

and what now

with the moST beautiful department at TU/e

report
of my findings and advice
about the department of Chemical Engineering
and Chemistry

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Accountability.

Cause. Last March, I was approached by the then rector of TU/e with the question whether I would be available to fulfil a role in the department of Chemical Engineering and Chemistry (CEC). The rector stated that the department was not doing well and that, after consulting with a number of professors in the department, he wanted to ask me to help. Due to the impending departure of the rector, I had further discussions about my possible role with the chairman of the executive board in April.

Situation department CEC. During these discussions it was mentioned that the department is going through a difficult phase. This is caused by a number of circumstances, including cases of social insecurity and incidents relating to safety in the labs. In addition, also other matters play a role, viz. the implementation of a new science strategy, the filling of professor positions that become vacant due to retirements, the governance and positioning of the department within the university, the financial position of the department, and the reappointment of dean and vice deans.

Advisor. During the discussions we considered a possible role in assisting the dean of the department in the necessary process of reorientation and strategy formulation by taking charge of the implementation of this process in the department as an advisor to the dean and the executive board. The executive board subsequently decided on May 2 to appoint me as an advisor. On May 8, I spoke to the department board about the advisory assignment. On May 9, the department was informed that I had been appointed by the executive board as advisor “.... to advise on the governance and organizational structure of the Chemical Engineering and Chemistry department as well as its research strategy, especially also in the context of the growth of the university.”

Method of working. In order to get an idea of the situation in the department, in the period May - July I had discussions with all assistant professors, associate professors, professors, part-time professors, with all members of the ‘coördinatorenoverleg’, with employees of the educational institute, with representatives of the department council, with some members of the support and management staff, with representatives of the PhD students and PDEng students, with student representatives, with representatives of the secretaries, with the members of the department board, with the deans of the departments of Mechanical Engineering, Biomedical Engineering, Applied Physics and Electrical Engineering, with several professors from the departments of Mechanical Engineering and Biomedical Engineering, with the diversity officer, and with the new rector. This concerns more than 70 people (appendix 1).

Conversations. In the period May - July I had more than 80 conversations. I have had multiple conversations with some people. The conversations usually lasted 1 hour. Some conversations took longer, from an hour and a half to 2 hours. The conversations were strictly confidential. I made personal notes of all conversations. In this report I show anonymous quotes from these conversations that provide a picture of what emerged in the conversations. I experienced the conversations as open and honest. None of the conversation partners was reluctant or unwilling to speak to me. Everyone showed a sincere commitment to their own research group, the department and/or the university. I am impressed by everyone's willingness to tell me their own story, to share personal experiences and observations, and to help me to interpret and improve the situation in the department. Many discussion partners were critical of the course of events in the department in the past period. They did not mince their words. I report on this in this report. This may be confrontational, but I want to provide the full picture as I heard it.

Adopting the recommendations. During meetings on July 11 and July 18, I presented my findings and recommendations to the executive board and the department board, where the executive board

decided to adopt the advice. In the period after July 18, I still spoke with a number of people. These conversations have further confirmed my findings and advice.

Report. In this report I describe my findings and advice. The report is intended for the executive board, the department board, the people I spoke with and the members of the department. I report openly and without restraint about what I have been told and what I think about it. The report contains comments that in some cases may be traceable to individuals without naming them. This is sometimes unavoidable given the relatively small size of the department. On September 13 I have presented my findings and advice to the people I spoke with and to the other members of the department. I therefore consider this phase of my advice to be complete. I am available for further involvement in the development and implementation of the advice.

Format of report and summary.

In part 1 I describe what is going on within the department. I use quotes to illustrate this.

In part 2 I describe my observations. What do people tell me over and over again? What are recurring topics? What are typical similarities? What insights emerge? The observations concern the atmosphere in the department, the situation in the CPT cluster, the young staff (particularly assistant professors), the management support and business operations, the career development of assistant and associate professors, the culture, and the department board.

In part 3 I advise on how to proceed with the department. I distinguish three parts: restoring confidence in leadership, offering perspective, and working on the future of the department within TU/e.

I will discuss the position of the department board, in particular the roles of the dean and the managing director. I make proposals for the career development of assistant and associate professors and for the position of principal investigator. I propose to set up three clusters in the department (molecules, materials, processes) with their own powers ('bevoegdheden') and a management team that leads the department.

