FACULTY OF ENGINEERING TECHNOLOGY

ENGINEERING FOR IMPACT

RESEARCH STRATEGY
FACULTY OF ENGINEERING TECHNOLOGY

2023-2028

UNIVERSITY OF TWENTE.

Colophon

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PREFACE

This document presents the research strategy of the Faculty of Engineering Technology of the University of Twente. In it, you will find the research focus of our faculty as it is now and the directions in which we intend to develop our research in the next 5 years.

Over the past year, the members of our faculty, students, junior and senior researchers, support staff and university partners, have shared their ideas and perspectives on our faculty's role within the University of Twente. We have looked at how we can best organise ourselves to deliver what society requires from us. Our research strategy leans on our past efforts, focussing on the engineering strongholds we have developed around our strategic research themes. It further describes how we are acting on the current global societal challenges in, for example, climate & energy, digitalisation, health and security. The role of engineering in addressing these challenges is not easily overestimated. Tools will be required to address these challenges and the global engineering community faces the task of developing these tools.

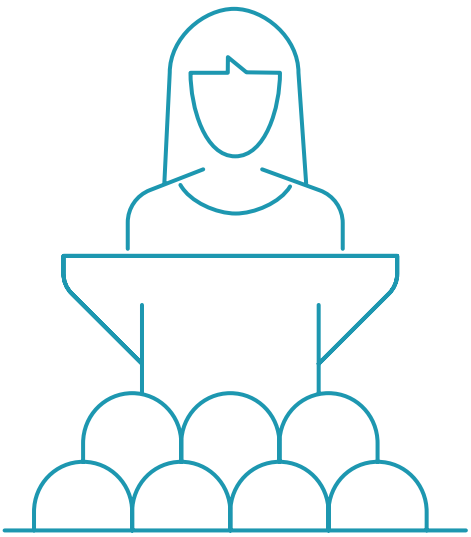
The title of the document "Engineering for Impact" summarises our strategy in its most concise form. We develop fundamental engineering knowledge to use as a basis to create the tools to address societal challenges, to create societal impact.

The document sets out our collective vision and purpose, as well as our goals and strategies for the years ahead. It describes our five strategic research themes and how we connect these themes to the way our faculty is organised. It also emphasises our enduring focus on academic excellence. In the coming years, our strategy will guide our decisions, actions and interactions into the future.

Addressing grand societal challenges requires an interdisciplinary approach. Collaboration is therefore key, and we will continue to focus on stimulating it, both within and outside our faculty. The way this strategy came together, where students, researchers, staff and university partners have offered their perspectives and have together worked towards a common goal, has strengthened my belief that collaboration is in our faculty's DNA. I am convinced that with this mindset our faculty will continue to be successful in the future.

January 2023

Prof. dr. ir. Bart Koopman
Dean Faculty of Engineering Technology



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TAKE HOME MESSAGES

WE ENGINEER FOR IMPACT

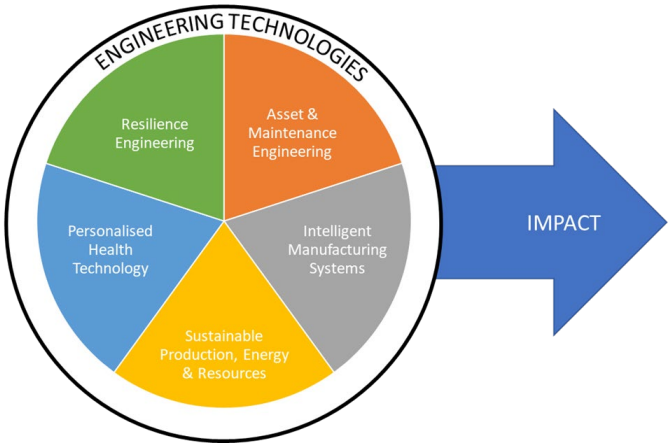
At the Faculty of Engineering Technology we believe that fundamental engineering knowledge provides the tools to drive change in ways that benefit society, people and our planet. The prospect of having a positive impact on society by offering engineering solutions for complex and urgent societal challenges motivates us, and it propels us towards high quality engineering research.

WE FOCUS ON 5 STRATEGIC RESEARCH THEMES

Five multidisciplinary themes constitute the backbone of our research portfolio: Resilience Engineering; Sustainable Production, Energy & Resources; Intelligent Manufacturing Systems; Asset & Maintenance Engineering; and Personalised Health Technology. Our strategic research activities aim to further strengthen our expertise in these five areas.

WE AIM FOR MULTI-DISCIPLINARY COLLABORATION

We believe a multidisciplinary approach is the principal catalyst for achieving societal impact. We aim to collaborate within and outside our faculty and university and provide an open door to parties who want to collaborate with us.



ET wheel of impact. By developing our experience in 5 research themes, we develop solutions to resolve societal challenges.

1. INTRODUCTION

Since the founding of the University of Twente in 1961, UT has addressed economic and societal questions through innovative combinations of technical and social sciences. The university has developed into a thriving, entrepreneurial institute that is known for its strengths in personalised healthcare technologies, smart manufacturing, advanced materials, digital technologies and its engineering capabilities to develop a resilient world. UT puts people first, reinforces the engagement with society and generates societal impact as summarised in its mission for 2030: "The University of Twente is the ultimate people-first university of technology. We empower society through sustainable solutions." At the Faculty of Engineering Technology, we subscribe to this mission. We develop engineering solutions to overcome societal challenges through a multidisciplinary approach. We believe that excellent research drives beneficial transformational changes in key societal domains. Our research practice is challenge-driven, and we cultivate an attitude of excellence, accountability and integrity towards our peers and society itself.

This document: "Engineering for Impact" outlines the research strategy of the Faculty of Engineering Technology for the coming 5 years. The document is a result of group discussions with our department research contacts and heads, theme leaders, support staff, Faculty Board and Faculty Council. Updates have been shared on a regular basis with these groups, leading to numerous adjustments, and eventually to consensus about the strategic directions to take. Additional inputs from external partners, industrial and international advisory board members, as well as the UT Strategy and Policy department have been very beneficial. We will continue to engage with them to optimise our efforts in the implementation phase.

"Engineering for Impact" summarises our ambitions. *Impact:* to contribute to solving societal challenges. *Engineering*: developing the tools that enable societal solutions. Impact is usually not achieved by engineering alone. It is the result of a collaborative process, involving all stakeholders in the challenge addressed. With collaboration we will build on our existing strength in integrating use-inspired research with industry, governmental bodies, and societal institutions. We are well positioned to extend our impact overcoming societal challenges based on our former accomplishments in challenge-driven research. Indeed, phenomenal challenges lay ahead that need solutions from science. To name a few: **Climate** - humanity threatens to exhaust the earth; **Health** - our ageing population creates challenges for our healthcare system; **Security** - War in Europe is currently a reality, requiring a reconsideration of our defence, our reliance on foreign resources and our increasing reliance on internet.

Obviously, within our faculty we cannot work on all problems at the same time. We have chosen to focus our efforts by concentrating on five strategic research themes in which we believe we can make a difference and that constitute the backbone of realising our vision and mission:

- Asset & Maintenance Engineering,
- Intelligent Manufacturing Systems,
- Personalised Health Technology,
- Resilience Engineering,
- Sustainable Production, Energy & Resources.

