will build

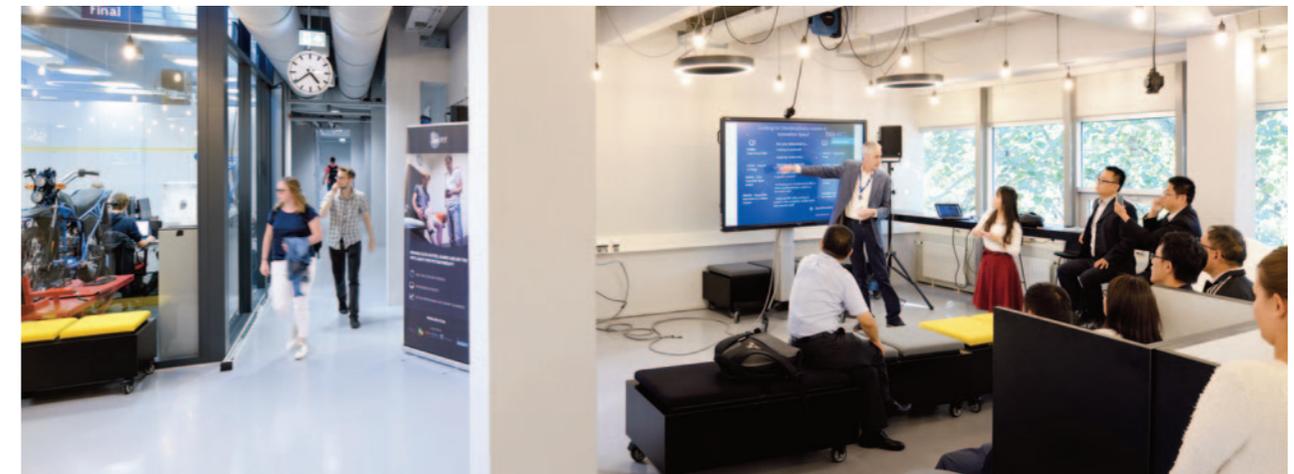
upon in the coming years by enhancing the PDEng Programs in close cooperation with our partners in industry.

TU/e Innovation Space

TU/e Innovation Space is our center of expertise for Challenge-based learning and student entrepreneurship. It is a learning hub for education, innovation and an open community where students, researchers, industry, and societal organizations can exchange knowledge and develop responsible solutions to real world-challenges. By linking education closely to practice, Innovation Space facilitates a new type of collaboration with industry and inspires and creates awareness of entrepreneurial behavior among TU/e's students and staff.

Entrepreneurship

TU/e wants to drive innovation not only with knowledge and talent, but also through its entrepreneurial community of students and staff. To date, many new companies have originated from our university including companies that pave the way for industries to reinvent themselves. We will further develop our entrepreneurial support structures by strengthening our cooperation within the region in the area of new business development. In The Gate, launched in 2021, business developers of Brainport Development and the TU/e will provide information and guidance on workspaces, financing, training and coaching to entrepreneurial students, scientists and tech starters. The shared goal is to improve the quantity and quality of the high tech startup climate in Brainport Eindhoven.



#7

Resilience

7.1 Good facilities

We will further invest in our campus and in on- and offline research and educational facilities. In light of covid-19, digitization of educational processes has got a head start during spring 2020. Moreover, covid-19 makes us reconsider strategic frameworks for real estate decisions.

Campus 2030

In recent years, large investments have been made in modern new buildings and settings for education and research. The further growth and development of the university nevertheless means that there is still a lot of extra space needed. We have built more living spaces on campus and we consider expanding this. Groups and departments have grown over the years and have become more diverse. We host other educational organizations, and many different cultures. This not only makes our campus lively and attractive, but also urges us to have a clear vision on social aspects, on safety and security. Moreover, the covid-19 crisis has let us experience other ways of working and of organizing educational activities. We will take into account the enormous experience gained by working and studying off-campus in developing our plans for a vibrant TU/e campus.

Digital facilities

A dedicated information strategy 2030 has been developed, that converts the ambitions of TU/e Strategy 2030 into the implications for the university's information management products and processes. This strategy aims to provide for flexible learning environments, digital certification possibilities, digital communication platforms, sufficient computing power and appropriate ICT support to help TU/e achieve its goals and objectives in the areas of education, research, impact and organization.

7.2 Professional processes

The TU/e regularly has to account for or adjust to rules as a result of legislation and government requirements. Our processes must therefore be flexible, effective and efficient. Furthermore, we want all our processes not only to be efficient but also to be customer oriented. In addition, improving cyber security is high on the agenda.

We start from the perspective of teachers, researchers and students. This requires a smooth collaboration between colleagues from different departments, between scientific and professional staff. We have already taken a big step in this direction with the future proof educational organization process (TOO). One of our next steps will be to improve our research support chain. The coming years will witness further developments in facility support, personnel processes, ICT and financial processes for our researchers.