I propose to draw up a plan for the field of chemical engineering within TU/e around future-oriented themes such as sustainability, circularity and electrification. This is a TU/e-wide plan in which the department CEC and the Mechanical Engineering and Electrical Engineering departments are involved.

I propose to appoint scouts ('verkenners') to map the area of (hard) materials within TU/e and advise on its design and set up. This should lead to a TU/e-wide plan for this area with the involvement of the department CEC and the department of Applied Physics.

Finally, I argue for a redesign of the governance and organizational structure of TU/e with a bundling of departments into larger units (i.e., Faculties of Sciences and Engineering).

Going well and not going well.

In parts 1 and 2 of this report I write about what is not going well in the department. This is understandable given the reason and background of my advisory assignment. This is what concerns the vast majority of department employees at the moment. The first question I asked during my conversations, -what is going on in the department?-, also invites somber expressions. Although a few answered this question with a disarming “well, it's actually going well”.

It is therefore important to remember that indeed also a lot is going well in the department. Fortunately, there were employees, PhD students and graduate students who reminded me of this during my tour through the department. Student numbers have increased in recent years. The students are satisfied with the educational program. The department and its staff have outstanding scientific achievements and prestigious research grants and personal grants. And in recent years the department has managed to attract many young, enthusiastic staff members. That gives hope for the future.

And it is important to note that everything that does not go well cannot be solely blamed on the current department board. Responsibility also rests with previous department boards and with the scientific staff as a whole. What is going on in the department is a shared problem. And the solution must be sought, found and implemented together. In part 3 I will provide recommendations for this.

And now what is not going well.

Part 1. What is going on within the department?

To start with. In this part I describe what is going on within the department based on what the department members told me. I start the paragraphs in this section with quotes that I noted during my conversations (except for paragraph 1.2). The quotes are statements that come straight from the heart. The statements are illustrative of what employees feel about what is going on in the department and how it affects them. I have seen it as a privilege to have the conversations and to experience how committed the department members are to their department. It was about something ('het ging ergens over'). Namely about their own work that concerns them on a daily basis, which should usually inspire and motivate them, but which is also often experienced as a burden under the current circumstances. Not by everyone to the same extent, and not always in the same areas, but in almost all conversations it emerged that things are not going well in the department and that it is time for change.

1.1 Broad feeling of general dissatisfaction in all levels of the department.

The department lives in its own bubble in which it thinks things are OK.

What is happening in the department is very dear to me, something beautiful is slipping through our fingers right now.

What the department suffers from right now is a lack of leadership and a lack of commitment to achieving common goals.

It is good to shake things up once in a while, that moment has come when the strength of the old structure is deteriorating.

These citations reflect a widely shared feeling of general dissatisfaction in all layers of the department. Different terms are used by different members to illustrate that feeling. Terms such as disruption and rigidity ('verstarring'). A few times it was stated that the department is confused ('in de war'). Others spoke of chaos and arbitrariness ('willekeur'). And still others of an invisible department board that is adrift and rudderless ('stuurloos'). Still others emphasized the bureaucracy and the indecisiveness ('besluiteloosheid').

1.2 Perception of unnecessary administrative commotion on minor issues.

Every conversation started with my question 'what is going on in the department?'. This question often turned out to be an invitation to illustrate what is going on with concrete examples of what had occurred in the recent past. This included the safety of the labs and the closure of the corridors, the article about this in the Cursor, and the way in which the department board responded to this. About removing the paintings from the meeting room. Everyone had their own smaller and larger examples, but often the same as others. People often pointed out that the department board would act in panic, spend a lot of time on small matters and not get around to the actual task, namely providing leadership and direction to the bigger picture.

1.3 Lack of progress on too many files.

I am considering leaving because of a lack of growth potential.

I am stagnant in my development because I don't get research funding myself.

The PI model does not get further in the department then only talking about it.

I don't get replies to my emails, like I don't exist, I don't get it.

Not everyone wants to stay UD all their life.

Many of the comments during the conversations were about stagnation, lack of progress on too many topics. An important example is the PI policy that is not getting off the ground. As a result, young assistant professors lack prospects for their further career development. Expectations are not met, there are no responses to e-mails, answers to questions are not given. There are too many matters that are left unresolved, where no action is taken by the department board. Many of the department members gave their own examples, decisions are postponed by the dean and the managing director, procedures get stuck, files are passed from one to the other.