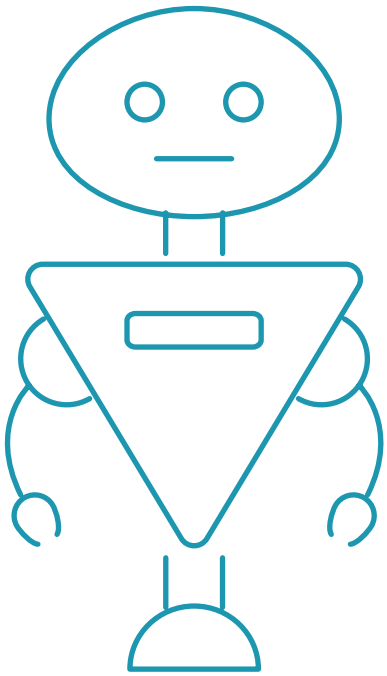
These themes are well-aligned to both the principal strengths of our research and the university's profiling. Further, the research themes are well suited to develop engineering solutions for solving current societal challenges. In this document, the themes are updated with respect to the faculty themes that we set in 2015, which helped us to align our efforts in order to build a stronger faculty profile. We will elaborate on the themes which will guide our future prioritisation, resource allocation and decision-making.

Writing down the strategy is one thing, but implementation is another. Implementation of the research strategy cannot be separated from the ongoing transformation in education and the restructuring in the way of working in our faculty. Our departments have been given more autonomy to make them more agile, giving them the means to decisively explore promising opportunities. Increased autonomy is balanced by our focus on the five cross-departmental strategic research themes, improving synergy within our faculty. Maintaining and extending this synergy requires our continuous attention. This is a shared assignment and involves connecting for better results. The success of implementation of our strategy will depend on students,

scientific and supporting staff alike. Any change in direction strains the people involved, who already experience high workloads. The Faculty Board is committed to this research strategy and will, where possible, supply the resources to enable implementation.

In creating the research strategy, we reviewed our vision and mission. This activity has truly been a faculty effort. Numerous adjustments and modifications based on the input of hundreds of people have been made. From the beginning, it was evident not everybody's suggestions could be included. However, the continuing input shows the commitment of our staff to the faculty. It is our hope and expectation that working with our mission and vision in mind, this strategy document will be the enabler to further increase our positive impact on society.

This document presents the strategy in *research* while the other, and equally important, pillar of our activities, *education,* does not receive in-depth treatment. These two pillars cannot be fully separated. We want to educate our students with the latest scientific knowledge, but moreover we want to prepare them for unexpected and unexplored challenges. We will continue to extend our lifelong learning activities in which cooperation between the faculty and external partners on research and education are integrated. *Engineering for Impact* is thereby relevant for education as well. This document is a first step towards a complete (Research and Education) faculty strategy. In a next step, we will continue our efforts, integrating the research and educational profile and strategy.



2. MISSION, VISION AND VALUES

OUR VISION

As part of the University of Twente, we envision a world in which engineering innovations are developed with one single purpose: to serve humanity. A world in which technology and engineering drive change in ways that benefit society, people and our planet. We see ourselves, the Faculty of Engineering Technology, as carriers of this vision. We are frontrunners in engineering research and education, connecting with industrial, governmental and academic co-workers worldwide to understand and resolve complex and urgent societal challenges.

OUR MISSION

The mission of the Faculty of Engineering Technology is to address societal challenges by generating fundamental knowledge in engineering technology. We want to harness its full potential in applying it to complex problems and in educating the engineers and scientists of the future. Our faculty pursues this mission with a spirited learning community of students, researchers, societal and industrial partners. Together, we develop transformational solutions for complex and multidisciplinary engineering applications across five vital and interrelated domains:

- Asset & Maintenance Engineering,
- Intelligent Manufacturing Systems,
- Personalised Health Technology,
- Resilience Engineering,
- Sustainable Production, Energy & Resources (SuPER).

OUR PROFILE

The Faculty of Engineering Technology is internationally known as a leader in its field, fusing engineering with social sciences. We educate entrepreneurial, forward-looking engineers with our own degree programmes in mechanical, civil and industrial design engineering, and by contributing to programmes across and beyond UT in Robotics, Sustainable Energy Technology and Humanitarian Engineering. We create inspiring learning communities and share interdisciplinary knowledge and expertise with a variety of world-class partners. Working across boundaries, we develop advanced processes, production systems and devices with the aim of making a significant difference in our society.

OUR 4 STRATEGIC PRIORITIES

In everything we do to pursue our mission, we are guided by four strategic priorities:

We care about society
Our focus is on technologies to address both current and future societal challenges. With our education and research, we contribute to consumer products, public infrastructure, applications, and manufacturing systems that benefit society, people and our planet.

We educate for the unknown
Our society needs engineers with an open, entrepreneurial mindset, a broad vision and excellent problem-solving skills. Highly trained individuals who can switch easily between the fundamentals of engineering science and its practical application, and who are comfortable navigating unknown territory and unravelling problems humanity has not faced before.

We engineer for circularity
We take a systemic approach to engineering, integrating everything from process design and development to manufacturing and construction, ensuring a sustainable life cycle. This means our education and research incorporate both the fundamentals of engineering science and the development of societally relevant and effective engineering applications.

We connect for better results
At the Faculty of Engineering Technology, we work together – and in doing so, we cross many boundaries and bridge many divides. We integrate research and education. We fuse mechanical, civil and industrial design engineering with social sciences. We bring together students, staff and researchers to engage with public and private stakeholders. Our projects connect the worlds of academia, government and industry, because addressing today's challenges and achieving transformational change requires that we all contribute.

3. THE FACULTY OF ENGINEERING TECHNOLOGY

FACULTY BOARD

The Faculty Board is the highest decision-making body within the faculty. The Faculty Board is a collegiate board with a portfolio division and consists of the Dean, a portfolio holder for education, a portfolio holder for research, and a portfolio holder for operations. One student of the faculty has an advisory role as student assessor and participates in meetings of the Faculty Board. The Faculty Board takes care of all activities within the faculty in accordance with laws and regulations applicable within the university. The Faculty Board, in consultation with the departments and programme directors, determines the vision regarding future developments within the faculty, and sets this down in a multi-annual plan, containing at least a vision on education, research and management. The relationships between the Faculty Board and the Executive Board of the University of Twente and with other forums in the faculty are formalised in the *Faculty Regulations*, based on the Dutch Higher Education and Scientific Research Act and on the *Way of Working* that forms an appendix to the Faculty Regulations.

KEY DISCIPLINES

The key disciplines of the Faculty of Engineering Technology are Mechanical Engineering, Civil Engineering and Industrial Design Engineering. The origin of this threefold division lies in the organisation of education. The faculty is home to three different educational programmes with the same names. .

DEPARTMENTS

The research chairs within the Faculty of Engineering Technology are clustered in five departments, described in this section. The departments are responsible for the corresponding research and education in the BSc, MSc, EngD and PhD programmes. A department consists of all employees of the chairs that form the department and has a Department Board.

