EEMCS 2020-2024
*I*nvesting and Conn*E*cting

Strategy Plan EEMCS 2020-2024 including Action Plan 2020

This strategy plan has been drafted using the input of the EEMCS faculty board members, the chairmen of the EEMCS disciplines, the programme directors and several advisers to the faculty board. Its elements form the cornerstones of the annual budget 2020 and beyond. This document has been approved by the university board and by our faculty council.

November 27, 2019

Joost Kok

Dean

Preface

In this document, the ambitions and actions for the EEMCS faculty are outlined for the 2020-2024 period. These ambitions and actions are in line with the ambitions of the University of Twente (Shaping 2030) and will guide the faculty decision-making and budget allocation in the coming years.

All research assessments during the 2016-2020 period show that the EEMCS faculty has a strong scientific basis in all its disciplines. Education is highly valued by both the students and our peers. The faculty has grown considerably and is financially sound. Our future perspective is excellent, due to increasing interest in technology and the social relevance of our themes. This translates into extra students and structural extra resources from the sector plans (M€ 3 per year from 2020) and from the Van Rijn resources (M€ 0.7 in 2020 and increasing to M€ 1.7 in 2023). As a result, we have become less financially dependent on the contribution margin from the 2nd and 3rd cash flow revenues.

The ambition is therefore to continue to expand our strong academic foundation, to further spread our wings and to connect more with our sister faculties and the outside world. Hence the theme of this strategy and action plan: "Investing & ConnEcting".

The aim is for EEMCS to continue to excel in the coming years and to respond flexibly to all opportunities and changes. We create the conditions for our staff to be able to perform sustainably. This leads to challenges in organisation, financing and scope and level of support. The involvement of our employees and students in this process remains necessary and we therefore continue to invest in a good relationship with faculty council.

The DNA of EEMCS *:

- We solve important problems
- We train people who can cope with change and feel they can make a difference
- We focus on people and society
- We respond quickly to changes and understand the impact of the change we are causing with our science
- We work together
- We are entrepreneurial, we are beautiful!

* outcome of the EEMCS Professors Dinner 2019

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Educational Ambitions

We aim to educate professionals who are intrinsically motivated to gain knowledge and skills in order to solve complex problems within the context of society, taking into account the possible implications of the proposed solutions. They seek challenges to cross existing borders, are flexible and creative and strive for innovation. They are also critical and reflective on their actions and the results of their actions related to society, disciplinary knowledge, collaboration, etc. In order to realise the development of the student profile as described above, we offer an inspiring, stimulating and safe environment in which students learn, experiment, can make mistakes, work together, receive feedback and are challenged to improve. Naturally, this is largely realised through professional teaching and support staff. The philosophy of education of the faculty is closely connected to the student profile of the faculty. We use the University's profile (High Tech-Human Touch, T-shaped professional, crossing borders, entrepreneurial mindset and inclusive campus) as the basis for our own philosophy of education.

Continuous improvement of the quality of education is important to the faculty of EEMCS. The faculty board stimulates all efforts aimed at improving the quality of education with the follow-up of the Excellent Teacher Practitioner project (2016-2018) in a new initiative called UTeachers' Academy.

The faculty has delivered exceptional educational performance in recent years. The quality of our courses is high; we are at the national top when it comes to student appreciation. We achieved this in a period in which student numbers and the diversity of our student population have grown strongly. Our student population has doubled in the last five years! In 2019 we will welcome more than 600 first-year bachelor's students and around 400 first-year master's students. More than 40% of our total influx comes from abroad. Moreover, the education provided to sister faculties has doubled in the same period to a turnover of more than € 2 million in 2019 - this is equal to the annual turnover of a 3-year bachelor's degree programme as large as Creative Technology.

Education will remain a core activity in the coming years. We will continue to invest in maintaining and improving the quality of education so that we remain sufficiently attractive for students and teachers. To achieve this, we will use the WSV resources, for which a detailed plan has been developed with input from the faculty representative advisory bodies.

We want to keep the number of first-year Bachelor's students at the current level (more than 600 / year). The Dutch VWO student remains our most important target group. We want to keep the percentage of foreign Bachelor's students for the faculty at the current level (40%), although this may vary per study programme. Based on our quality ambition, we strive for the "Special feature of international education" for all our bachelor's programmes. To ensure that our Bachelor's programmes attract enough students after 2024, we will collaborate with VU University Amsterdam on the interface between electrical engineering, movement sciences and humanities. In the slightly longer term, we are considering developing courses in the field of Technical Humanities (vision 2030), in which the humanities are combined with our disciplines.