1.4 Low sense of belonging.

I miss the feeling of a bigger picture, attention and support by the greater whole.

I miss the feeling of being of value to the department.

I also have ambitions, but it seems that the department does not care what my ambitions are, you have to see for yourself.

How can I grow? I am busy with things that are also important but do not get the appreciation that others do who follow a different track.

There is a separation going on between individual ambition and team effort that requires leadership in the department to maintain the right balance.

There is no communication about where we want to go, what we want to achieve together, what is our common story.

The feeling that solidarity ('saamhorigheid') in the department has decreased is widely shared among the department members. The responsibility that one experiences as an individual for the bigger picture has become less. Many regret this and also point fingers at themselves. However, people feel resignation ('gelatenheid') and apathy because there is no prospect of improvement of the situation. As a result, mutual trust and respect for each other also diminishes. The urgency to seek connection is felt, but no follow-up is given because there is a lack of perspective, people point fingers at each other, and the hustle and bustle of the moment often has the upper hand. As a result, co-ownership of the problems in the department lags behind and it becomes everyone for him or herself.

1.5 Lack of attention for each other.

You have to take care of yourself, no one else does.

I have had only one jaargesprek in many years, the only time something nice was said to me.

We lose sight of each other, we no longer have time for each other, to help each other, and everyone ultimately chooses for themselves.

We take less care of each other than we did 7 years ago.

The limited sense of solidarity ('saamhorigheid') also leads to less attention for each other. This is experienced at all levels of the department and plays a role in many areas. In this context, employees frequently mention the high work and time pressure, which is increasingly experienced as a burden and is seen as an important reason for the little attention they have for the well-being of their colleagues. As a result, social contact lags behind and collegiality in and outside work disappears from view, leading to an impoverishment ('verarming') of mutual relationships.

A recurring theme is social safety. Several cases of social insecurity have occurred in the department in the past period. Employees involved in this experience little support from colleagues, often due to ignorance about the situation and how to deal with it. The professional attention from the department board is mentioned with appreciation in all cases, but at the same time it is pointed out that this attention should also extend to the wider circle of colleagues who can provide important support to those involved.

1.6 Feeling of hopelessness.

I am not busy anymore with my career, but with struggling to stay afloat.

The perception is that nothing changes, you need to be loud to be heard.

If things don't change, I will leave.

Promotion depends on securing money, I cannot become UHD without securing a big grant, so I'm considering leaving to see what my opportunities are elsewhere.

Good teaching and good research do not seem to be enough anymore.

We have stopped giving feedback because there is always an answer.

I have no idea what is expected of me, and what I can expect from the department. Teaching another course, and another one?

Many employees expressed a certain sense of hopelessness ('uitzichtloosheid') because there is no prospect about how to get out of the current situation. There is a lot of complaining that leads to cynicism and feelings of powerlessness ('onmacht') and despondency ('moedeloosheid'). There is a lot of frustration about how things are going, the perspective on 'what to do next' is missing. Young assistant professors who feel constrained in their career development struggle with their feelings of loyalty to the department and some even talk about possibly leaving the department if other career opportunities present themselves.

Part 2. What are my observations?

2.1 Atmosphere.

Pace. The general dissatisfaction with what is or is not happening in the department has increased since the last changes in the department board. The feeling of stagnation started during the period of the previous dean and has not changed since the appointment of the current dean and the new managing director. The general feeling is that the department is at a standstill. The rate of increase in the feeling of dissatisfaction about this is high. This largely determines the atmosphere in the department. There is resignation ('gelatenheid'), apathy and negativity among a significant part of the scientific staff and support staff. People hardly speak to each other about this, it only seems to reinforce itself, especially because there is no prospect of how things should proceed.

Pride and loyalty. The feeling of pride in the department has decreased in recent times. Previously, there were genuine feelings of pride and visible drive among the members of the scientific staff and the members of the support staff. Now this drive has also lost, and people speak more of loyalty to the department. Drive with perspective knows no bounds and allows the department to flourish, but loyalty without perspective has an end date and ultimately pushes people to their limits.