Biomechanical Engineering (BE)
BE does research at the interface of technological and medical sciences, aimed at improving rehabilitation of patients with sensory or motor disorders, resulting in their increased independence. The research is focused on three themes, neural control of movement and posture, characterisation of biological tissue behaviour and the effect of (surgical) interventions, and development of methods to study human movement. The medical application areas of the research are rehabilitation, orthopaedics and neurology.

Civil Engineering and Management (CEM)
Research in CEM aims at acquiring qualitative and quantitative knowledge on the life cycle of civil engineering systems and objects, with a particular focus on the initiative phase, the phase of conceptual or functional design, and the operation and maintenance phase, all in a societal and environmental context. Research concentrates on construction management and engineering (e.g., planning, development, procurement systems and construction engineering), transport studies (e.g., engineering, management and interaction of transport systems) and water engineering and management (physics of marine and fluvial systems and integrated water management).

Design, Production and Management (DPM)
Research in DPM considers the understanding and improvement of design processes (and consequently also manufacturing processes). Focal points in this research field are the development of methods and tools for scenario-based, user-oriented product design against the background of the requirements and constraints of the entire product life cycle, and manufacturing facility and warehousing design. 'Integration' and 'synthesis' are important topics for design engineering research, the focus is on understanding and improving the design process irrespective of the product.

Mechanics of Solids, Surfaces and Systems (MS3)
The aim of MS3 is to develop the technology for future manufacturing processes and new products through a science-based engineering approach focused on material behaviour, system behaviour and robust optimisation. Manufacturing new products and/or developing new

processes requires a profound scientific understanding of (functional) materials (e.g., elastomers, polymers, composites, metals, biomaterials) and their interactions throughout the complete life cycle: during design, production, use and after service life.

Thermal and Fluid Engineering (TFE)
TFE performs research in theoretical, numerical and experimental fluid dynamics, granular materials and thermal engineering, driven by applications in fields such as mechanical engineering, maritime engineering, aerospace engineering and process technology. Research themes are aero-acoustics, fluid mechanics of rotating flow machinery, multi-phase flows, transport phenomena, sustainable fuels, turbulent combustion and heat transfer.

RESEARCH

In this vision, the faculty is an internationally recognized centre in advanced processes, production divices in the areas of our five research themes:

ASSET & MAINTENANCE ENGINEERING
Safeguarding reliable, available, cost-effective technical systems

INTELLIGENT MANUFACTURING SYSTEMS
Building intelligent manufacturing solutions to advance society

PERSONALISED HEALTH TECHNOLOGY
A medical revolution with personalised health technology

RESILIENCE ENGINEERING
Resilient solutions for a connected world

SUSTAINABLE PRODUCTION, ENERGY & RESOURCES
Sustainable solutions must be the gold-standard

EDUCATION

The faculty offers three Bachelor's programmes, and five Master's programmes.

BACHELOR'S PROGRAMMES

- Civil Engineering
- Industrial Design Engineering
- Mechanical Engineering
- Mechanical Engineering (VU)

MASTER'S PROGRAMMES

- Civil Engineering and Management
- Construction Management and Engineering
- Industrial Design Engineering
- Mechanical Engineering
- Sustainable Energy Technology
- Robotics

KEY FIGURES

The Faculty of Engineering Technology is growing in numbers.

711
Student influx 2021-22

147/31
PhD/EngD population 2022

550
Total academic staff 2022

253/312
BSc/MSC diplomas 2021/22

53
PhD/EngD defences 2021

759
Publications 2021

INFRASTRUCTURE

ET houses and participates in a range of unique facilities: Virtual Reality Lab, Aeroacoustic Wind Tunnel, DesignLab, Mechanical Testing Laboratory, Advanced Manufacturing Center (AMC), Thermoplastic Composites Research Center (TPRC), Living Innovation Lab (LILA) Twente, and Surgical Robotics Laboratory.

UT EMBEDDING

Various ET researchers are involved in the three research institutes of University of Twente (TechMed, Mesa+ and Digital Society Institute), often through the university strategic programmes. ET plays an active role in the programme on Resilience@UT: Engineering for a Resilient Urban World with main topics being drought (ET lead), safety and health.
The Fraunhofer Innovation Platform for Advanced Manufacturing at the University of Twente (FIP-AM@UT) performs applied research, technical consulting, and project development for regional and national manufacturing industry. It runs the Advanced Manufacturing Center, next to our campus, that is a testbed shop floor for digitalised and connected manufacturing machines. FIP-AM@UT commonly runs shorter projects at higher TRL (Technology Readiness Level) than typical research projects in the ET departments. It is embedded in ET at the faculty level and is a significant extension of our facilities in manufacturing technology.

RESEARCH SUPPORT

Our faculty established a Research Support Team (RST) providing effective, efficient and demand-driven research support to the research staff and management. RST provides the research staff with the best available support so that they can focus on doing excellent research and making a real societal impact. Furthermore, it provides the management of the faculty with research related intelligence to confirm, polish, adapt or change the research strategy and policy.

GRANTS SUPPORT

The Research Support Team collaborates with the University's Grants Office to offer a holistic support package to the research staff. With overall decreasing granting rates, proposal excellence is becoming more and more important, where scientific quality is not the only assessment criterion. The Research Support Team has an overview of funding instruments and helps researchers in strategically aligning their research with the scope of research calls, university and societal themes.

REGIONAL EMBEDDING

Originally founded as a catalyst for social and economic development and growth in the region, our university is strongly attached to regional and local businesses, helping them to innovate and grow, and educating their future employees. Relying on our key disciplines, the ET faculty therein focuses on manufacturing. Within the Eastern Netherlands (Overijssel & Gelderland) and Twente regions, manufacturing business is strongly developed, with several large (VDL, Toray, DEMCON, Apollo, Thales) and myriad small and medium sized enterprises. The faculty has a strong track record of start-up companies created based on our research projects (e.g., Triboform, Aniform, MercuryLab, Lightmotif, Nextscan, 4Silence, Kite Robotics, Contecht, SoundInsight, Gable Systems, ASCEE, Yumen Bionics, EAZWind) and collaborates closely with several municipalities and provinces. We are committed to supporting these entrepreneurial initiatives, realising that start-up companies will grow to be employers and ambassadors for the region and will grow further to be the multinationals of the future. As such, they are a main lever to create the impact we are striving for.

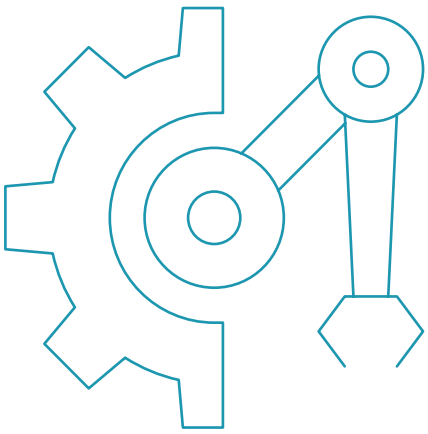
STRATEGIC EXTERNAL RELATIONS

Industrial Advisory Committee
Apollo Vredestein; DEMCON; Hankamp Rehab; NLR; Rijkswaterstaat; Tata Steel; Thales; Toray; VDL

International Advisory Board
KU Leuven; Dublin City University; Leibniz Association; City University of London

Strategic Industrial Partnerships
Apollo Vredestein; NLR; NS; Prorail; SKF; Tata Steel; VDL

European Partnerships
Fraunhofer IPT; EFFRA; ECIU; CESAER



4. STRATEGIC RESEARCH THEMES

ET has identified five strategic research themes to stimulate and align the research within the five departments. A theme leader has been appointed for each research theme. This person represents the theme and coordinates alignment of the various departments within the theme.