Ultimately, we want to increase the number of first-year master's students to 600 per year (in 2030). We strive for a proportion of foreign students not higher than 50% (currently 40%). A high conversion of our bachelor students to the master is crucial for this, in addition to realising sufficient side-entry (national and international). We expect that the conversion will come under pressure, but because of the rapidly growing bachelor population, our master's influx will still grow in the coming years. Increasing the attractiveness of our masters, linked to our research, is therefore a high priority. In addition to the master Interaction Technology and the recently approved expansion of our EIT participation (Data Science track), we are developing the Robotics master's (possibly also in collaboration with the VU) and the Sport Data Science specialisation in the coming years. Part of the effect of this on the influx will only be noticeable after 2024. We expect that in the coming years it will not be necessary to add extra EEMCS resources to the UTS scholarship fund for international master's students. figure 1 shows our ambition with regard to the intake and transfer of full-time students in 2024.

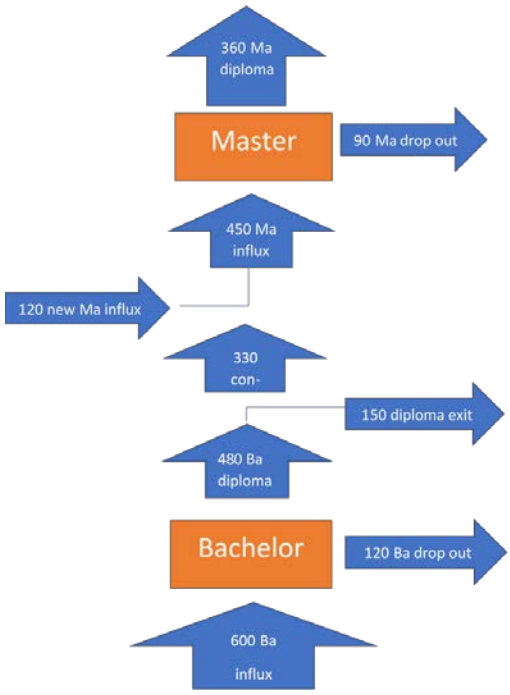

Figure 1: Bachelor's and Master's students in 2024

In addition to investing in educational programmes, we will invest in teaching staff, support staff and in educational facilities. Our UTeachers Academy@EEMCS is an important initiative. Its objectives are the continuous improvement of the quality of education to increase student satisfaction and to reward employees who are dedicated to the professionalisation of their teaching practices. Rewards for teaching practice extends to the possibility of being promoted to the next level, be it associate professor or full professor. In addition to the teaching staff in mathematics, we are expanding the teaching staff in computer science. This will help us to fulfil the increasing requirements of educational organisation, quality, and innovation. We support decision-making about the desired size of our teaching capacity with a better understanding of our student-staff ratios.

We will further fine-tune the quality and quantity of our support organisation and support processes to meet the evolving needs of our students and teaching staff, where necessary involving our sister faculties and central service departments. In particular we will focus on the need for internationalisation of education.

We want to grow the educational facilities in line with the size of our educational programmes and bring them (where necessary) to a higher qualitative level. We foresee a need for expansion and modernisation of teaching rooms (including SmartXP / ITech, Welpzaal and DataScience Lab (see WSV plan)) and for more digitisation (including testing, tele-reading and knowledge clips, scheduling and module support) to support our ambitions.

Research Ambitions

The volume of our research has come under considerable pressure in the past decade, due to the loss of FES resources, the effect of two reorganisations and the aforementioned growth of education in recent years. In our peak years, we achieved a turnover in 2nd and 3rd cash flow revenues of more than M€ 20 per year. In 2017, this was only M€ 12. Since 2018, the number of projects and turnover has increased again. The forecast for 2019 is M€ 15 and we expect further growth in the coming years.

We have been able to maintain the high quality of our research, as evidenced by the positive results of all recent research visits. Our aim is to keep quality high and to continue to grow in volume with the growth in the size of permanent academic staff (excluding lecturers). The growth of our first money stream resources in the coming years offers us the opportunity to do this. Our ambition for 2nd and 3rd cash flow turnover in 2024 is M€ 20. We aim for one personal grant per year for each discipline. We will maintain the financial support for project applications provided by the faculty SPA programme.