The challenge in all this is to maintain the human dimension of TU/e. No excessive bureaucracy and red tape, but targeted, user-friendly processes that facilitate people to identify what needs to be done and to be able to respond to each other.

Service chains

The overarching goal is to create a seamless support for our primary processes: the customer should not notice which departments, services or teams are involved in delivering the desired support. We should make the transition from support staff to professional staff. From 'your wish is our command' to proactive partnerships. Collaboration is the key to success. We tackle challenges in teams by having the end in mind, not by each department optimising their own subproblem. All relevant - and only the relevant - departments in a service chain are working together. People move in and out of teams when

needed. Some chains have a more permanent character, mainly in the basic services we provide. The people in the teams are empowered and trusted to solve issues based on their professional experience. They do not need unnecessary blessings from the top.

The first 'chain' that will be taken up is the research life cycle. A researcher requires all kinds of support in the whole process from first idea to reaching out on research results. Additionally, other potential chains are evaluated and an 'idea box' will be created to allow for continuous improvement projects.

Quality of service performance

In quality of service performance the goal is to create a culture where it is normal to measure quality in service performances as well in order to improve the quality of services. As was acknowledged by the NVAO in their institutional quality assurance report in 2020, for education and research we have many different means to measure and evaluate the quality of our work. However, for the administration and service processes we need to step up quality measurements to better deliver services that are needed at a higher level where desired.

On several levels we will experiment with quality measurement, such as an organization maturity assessment pilot to measure the performance of an entire service, a pilot to measure customer

satisfaction, a pilot to measure employee satisfaction, and operational measurements such as 'happy or not' pillars to instantly measure operational services. Furthermore, we will experiment with customer experience methods in order to improve our processes.

Leadership and people development

The ambitions in our strategy require skilled people with a heart for education, science, technology and for each other. They require leaders who can lead the change, leaders with a vision and a drive to reach success, and always with an eye for people's talent. Leaders who recognize talent, stimulate their team members to develop their individual talents, and enable those talents to flourish. Leaders that are able to connect people in- and outside of TU/e, and guide their teams to create the requested network organization.



We will intensify our investments in people acquiring new knowledge, new competencies and new behavior. Moreover, in facilitating people to periodically make a move to another type of assignment, or to make a next career step, we will invest in people development, both for academic staff and support professionals.

Social safety

In 2019, we signed a joint statement of the Association of Universities in the Netherlands (VSNU) regarding social safety, thereby committing to providing a safe, open and respectful working and studying environment for all our staff and students.

We have appointed confidential advisors at different institutional levels, whose work is based on the code of conduct for the national confidential advisers association (Landelijke Vereniging voor Vertrouwenspersonen, LVVV). By conducting periodical research into social safety, we identify possible patterns among the notifications to confidential advisers. Together with the results of employee satisfaction surveys, we determine what measures need to be taken to ensure a safe working and studying environment for our entire community.

#8

Implementation, reporting and monitoring

Since we regard this Institutional Plan as a rolling agenda, we will continuously and closely monitor and evaluate its implementation.

The relevance and effectiveness of the objectives will be assessed in the strategic cycle. Moreover, the strategic process and planning & control cycle facilitates our periodic strategic reflection about the questions "Are we doing the right things?" and "Are we doing things right?" Significant settings for the strategic discussions are the biannual two-day strategic meetings with the Executive Board, the Deans and/or directors as well as the biannual 'bilo' meetings: Strategic meetings between the Executive Board and each of the Departmental Boards.



The implementation of the projects and actions defined in this document is based on the following guiding principles:

- A set of 17 strategic priorities (goals) has been derived from our TU/e Strategy 2030 which we will focus on up till 2025.
- Each goal has one or more objectives: Specific results that serve as the basis for creating policy and evaluating performance. Responsibilities are delegated at the level of the objectives; each objective has one or more owners that manage related strategic projects.
- Each objective is translated into one or more strategic projects with yearly determined deliverables. The deliverables can be defined as the first next steps on our way to realizing our objectives and goals in 2025. Deliverables are being reported on twice a year in order to monitor progress and to adjust course if necessary.
- Internal communication on the implementation and realization of the Institutional Plan is done via 6-weekly strategy updates and through periodic dialogue sessions.
- In order to ensure a lively, dedicated and transparent process, the implementation of the Institutional Plan is managed by a Strategy implementation team regarding plan, process, reporting, evaluation and ensuring coherence between strategic projects (e.g. attention for mutual interdependencies).

The Magic 7

Based on the 17 strategic priorities we have defined the 7 most impactful themes. These themes, the Magic 7, are impactful from a strategic, financial and/or organizational perspective.

We use the Magic 7 for steering on our multi-annual budget, as the themes relate to the most impactful investment decisions. Moreover, we will use the Magic 7 to develop integral steering based on the 17 strategic priorities.



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