ASSET & MAINTENANCE ENGINEERING

INTELLIGENT MANUFACTURING SYSTEMS

PERSONALISED HEALTH TECHNOLOGY

RESILIENCE ENGINEERING

SUSTAINABLE PRODUCTION, ENERGY & RESOURCES

1. ASSET & MAINTENANCE ENGINEERING

Safeguarding reliable, available, cost-effective technical systems

Among the cornerstones of a society in transition are reliable, available, and cost-effective technical systems. By controlling functional performance, asset & maintenance engineers can support operational systems against uncertainty, fostering both a resilient and a circular use of precious resources.

We focus our asset & maintenance engineering work at the Faculty of Engineering Technology on capital-intensive infrastructures. The work includes predictive maintenance strategies for large assets, process industry, and infrastructure in a circular economy. We encourage a multidisciplinary approach to maintenance engineering, delving into the physics of failure and condition monitoring to data analysis, maintenance process optimisation, and logistical challenges. All of this is set in a double context of education and research.

Collaboration is fundamental, we partner with UT's Asset Management and Maintenance Innovation Centre and the 'Asset Management and Maintenance' department of the Netherlands' Royal Institute of Engineers, KIVI, alongside other faculties and national and international universities. Our research groups are aligned with UT's drive towards a sustainable society, prioritising several of the United Nations' Sustainable Development Goals (SDGs), including SDG 9, 'Industry, Innovation, and Infrastructure'.

2. INTELLIGENT MANUFACTURING SYSTEMS

Building intelligent manufacturing solutions to advance society

Manufacturing the goods people and society need in intelligent ways is a key to improving sustainability. In fact, smart manufacturing can help us to tackle many societal challenges, from climate change, resource scarcity and social welfare to global competition and profitability issues.

In the search for intelligent manufacturing solutions, the Faculty of Engineering Technology fuses knowledge of future-oriented processes with the unique ability to design, test, and integrate solutions across a variety of product, process, and system-level applications. We do this in close

collaboration with many hands-on industrial partners. By seizing digital opportunities, we strive toward solutions that impact productivity, flexibility, and sustainability. In combination with tailored data acquisition, we are establishing digital twins that enable advanced planning and operations in manufacturing, for example through model-based inline control of processes and systems. Our work contributes to several United Nations' Sustainable Development Goals (SDGs), including SDG 9, 'Industry, innovation, and infrastructure', and SDG 12, 'Responsible consumption and production'.

3. PERSONALISED HEALTH TECHNOLOGY

A medical revolution with personalised health technology

Personalised health technology is transforming healthcare in many ways. This revolutionary technology targets precise individual needs, making medical treatment both more effective and more accessible, thereby supporting public health and the well-being of our society.

Operating where technological and medical sciences meet, our faculty's work in the field of Personalised Health Technology centres on real-world health applications that target the needs of both patients and health professionals. Our teams support projects like disease prevention and detection, improved rehabilitation, surgical interventions, characterisation of biological tissue and fluidic flows, and healthcare design, including physical interaction and services.

With solutions like these, we are blazing new trails into the future of healthcare. Personalised health technology helps people to stay healthy, and helps clinicians identify which diseases individuals are prone to, making diagnoses faster and minimising the effects of disease. Our work on Personalised Health Technology ties in with the United Nations' SDG 3: 'Ensuring healthy lives and promoting well-being'.

4. RESILIENCE ENGINEERING

Resilient solutions for a connected world

In an interconnected and digital global society, even small disruptions can have far-reaching impacts. A society that faces complex challenges demands solutions not seen before. Today's engineers must engage in developing 'anti-fragile' systems that are prepared for the unexpected and become stronger under stress.

We embed Resilience Engineering in a triple context of education, fundamental research, and beneficial real-world solutions that make our society stronger, safer, and more sustainable. At ET, we focus on remodelling energy, water, and transport infrastructure networks and supply chains. Within this framework, we prioritise integrative approaches. These include systems engineering and integration, nature-based solutions, water footprint assessment, decentralised and decarbonised energy systems, and circular constructions for served and under-served communities.

As we work towards resilient solutions, we place people and the planet at the centre, linking to the United Nation's Sustainable Development Goals, including the 9th: 'Build resilient infrastructure, promote inclusive and sustainable industrialisation, and foster innovation.'

5. SUSTAINABLE PRODUCTION, ENERGY & RESOURCES (SUPER)

Sustainable solutions must be the gold-standard

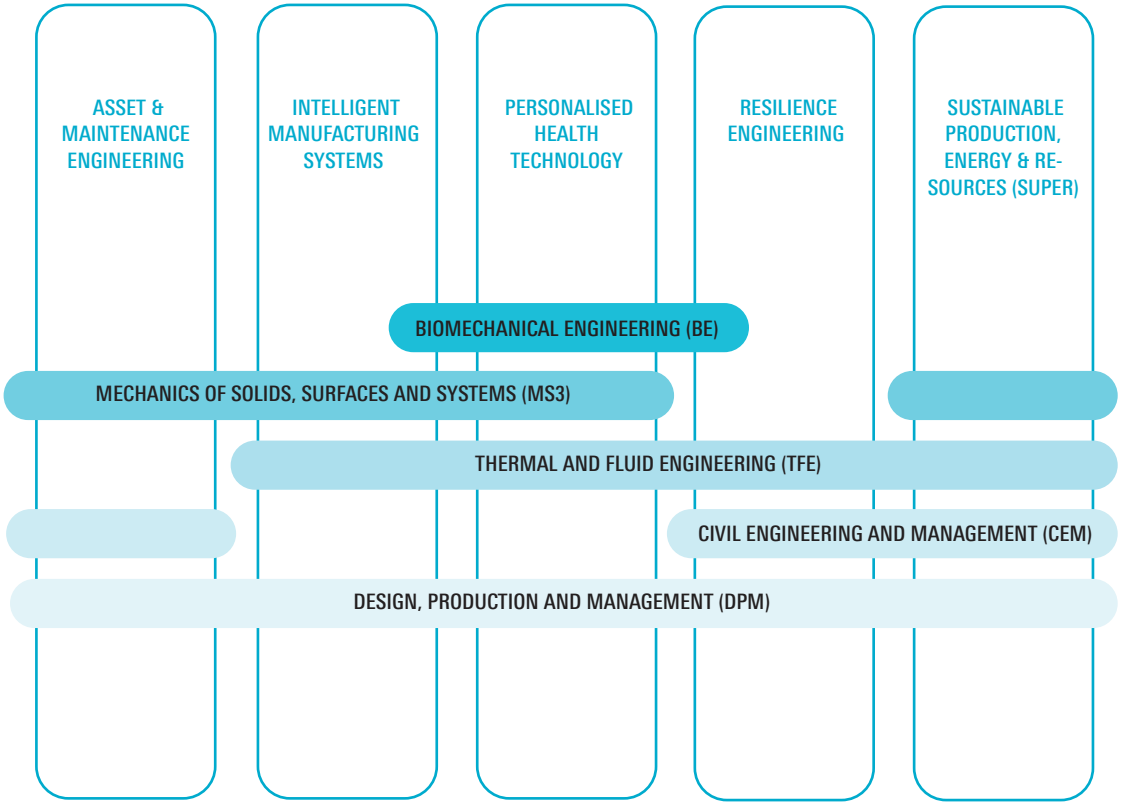
Over three earths would be needed to meet the material, water, and energy demands of today's global population if we continue to live the way we are currently, according to UNICEF data published in 2022. Reducing our environmental footprint is a vital step toward a better future for all. Within our research theme Sustainable Production, Energy, and Resources (SuPER), our faculty faces this challenge head-on.