We aim to regularly take on the role of coordinator within projects and to retain the number of personal grants. Moreover, with the input of the Grants Support Office, we will focus even more on the national science agenda and on calls involving collaboration with social parties (for example, Commit2Data). This means that we will invest more in connecting with companies and parties such as municipalities, provinces and fellow institutions. With the increase in research volume, the influx of PhD students will also increase and ultimately the number of promotions per year. Our ambition is an influx of sixty PhD students per year from 2024.

The structural growth of first money stream resources (sector plan funds, Van Rijn funds and the growing educational income) offers us the possibility to appoint first money stream PhD students. In this way we boost the quality of our research, increase our attractiveness for talented academic staff (start-up packages, honour outstanding research proposals, respond quickly to opportunities) and partly tackle the educational workload. From 2020 we will include at least fifteen positions in our budget. At the faculty level, new policy with regard to the allocation of first money stream PhD students is formulated. We will continue the experiment with six-year PhD students, who combine education and research.

We anticipate that the quality and quantity of research support will have to be expanded for all of this. This applies to the acquisition, execution and accountability phases of research projects. Together with the disciplines, the Grant Support Office and the research institutes, we will further map this need and translate it into solutions that will be introduced from 2020. A second important topic of research support concerns advice in the field of ethics, scientific integrity and research data management. We have already recruited a research data specialist for this in 2019, who will work with specialists from the other faculties and central support. The ethics committee of the faculty will continue to exist for the time being and collaborates with the ET faculty.

The external research profile of EEMCS can be characterised by three main issues:

1. The thematic clusters within the three disciplines

2. The faculty-connecting research themes

3. The high-tech laboratories

The three disciplines Electrical Engineering, Mathematics and Computer Science are the foundation of EEMCS. Important matters such as visitations usually take place within a discipline. We therefore opt for a certain autonomy, whereby substantive choices can be made within the disciplines. Within the disciplines we currently distinguish the following clusters (Table 1).

Table 1: EEMCS Clusters per Discipline

Discipline	Cluster
Electrical Engineering	Sensors & Actuators
	Electronic Systems
	Software Applications
Mathematics	Operations Research
	Data Science
	Computational Science
Computer Science	Cyber Physical Systems & Security
	Software, Data Science & AI
	Human Computer Interaction

The disciplines formulate their research agendas on the basis of these clusters. They are given the space to partly align the distribution of research budgets to this agenda. The agenda is translated into an annual plan of approach. A good example of this are the recently formulated sector plans that have been designed by the disciplines themselves. The ambitions and investment agendas set out herein are an important part of the disciplinary and faculty research agendas for the coming six years. Supplemented with the research agenda's for the non-sector plan research areas this forms the agenda for the entire discipline.

In addition, we distinguish a limited number of cross-discipline faculty themes (Table 2). These themes are inspiring and relevant to the outside world. They give us a clear profile for students and research funding organisations. Our ambition is to translate the themes into specialisations in education and in externally funded research project proposals.

This collection of themes is dynamic. EEMCS actively goes into the outside world and finds the motivation for the choices there. The chosen themes are in line with the university context (Shaping 2030: Digital, Sustainable and Social).

Table 2: Faculty Research Themes and Ambitions

EEMCS faculty research themes	**Initiatives**
Human Centered Robotics (HCR)	
Personalised Health, Wellbeing & Sports (PHWS)	TopFit
Data Science & AI - (DAI)	TUCCR BRAINS Data on Sport and Exercise Smart Data Sensing & Imaging
Energy Optimisation (ENO)	Smart Grids & Power Electronics

For each faculty research theme one coordinator from each discipline is involved. These coordinators are responsible for planning (ambitions), implementation, periodic accountability and external profiling. Resources are available at faculty level for initiating these plans.

State-of-the-art research infrastructure is essential for our research (and education). The quality of our research infrastructure is used to connect with large partnerships and projects, regionally, nationally and internationally. The responsibility for this infrastructure lies primarily with the departments / disciplines. The infrastructure for the faculty research themes is part of our profile.

We foresee investments in our laboratories for the current four faculty research themes in the coming years. We will further expand our digital research infrastructure as this is a subject of research within EEMCS. We also want to use our research infrastructure to connect better with the other faculties.