Sustainable Production, Energy, and Resources (SuPER) at the ET faculty centres on exploring multidisciplinary approaches to sustainable ways of living. These include design processes, material development, and smart energy and resource integration. Our research focuses on assessing resource use, promoting sustainable energy in all forms, and understanding material flows.

From this research, we look to develop and implement real-world solutions. Examples include databases for water and land use of global crop production in high spatio-temporal resolution; circular products and systems; and parametric and prospective life cycle assessment methodologies for emerging technologies.

Through this work, we can foster a society founded upon circular resource management and sustainable solutions. SuPER contributes to several United Nations' Sustainable Development Goals (SDGs), including:

- SDG 6: 'Clean water and sanitation'
- SDG 7: 'Affordable and clean energy'
- SDG 12: 'Responsible consumption and production'



5. RESEARCH STRATEGY

RESOLVING COMPLEX AND URGENT SOCIETAL CHALLENGES

The research strategy of the Faculty of Engineering Technology is guided by our vision which reflects that as well as performing excellent research, we face the challenge of disseminating our scientific results in society, and resolving societal challenges. Thus, we create societal changes, or better: *societal impact.* Highlighting both engineering technology and society, the strategies we propose are a mix of 'traditional' strategies to guard and improve our *scientific* impact (for example, relating to publishing in high-impact journals), and strategies to create *societal* impact with our work (for example, by concentrating on research themes for which there exists an urgent societal need). For our faculty, high quality engineering research and societal impact are two sides of the same coin. The prospect of having a positive impact on society by offering engineering solutions for complex and urgent societal challenges motivates us and it drives us towards high quality engineering research.

RESEARCH QUALITY

The University of Twente strives for research with high scientific quality to create societal impact. Engineers play a key role in this process, combining the scientific fundamentals with the drive to exploit them in order to create useful and practical solutions. In the recent national research assessment (2020), the research quality in the disciplines of the Faculty of Engineering Technology was considered good and, in some instances, excellent. The approach of the different departments and chairs to achieve high quality research is diverse. Where some groups are industrially focused, others target national funding instruments, are concentrating on participating in European research programmes, or are involved in local research programmes with municipalities or provinces. In part, this relates to the diverse nature of our mechanical engineering, industrial design engineering and civil engineering backgrounds. Arguably, there is a certain risk that, with the larger independence of our departments, we will lose synergy in our faculty. However, we consider the diversity in our research disciplines as our principal strength. By working together on the same research themes but from distinctly different perspectives, we will be able to generate original research with high scientific impact. Our research quality strategy is aimed at exactly that: maximising synergy to obtain high quality research.

" Generating fundamental knowledge in engineering technology"

Improvement of the quality of our research will be achieved by strengthening internal and external cooperation on topics that contribute to sustainable development of our society. Strengthening the five strategic research themes, which are linked to UT themes, is key to our strategy. The recently introduced theme leadership will help sharpen the profile of these research themes, highlight the connections to the UT Research Strategy 2020–2030 and strengthen internal cooperation. Theme leaders are responsible for setting up communication between a theme-team, consisting of members of the contributing departments and for starting bottom-up initiatives with this team. The theme leader communicates directly with the Faculty Board and service departments to organise support for the research theme.

Facilitating and promoting strategic research initiatives and setting up and participating in research networks we will build on areas of existing research strength, bringing together a critical mass of expertise across disciplines and organisations to address large scale multidisciplinary research challenges. These networks and collaborations provide a platform for large scale funding opportunities and the ability to influence national and international research agendas.

Research themes – Our research efforts will be focused on our five strategic research themes: Resilience Engineering, Sustainable Production, Energy & Resources, Intelligent Manufacturing Systems, Asset & Maintenance Engineering, Personalised Health Technology (see Chapter 4). These themes are chosen to both align well with international, national and university priorities, and with the research strengths of our faculty. The fact that our current themes are elaborations of the themes that we have been working on since 2015 (which thus have kept their relevance), gives us confidence that we are on the right track. The focus obtained by concentrating our research efforts on a limited set of themes, we believe, will lead to higher scientific quality.

Multi-disciplinarity – Researchers from different departments have been involved in the theme descriptions, to anchor the research involvement of a diversity of departments from the start. The themes are represented by theme leaders who will drive the multi-department initiatives. As theme representative, they will be the figureheads and carriers of these interdepartmental efforts and they will be consulted in Faculty Board decisions where necessary.

Research support – The multidisciplinary task of focussing on research themes from different perspectives takes time, which is a scarce commodity. The Research Support Team of our faculty aims to support this process as much as possible. Therefore, it will concentrate on activities to make researchers aware of the research activities of their colleagues, facilitating ideation and the subsequent collaboration process. Furthermore, the Research Support Team will assist with writing proposals. Good quality science starts with good quality proposals. Apart from scientific content, proposals nowadays must fulfil several extra requirements, related to narrative, impact, data handling, open science, ethics etc. While the scientific part of proposals will remain the researcher's responsibility, the Research Support Team will assist in the non-scientific part of the proposals, prioritising their efforts on interdisciplinary initiatives.

Internationalisation – Research in the disciplines covered by ET indisputedly takes place in an international context. Research in engineering that is done in the Netherlands has a worldwide impact, and, conversely, much of the worldwide engineering research has an impact on the Netherlands. The quality of our research is measured in relation to international standards by our peers. In this international research community, our researchers can prosper, come to innovative ideas, and can reflect on the methodologies they use and results they obtain. Being part of the international community is a requirement for delivering the best possible results and for the progress of science. Therefore, we strongly promote and seek international collaboration and exchange to create an international working environment.

International exchange will be supported in both directions. For short term exchange, we encourage our permanent staff to spend time at research institutes and universities of high reputation abroad, using sabbatical leave. Vice versa, we strengthen our bonds with foreign researchers by hosting them for short stays in our research groups. The initiative for such visits is taken by the research groups and the faculty offers financial support through the Da Vinci-fellowship.

The preferred way to collaborate on research is through joint research projects. We will actively seek international collaboration with highly reputed research groups, for which collaboration is mutually beneficial. We do not focus on specific countries, but on specific institutes. At faculty level, we will concentrate our efforts on institutes for which structural joint research funding is expected to be available. This is the case, for example, for institutes that are eligible for funding by the framework programmes of the European Commission.

CREATING SOCIETAL IMPACT

Our mission to resolve complex and urgent societal challenges through engineering technology, translates in striving to create impact. Virtually all funding instruments, whether they are regional, national, or international, benefit from drafting a concrete route to impact, where impact is regarded as a societal change as a (direct or in-direct) consequence of the research. In many funding programmes the envisaged societal impact is prescribed where engineering

activities should be aimed at solving a specific societal challenge. Expertise of single researchers, departments, faculties of universities, will rarely suffice to cover the entire scope of complex societal challenges. As the University of Twente has always addressed economic and societal questions through innovative combinations of technical and social sciences, we are well-positioned to take a leading role in establishing initiatives that address societal issues from a multidisciplinary perspective. However, where our faculty traditionally focused on creating impact for *industry*, we will need to expand our scope to a more societal context. In collaboration with DesignLab and the Shaping Expert Group on Citizen Science, we will explore which research fields within the faculty can benefit from the concept of Citizen Science.

Engineering for Impact – At our faculty we are committed to create impact by addressing and overcoming large societal challenges. Therefore, we will strive to become more adept to collaboration with other departments, universities, societal organisations, governments, and industries to bring in expertise that we do not have. In doing so, we will focus on setting up and participating in large research initiatives of a multidisciplinary nature, which align well to both societal challenges and the strategic research themes of the faculty. This requires new ways of working which surpasses our traditional way of consortia forming within our existing network of shared expertise. The Research Support Team will focus its support on initiatives of truly multidisciplinary teams with a diversity of researchers working in pursuit of common aims, exchanging their expertise to achieve impact. Our faculty will continue to offer financial support for grant proposal writing for setting up large multidisciplinary projects and will help these initiatives with consortium forming and grant writing, in collaboration with the university's grant office. A key component of this strategy is to invest in unique infrastructure as enablers for impact creation through multidisciplinary collaboration.

"Addressing societal challenges"

Regional impact – Our faculty will continue to foster the regional manufacturing ecosystem through assisting local companies in their innovation. The Fraunhofer Innovation Platform for advanced manufacturing is one of the tools we will use to accelerate the transition to Industry 4.0 in the region. Working relations with local organisations representing businesses (Twente Board, OostNL, Kennispark Twente) and non-industrial stakeholders such as municipalities and provinces are and will remain important and will be further developed by organising collaborative activities. Working across levels, existing relations with Saxion, HAN, and Windesheim, universities of applied science, will be strengthened. Collaborative research efforts will be our main vehicle to maximise our impact on the region. One of the ways to help companies is to provide a learning environment for their employees. We are already successfully offering EngD programmes which are accessible for professionals working at companies, and we will extend our services to other types of professional training. Several lifelong learning mechanisms are currently initiated across the university (courses, open science, learning communities). Our faculty's activities will focus on learning communities, in which companies and universities work and learn together, for the benefit of both. Although business challenges are important drivers for our activities, companies do not govern our scientific strategy. We believe that by aligning our collaborative research efforts with societal themes and the research priorities of our faculty, we guide companies towards sustainable, future-oriented business.

VISIBILITY

To achieve our research goals, internal and external visibility is crucial. We strive for effective ways to display our research to the community within and outside UT. Our researchers carry out excellent research. A challenge that many researchers face is how to make the research AND the person behind the research more visible. Increased visibility contributes to the research strategy in multiple ways. By showing that our research makes societal impact, acquiring future

research funding, contributing to the UT brand and community building; fostering connections to academia, consortia and industry, leading to new, multidisciplinary collaborations. We are becoming better at communicating our research, but we are not there yet. We will offer support to help our researchers to profile themselves and their research in the best conceivable way. More specifically, support on personal branding, social media presence, press and media outreach and profiling of the strategic research themes.

Open access/open science – The University of Twente believes that the results of publicly funded research should be made available to everyone free of charge as soon as possible, preferably with a licence for reuse. Open Access publishing accelerates innovation and ensures equal access to scientific results. The benefits for researchers are that OA publishing increases your visibility, the number of downloads, citations, and the impact of your articles. ET aims to make 100% OA publishing the norm by the end of 2023 . ET authors must make all their publications open access, preferably immediately with a licence for reuse. All ET publications must be open access at least six months after the initial publication date. ET will collaborate with the Faculty Information Specialist and the OA Specialist at the University Library to identify the support needed to achieve this.

International profile – We recognise that international conferences and workshops are excellent means to connect to the international research community and to initiate research collaboration. Therefore, researchers, including those on a temporary contract, are stimulated to participate and present their work at international conferences. To enhance our international visibility, the organisation of international meetings and conferences at UT is recognised and appreciated.

ENGINEERING THE FUTURE

The Netherlands has a strong tradition in engineering research. Looking at the challenges that lay ahead, especially in climate and health, we see a strong societal need for engineers to enable the societal transitions required, based on fundamental knowledge in engineering technology. Through the years, engineering research has remained a stronghold of the Dutch research infrastructure. We believe that the urgently required transitions will promote and encourage the research field in our disciplines. We invest in knowledge generation for this transition, not just to safeguard the position of our faculty, but because we believe that high quality engineering research is key to safeguard our sustainable future.

COMPLIANCE

SCIENTIFIC INTEGRITY

Monitoring and strengthening scientific integrity have proven to be essential for the future of universities. Everyone involved in education and research bears responsibility for maintaining scientific integrity as described in the Dutch and European codes of conduct for scientific integrity. The University of Twente has a Code of Conduct with general principles of integrity for everyone who is part of the UT community: employees, students and persons representing the University of Twente. This Code of Conduct includes UT's core values and general principles of integrity, including scientific integrity for students and employees.

ET will foster an environment in which responsible research practices are encouraged. We strive to ensure that research integrity is well embedded in the research culture and rules for research integrity are recognised and applied by researchers. The faculty provides specific facilities such as ethical review of research and innovation, scientific integrity education for PhD students, and support in research data management. In this way, all PhD students follow the mandatory tailor-made data management bootcamp, given by the ET Data Steward, and scientific integrity in general, as part of the mandatory introductory TGS course for all PhD and EngD candidates. In addition, a comprehensive Basic Scientific Integrity Qualification course is available for junior staff and a short course for senior staff with supervisory duties. To further ensure scientific integrity, the integrity policy will be revised where necessary and disseminated through the recently developed research support website and other communication channels.

RESEARCH DATA MANAGEMENT

Research data management is crucial to ensure the quality, reliability, reproducibility, and verification of scientific research. Our Research Data Management practices comply with norms of transparency and integrity, and we support researchers and students with Open Data and Open Software Activities via the Digital Competence Centre. Research data forming the basis of publications will be Findable, Accessible, Interoperable, and Re-usable (FAIR). The research data policy of ET formulates general guidelines regarding data management and the responsibilities of researchers, supervisors, and research managers. These guidelines are elaborated to specific rules in the department policies that are made by each department. Execution of the RDM policy is supported by a Data Steward who is assigned to ET and embedded in UT's Digital Competence Centre. While the RDM policies for the departments were established in 2021 and 2022, the strategic focus for 2023 and 2024 will be on implementation of these policies.