Collaborations

We position ourselves as the central faculty of the UT and we cherish the intensive relationship with our sister faculties. We aim to include them in our partnerships and we are happy to connect with theirs.

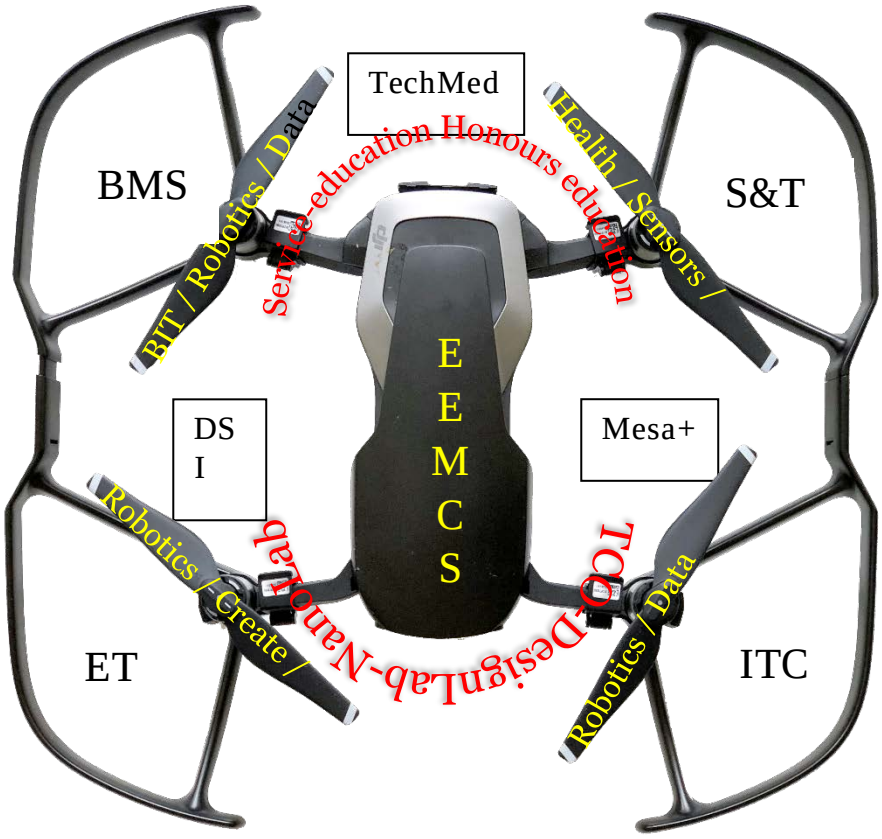

Figure 1: EWI@UT

EEMCS works closely with the other faculties and contributes significantly to the university research institutes. We are happy to further develop the necessary governance and consultation structures with the other faculties and institutes, with the university themes at the centre. We want to play a particularly important role in the digitisation agenda of the University of Twente.

We take responsibility for the management of infrastructure and central facilities, such as the NanoLab, TCO and DesignLab. These facilities also contribute to our external profile.

Our themes are prominent on the national and international agendas. We are selective in our partnerships and opt for investment and longer-term relationships. Currently we have chosen to focus on the following parties: Apeldoorn, HBO, VU Amsterdam and 4TU. We are going to intensify our relationship with each of these parties and translate the cooperation into more concrete projects and activities.

We are selective and focused on entering into international partnerships from a research and education ambition. Our research collaborations are driven by content. This means that the departments / disciplines take the lead in this. The most important partnership objectives for education are intake of high quality students and the creation of an international study environment.

At the faculty level we therefore invest in a limited number of international networks, where we bring education and research together where possible. This means that, in addition to

the exchange contracts with universities that are valuable for education (such as Erasmus partners, GlobalE3 and ISlink), we opt for the following relationships (Table 4):

Table 4: International partnerships

Europe	EIT	Participation in the Master School, Co-location Apeldoorn, EIT PhD programme (https://masterschool.eitdigital.eu/)
	Germany	FAIR DI (https://faidi.eu/)
Asia	China	Education and research cooperation with USTC (http://en.ustc.edu.cn/) and NPU (http://en.nwpu.edu.cn/)
	India	Student recruitment via India Office, Educational cooperation AMRITA (www.amrita.edu)
South America	Brasil	Research collaboration with USP (https // www5.usp.br)

We invest in coordination capacity and in the development of concrete activity programmes for each of these networks. At the faculty level, stimulants are temporarily linked to plans for the various networks. The progress is monitored through periodic evaluations.