ETHICS

Ethical aspects of research have, to an increasing extent, become the subject of consideration within universities worldwide. With new EU and Dutch regulations on privacy being introduced with the GDPR (General Data Protection Regulation), UT has developed a new research ethics policy, which is wholeheartedly supported by ET.
Researchers and BSc/MSc thesis supervisors have an individual responsibility for implementing the rules and regulations and assessing whether ethical review is necessary, helped by the guidelines provided by the faculty before the start of the research. If it is deemed necessary, students will go through the appropriate channels to get the right type of ethical approval. Mandatory ethical review of medical research is conducted by a certified national medical ethics committee. Ethical review of non-medical research is conducted by one of four independent domain-specific committees appointed at UT. For ET research, ethical review is mostly conducted by the **Ethics Committee Natural Sciences and Engineering Sciences**, which facilitates and monitors the ethical conduct of all research in these domains and keeps the policy and protocols up to date. A new tool has recently been developed UT-wide to facilitate requests for ethical approval. The tool helps researchers to evaluate the ethical aspects of their research without putting too much of an administrative burden on them in cases in which there are no ethical risks. ET will promote the use of this tool for all relevant research projects through information sessions and hands-on assistance.

KNOWLEDGE SECURITY

In 2020, the UT Knowledge Safety Team (KST) was established. The KST focuses on balancing the opportunities presented by innovative research and international collaborations with the risk that knowledge is used for adverse purposes. These risks make it important to establish a reliable system that ensures the security and integrity of scientific knowledge.
Knowledge security and export control plays a role in many processes within UT such as international collaborations and agreements, the recruitment of international staff, opportunities that foreign investments brings, but also access to physical and digital environments, among others. ET collaborates closely with the KST to:

- comply with (inter)national laws and regulations about international sanctions and export control;
- reduce and mitigate knowledge security risks to the ET community and associated research infrastructure;
- provide the ET community with a focal point for questions concerning knowledge security and export control.

To meet the above objectives, among other things, ET will consider all knowledge security aspects when defining strategic collaboration partners. In addition, individual research initiatives where knowledge security could play a role will be reviewed case by case. Taking these measures will mitigate or reduce knowledge security risks, keep our knowledge safe, and allow us to continue to collaborate with partners around the world.

TALENT

RECRUITMENT, RETENTION POLICY AND INCLUSIVITY

Attracting top talent (national or international) is one of our main challenges. ET encourages the development of employees in research, education and impact. Recruitment and selection of scientific staff and training and mentoring require ongoing attention.

Identifying and attracting talent - Early identification of our own employees and proactive identification of talent outside the University of Twente is essential for strengthening both our research programmes and reputation and the educational profile of our faculty. The core of our strategy is that we give everyone the opportunity to grow. This starts with 'scouting' promising talent and offering them a challenging position that is stimulating for their personal careers and that strengthens scientific development in the relevant field of science. When filling vacant positions, we take a broad look at the quality and competencies of candidates and talented scientists whose field of expertise does not fully match the outlined job profile will still be considered. Quality emerges best through open competition. Therefore, in appointments an open recruitment process is the standard. This also offers the best opportunities to attract talented women and international talent. Internal talent will be actively approached and guided. If scientific or support staff leaves, their position will not be filled automatically or in the same way. In each case it will be examined whether the vacancy should be filled or whether the resources can be better used elsewhere.

Diversity - ET strives for a diverse research environment to achieve a variety of perspectives and opinions so that research groups are a mix of different nationalities as well as show a healthy balance in gender, ethnic and age diversity. This leads to an internationally diverse composition and fosters an inspiring multicultural workplace. Permanent and temporary research staff are recruited internationally, leading to a continuous inflow of non-Dutch researchers. In the last decades, both categories have become truly international. It remains our strategy to form and maintain research groups from diverse nationalities, including Dutch, in order not to lose our regional embedding.

Regarding gender diversity, the faculty aims to have at least 35% female staff. Different policies are being implemented to improve this percentage, including some vacancies for women only (Hypatia chair), the requirement to shortlist at least 30-50% female candidates for other vacancies, and an incentive fund to accelerate the careers of talented female researchers. With the above instruments, ET also aims to encourage the recruitment of female researchers to permanent positions.

Investment – A principal factor in attracting talent is the research infrastructure offered to newly employed staff. Strategic budget of the faculty will be available to attract talent with investments (equipment/support) relevant to their research expertise, especially if investments are required to kick-start novel, promising research directions. Prioritisation of the faculty contribution to the budget will be performed based on the reputation of the talent, the fit of the research direction with the strategic research themes, the potential for interdisciplinary collaboration, societal impact and visibility, and on the available financial matching from the relevant research department(s).

FINANCE

FINANCIAL SUSTAINABILITY

Each department is expected to reach a financial balance between income that is commonly based on education and research activities and costs that are mainly formed by personnel, housing, equipment, and maintenance costs. A healthy mix of research projects contains projects with a substantial contribution margin and fundamental projects with often no or only a low contribution margin, a mix of large (consortium) and small projects and a mix of personal and non-personal grants. The mix of income from education and from applied and fundamental research can differ per department, within the constraints of financial balance. Workshops or short courses will be developed for academic staff to familiarise them with financial aspects in general and specific to the UT systems and to make them aware of financial opportunities.

STRATEGIC RESEARCH BUDGET

After financially challenging years, there is currently room for investment. Next to the freedom that departments have to distribute their own budget within the limits of financial balance, the faculty will designate funds as *strategic budget.* The size of the strategic budget and the rules on how to spend this strategic budget will be established by the Faculty Board. The strategic budget will be used for temporary funding and investments to support research and/or education, in line with the faculty's strategy and research priorities. The strategic *research* budget, will be typically used as seed-money to initiate new research activities to create new and significant funding opportunities, aligned with the strategic research themes of ET, to support state-of-the-art infrastructure, and to attract and retain scientific talent and staff.

However, we cannot invest in everything, and prioritisation will be necessary. First, these investments should have a strong effect on the impact and visibility of the faculty and should be in line with our strategic priorities. Initiatives to invest strategic faculty budget can be started by individuals or groups in the faculty, not necessarily based on a call for proposals. Initiatives will be assessed with respect to their alignment to the faculty's strategic research themes, societal challenges, and their promise for achieving societal goals and missions. By addressing societal issues, the investments will naturally require a level of interdisciplinarity, most likely and preferably, carried by the interests of more than one department. Cross-faculty and cross university initiatives will be encouraged, for which co-funding from the other faculty or university is expected.

Currently, lab space is in short supply. Initiatives for large scientific equipment could therefore be limited by the practical availability of space. The many criteria that play a role complicate an unambiguous weighing of proposed initiatives. In the case of a call for proposals, we will strive for a fair funding procedure. This will involve transparency about the award procedure and the committee members making the decision, as well as a clear motivation for the winning initiatives.

For large initiatives outside of a call for proposals, the Faculty Board will consult the Department Boards and Theme Leaders to assure broad support. The writing of many elaborate proposals for a call with only low success rate will be avoided and consensus will be pursued.
The strategic research budget includes funding for writing large consortium proposals, support for visiting researchers and stimulation for innovative research ideas (Crazy Research Call). The possibility for other instruments such as interdepartmental research initiatives (shared researchers) will be explored.

LARGE INFRASTRUCTURE AND SHARED FACILITIES

State-of-the-art research infrastructure is one of the decisive arguments for collaboration with ET. The faculty is committed to continually renewing facilities within the strategic research portfolio. We are continuously monitoring new opportunities, and the faculty will prioritise new initiatives on uniqueness, strategic fit and the possibility of sharing facilities with other faculties, universities, and industries. Currently, availability of lab space is a critical bottleneck to house additional infrastructure. The faculty will therefore carefully select new initiatives based on the above criteria, where removal of existing equipment cannot be excluded.

For large infrastructure and expensive equipment that is used by many groups, a financial structure will be created to distribute depreciation and maintenance costs proportionally. This may include attribution of costs to funded projects and actively offering availability for external use. The aim of the financial structure is a fair sharing of costs, while still stimulating the use of available facilities.

FUNDING STRATEGY

Acknowledging the importance of the second and third streams of funds, ET actively encourages researchers to apply for research grants by offering organisational and financial support. Organisational support is offered through the Research Support Team in collaboration with the Grants Office. The faculty encourages leading roles in the writing of grant applications in collaboration with large multidisciplinary consortium to conduct research that aligns with the strategic research themes of ET. To stimulate this leading role, the faculty provides budget for hiring external expertise. Financial support is also offered to researchers who wish to apply for a personal grant for the purpose of improving their grant proposal. The faculty aims to have a good balance of funding sources within the departments, such as personal grants, medium to large sized consortia, third money stream etc.

6. IMPLEMENTATION

The research strategy 2023–2028 as laid down in this document describes faculty goals for the next five years. Forthcoming (multi-)annual plans from the faculty, research and service departments will explicate these directions into concrete steps to be taken and will include quantitative targets to measure our progress. Below we summarise the most important targets for where we want to be in five years or earlier. They will serve as a reference to evaluate our strategic progress. It is our aim to have the organisational changes realised by the next research assessment of the faculty in 2025.

1. **Strategy:**
   a. Fully integrated Research and Education strategies by 2024

2. **Research Quality:**
   a. Consolidate the good engineering scores in international rankings
   b. Increased focus on cross-departmental research themes, as evidenced by an increased proportion of cross-departmental publications and proposals

3. **Creating societal impact:**
   a. Increased participation in large multidisciplinary research projects specifically aiming for societal impact, using e.g., the KIC and NWA instruments

4. **Visibility:**
   a. 100% open access publishing by the end of 2023
   b. Increased (social) media attention for the faculty's strategic research themes

5. **Compliance:**
   a. Scientific Integrity, Ethics, and Knowledge Security fully embedded in our way of working by 2025
   b. Research Data Management policy fully implemented by 2024

6. **Talent:**
   a. Consolidate the current ambitions on international and gender diversity
   b. Identify research talents within the faculty and provide the support (training, coaching) that will kick-start and consolidate their scientific careers

7. **Finance:**
   a. Create an easily accessible monitoring system (dashboard) for financial and other performance indicators at department level by 2024
   b. Transparent allocation of strategic research budgets by 2025

RESPONSIBILITIES AND MONITORING

Implementation of the ET research strategy is primarily the responsibility of the Faculty Board, with the portfolio holder research as first point of contact. Some of the strategic developments can be carried out at central (faculty) level e.g., by the Research Support Team, Human Resources or Finance & Control, but others must be carried out by departments, research chairs or individual researchers. It is essential that the (multi-)annual plans of the departments are consistent with the (multi-)annual plan of the faculty. The alignment of plans works in both directions: from faculty plan to department plans, but also from department plans to faculty plan. In the process of drafting the (multi-)annual plans and the bilateral alignment, the contribution to the research strategy will be explicitly addressed in the biannual bilateral meetings between Department Boards and Faculty Board. Alignment between the departments will be discussed in the regular meetings of Chairs of Departments with the Faculty Board.

The status of realisation of the research strategy will be monitored annually in January in a meeting of the Faculty Board. In this way, it is synchronised with the management report (Marap) to the Executive Board with a reflection on the annual plan and *Shaping 2030*, also in January.

APPENDIX A: ET DEPARTMENTS AND CHAIRS (JANUARY 1ST, 2023)

DEPARTMENT	RESEARCH CHAIRS
Biomechanical Engineering (BE)	1) Biomedical Device Design and Production Technology 2) Biomechatronics and Rehabilitation Technology 3) Rehabilitation Medicine and Technology (0,3 fte) 4) Surgical Robotics 5) Engineering Organ Support Technologies 6) Neuromechanical Engineering 7) Design of Biomedical Products (0,2 fte) 8) Biomechanical Implants (0,3 fte)
Thermal and Fluid Engineering (TFE)	1) Thermal Engineering 2) Engineering Fluid Dynamics 3) Multi-Scale Mechanics 4) Heat Transfer and Thermodynamics 5) Granular Materials 6) Computational Mechanics of Multiscale Materials
Design, Production and Management (DPM)	1) Human Centred Design 2) Integrated Life-cycle Management (0,2 fte) 3) Packaging Design and Management (0,3 fte) 4) Product Market Relations 5) Advanced Manufacturing & Sustainable Products & Energy Systems 6) Manufacturing Systems 7) Interaction Design 8) Information driven Product Development & Engineering 9) Systems Engineering & Multidisciplinary Design
Civil Engineering and Management (CEM)	1) Market Dynamics 2) Integrated Project Delivery 3) Soil MicroMechanics 4) Transport Engineering and Management 5) Transport Planning 6) Water Systems 7) Coastal Systems and Nature-Based Engineering 8) Multidisciplinary Water Management 9) Construction Process Integration and ICT (0,2 fte) 10) Modelling Water Management and Climate (0,3 fte) 11) Persuasive Systems Modelling for Sustainability Science (0,5 fte) 12) Climate Change Impacts of Coastal Risks (0,2 fte)
Mechanics of Solids, Surfaces and Systems (MS3)	1) Applied Mechanics & Data Analysis 2) Computational Design of Structural Materials 3) Dynamics Based Maintenance (0,15 fte) 4) Elastomer Technology and Engineering 5) Laser Processing 6) Mechanics of Polymeric Materials (0,2 fte) 7) Nonlinear Solid Mechanics 8) Precision Engineering 9) Production Technology 10) Skin Tribology 11) Tribology Based Maintenance (0,2 fte) 12) Surface Technology and Tribology

APPENDIX B: LIST OF ABBREVIATIONS

ET	Faculty of Engineering Technology
BE	Biomechanical Engineering
BSc	Bachelor of Science
CEM	Civil Engineering and Management
DPM	Design, Production and Management
EngD	Engineering Doctorate
EU	European Union
FAIR	Findable, Accessible, Interoperable, and Re-usable
GDPR	General Data Protection Regulation
KST	Knowledge Safety Team
KIC	Kennis Innovatie Convenant
LILA	Living Innovation Lab
MSc	Master of Science
MS3	Mechanics of Solids, Surfaces and Systems
NWA	Nationale Wetenschaps Agenda
OA	Open Access
RDM	Research Data Management
SUPER	Sustainable Production, Energy & Resources
TFE	Thermal and Fluid Engineering
TGS	Twente Graduate School
UT	University of Twente

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