Valorisation and Entrepreneurship

An attractive proposition for business and government is to offer packages with education and research. We see that the demand for Life Long Learning is increasing and we are therefore expanding our offer further (see also research section). A first step in this direction is further investment in acquisition and coordination of the current initiatives, being our PDEng courses, Nedap University and the collaboration with ING. We want to increase the inflow of new PDEng participants to 20 per year. This allows us to cope with an expected temporary decline in the number of promotional premiums in the coming 5 years. We also want to offer the Nedap University concept to other companies, including in the Apeldoorn region. In addition, we aim for an influx of fifty new participants per year from 2023.

Organisation and Administration

To successfully meet the challenges that we face, we will adjust parts of the organisation of the faculty.

The most important change is that we will further shape disciplines as a formal level within the faculty and give them more responsibilities and authority (in line with Shaping 2030). The disciplines formulate their education and research agendas annually and partly coordinate the distribution of education and research resources. Choices with regard to disciplinary accommodation, facilities and incentives are also made at the discipline level. At the discipline level, the role of the discipline chair is further elaborated. The necessary support and information provision will be arranged for this.

A second change is that we are going to work in a more project based way. This means that we appoint project leaders for the various renewal initiatives. They are given the task of drawing up project plans and coordinating their implementation. The plans and progress are periodically reported to the faculty board and included in the financial planning and accountability, also regarding employee participation. In line with this, the provision of management information is being further developed. Depending on the nature of the project, the project leaders are appointed and managed by the faculty or by the discipline.

The third development has to do with the expected growth in the coming years. The sector plans are expected to lead to 70 new scientific positions (including additional revenue from research), one third of which are permanent positions. In addition, we expect to be able to pay for 30 new positions from the Van Rijn funds and the increased education turnover. This means that we will be staffing 100 extra positions in the coming years, an absolute growth of almost 25 percent. We will therefore put a lot of energy into strategic personnel policy and in particular in recruiting new people, retaining existing people and replacing planned and unplanned staff turnover. Due to this growth, there are plenty of opportunities for achieving more diversity and offering opportunities to talented employees. We are constantly making the right match between the ambitions and talents of employees and what the organisation demands from them.

Sustainable employability and development opportunities of our employees are high on the agenda. We actively promote personal development and (internal) mobility and focus on the improvement of three important preconditions (outcome of wellbeing research), being:

1. Reduce of the administrative workload of the academic staff

2. Translate the ambitious and expected growth of our education and research into a suitable (quality and quantity) staffing (strategic personnel policy)

3. Further develop the skills of our senior academics and administrators (leadership development).

We are convinced that a diverse composition of the workforce helps us to achieve our ambitions. In order to fully benefit from this, we must be an inclusive faculty.

Finally, our ambitions will demand more from the UT organisation. First of all, we will have to use more space for offices, labs and, last but not least, our students. Since the faculties of Applied Sciences and ET are in a similar situation, we expect major bottlenecks in the short term. It is important that expansion plans for the entire UT are implemented in the short term. Secondly, the need for good management information is increasing. We warmly support the UT-wide Business Intelligence project and the further development of the Planning and Control cycle.

Appendices

Our goals for 2024

In 2024 we will still be an entrepreneurial faculty with excellent education and research. We are a faculty with 140 FTE permanent staff, a student population of more than 3000 full-time students and a turnover of more than € 60 million, of which € 20 million from the 2nd and 3rd cash flow. These student numbers translate into an extension of temporary contracts at least in the shorter term (order size 10-15 FTE) and possibly also in the longer term.

We are carefully monitoring the development of our faculty. We have formulated the following success indicators and ambitions for this (Table 4).

Table 4: Success indicators and ambitions

	Success indicator	**Realisation 2019**	**Ambition 2024**
Education	Scores Educational assessments	NVAO: All criteria are sufficient Keuzegids score higher and lower 70	NVAO: All criteria are sufficient Keuzegidsscore ≥ 70
	Bachelor: inflow / year % ready ≤ 4 years Conversion to master % internal. inflow	 >600 59% 59% (2018) 39%	 >600 ≥70% 60% 40%
	Master: Inflow / year % internal. inflow	 336 (2018) 37%	 450 (600 in 2028) <50%
	Supplied education	ME 2	ME 2
	LLL ambition - Participation BPO - Participants Nedap University	 Master Risk Management 20	 Master Risk Management 50 (expansion with other companies)
Research	Scores Research Assessments	All criteria ≤ 2	All criteria ≤ 2
	PhD students: intake / year % ready ≤5 yrs	unknown 55%	60 60%
	PDEng intake / year	5	20
	Size 2nd and 3rd money / year	17 ME	20 ME
	Number of personal grants / yr	3 (2005-2018 average. 2)	3 (1 per discipline)

Agenda for 2020

Education

- WSV plan: Implement the elements of the WSV plan as described in the agreed upon plan.
- Master Robotics: Start 09/2020. Recruitment starts autumn 2019.
- Master track Sport Data Science: Start 09/2020. Recruitment starts autumn 2019. Target inflow 75 students as from 2022.
- EIT Master School Data Science track: Start February 2020. Target inflow 20 students in as from 2021.
- Collaboration with Vrije Universiteit: Design Bachelor programme Electrical Engineering Start 09/2021. Recruitment starts in 2020.
- Student recruitment: Improve national recruitment for EEMCS programmes, together with M&C. Ambition is to attract more students from outside Twente. Reinforce our connection with India, by appointing an India coordinator and investing in our relationship with the India Office and AMRITA.
- Staff investment: Recruiting 6 fte additional lecturers for our Computer Science programmes. Start UTeachers Academy@EEMCS. First UHD or HL promotion based on educational qualification.
- Admission process: Improve our master application processes, invest in extra admission officer (0,8-1 fte) and start pilot application fee.
- Bijzonder Kenmerk International Opleiding: We evaluated two of our programmes (mathematics and Creative Technology) using the criteria from this kenmerk.
- Digitalisation: Next to the elements mention in the WSV plan, we will implement the use of existing digital support tools for teaching (like TA Help Me) across the EEMCS education programmes. Also evaluate the recently increased use of digital testing.

Research

- Implementing sector plans. Appoint new staff for all fixed positions (130%) applied for in the sector plan. Ambition is to have filled all the fixed positions (= 23fte).
- First money stream AIO: Appoint at least 15 new AIO's based on new EEMCS AIO policy.
- Faculty research themes: Identify project leader for each faculty research theme. Make proposals specifying research agenda, planning and division of tasks and responsibilities. Ambition is that in 2020 we have started the execution of concrete and agreed upon research project plans.
- Disciplinary research plans: each discipline will expand the sector plans to a comprehensive disciplinary plan. These plans will be connected to the programmes of the UT institutes.

- Industrial Doctorate programme met EIT: explore the feasibility of such programme in combination with Apeldoorn initiative and take go/no go decision in 2020.
- Research Support: Via the newly appointed research support specialist we will implement the EEMCS research data policy across the EEMCS research groups. The position, tooling and work processes of our ethics committee will be reviewed in line with the UT policy on this subject. Our financial support program for project acquisition (SPA) will be continued in 2020.

Valorisation and Entrepreneurship

- Nedap University: Expand concept to other companies. Invest in acquisition and recruitment.
- PDEng: Appoint coordinators for the BIT and Robotics PDEng programmes. Ambition is to obtain the final accreditation for the robotics programme and to realise a sustainable inflow of candidates for the BIT programme. We will do this in consultation with ET.
- MRM/BPO: We will maintain our involvement in the MRM programme and want to discuss with BMS the possibilities of BPO in supporting our Life Long Learning activities further.

Management and Organisation

- Reinforce EMCS Disciplines: We will make new role descriptions of the discipline chairmen. Based on this we will organise the staff and information support that they need for executing this role.
- Project approach: For the major projects in education, research and valorisation and for the collaboration projects with our partners the role of project leader will explicitly be assigned in case this has not yet been done. Each project will be explicitly connected to one member of the faculty board.
- Safeguard good working conditions: We will optimise the module support for our teaching staff with the aim of lowering their administrative burden. Next, we will put major effort into personnel planning (quality and quantity) and recruitment. This might lead to a need for (temporary) extra HR staff. We will monitor working conditions by better management information in general and specifically investigate existing and preferred student-staff ratios. Our efforts in management development will be continued. In 2020 we will further improve the annual interview procedures for our personnel and strategically advise our disciplines.
- Housing: The ultimate challenge is the housing of all the growth and innovation ambitions that we foresee. We will brief the UT on our expectations and requirements related to this and we will constructively support future decision-making in this field.