The bigger picture. The decreased sense of pride in the department also stems from the lack of insight into 'the bigger picture', as some department members put it. It is only loose sand, and what are we doing it for, the feeling of 'us together' is missing, are the statements that are made. The latter touches on what both young assistant professors and part-time professors in particular wonder: what is the common story that the department stands for? Both groups, young assistant professors who have only recently joined the department and professors from industry, look from the outside in and ask themselves: what is the common goal, what does the department as a whole stand for? In the times of larger organizational bodies, such as DPI, NIOK, OSPT, the story was clearer and there was more coherence between the research groups, which was further supported by the role of the chemical industry as an active and visible partner of the department. Now the situation is different, the position of the chemical industry has changed significantly, and it is also less clear what the research groups collectively stand for. The feeling is that there is now more focus on the daily business ('op de winkel passen'), with the department focusing internally, without clear goals and beckoning prospects ('wenkende vergezichten'). Young scientific staff members in particular point to this. This also indicates an essential aspect that the new generation considers important in how they experience their work, which is freedom and meaning ('zingeving'), also in relation to the balance between work and private life.

What do we stand for together? An aspect that also plays a role in this is that there are no longer leading figureheads ('boegbeelden') in the department who take the lead nationally and within the TU/e and thus also push the department forward. This creates the impression, especially among the young staff and the part-time professors, that the department is composed of a collection of professionals of high scientific stature who each go their own way without joining forces to jointly tackle the major societal challenges. There is a great need to answer the question: what does the department stand for, what do we collectively stand for, and therefore also the questions related to this, what is our place within TU/e, and where does TU/e stand?

Communication. The overall feeling of dissatisfaction, and therefore the atmosphere in the department, is also reinforced by the communication experienced by many as very poor at all levels in the department. This varies from repeatedly cancelling the meeting of the professors' council ('hooglerarenberaad'), resulting in no information being provided to the professors and to the 'capaciteitsgroepen', to prolonged and repeated failure to respond to questions and emails

addressed, for example, to the department board. This means that there is little transparency experienced, there is little clarity about what is going on in the department, and there is little or often no explanation of decisions made or the lack of decisions. The feeling is that one is not involved, management is top-down, without adequately and regularly informing the department employees.

2.2 CPT cluster.

Support. The confidence of the professors in the Chemical Process Technology (CPT) cluster in the department board has virtually disappeared. One of the important reasons for this is that the CPT professors do not experience support from the department board in tackling the problems facing the cluster. The feeling about the lack of this support has now led to there being hardly any communication between the CPT professors and the department board. There is a lot of mutual misunderstanding, and the CPT professors feel abandoned and left to themselves.

[N.B. Formally, the capacity groups of the dean and the vice dean belong to the CPT cluster. In practice, however, they are not an active part of the consultation between the CPT professors. This is mainly due to a substantive reason: the fields of research of the dean (materials for separation processes) and the vice dean (materials for catalysis) are relatively far removed from the research fields of the other CPT professors which are much more directly part of the classical field of chemical engineering. In the remainder of this document, therefore, by “CPT” I mean the professors in the cluster without dean and vice dean.]

Workload. The professors and assistant professors in the CPT cluster experience an enormous work pressure. This relates in particular to the large amount of education that is provided by the CPT cluster. This education load is taken care of by only a small number of (assistant) professors. A few of these staff members also teach a relatively large number of courses, making it particularly difficult for them to bear the workload. As a result, assistant professors hardly get around to writing research proposals themselves and are largely dependent for their research program on the professors in the group in which they work. Two professors in the cluster have been appointed for 0.5 fte each as education director and director of the PPD program. Fulfilling these responsibilities further limits the educational capacity of the cluster and therefore contributes additionally to the workload. The large CPT teaching burden is recognized and confirmed by the other professors in the department who advocate that the department board gives priority to solving this problem.

Plan. Some time ago, the department board asked the CPT professors to plan for the future of the cluster. This has been responded to by presenting the *Future of CPT @ TU/e* plan, which calls for the filling of at least seven new positions in the CPT cluster. However, the department board has not followed up on this plan and consultation on this with the CPT cluster has therefore come to a standstill. The reason for this, in my impression, is that the department board has not provided any real and clear organizational, substantive and financial frameworks for this plan. The plan therefore seems to assume unlimited financial resources, which of course does not correspond to reality. It is also a shortcoming that the plan is only limited to filling positions in the department CEC, while the field of process technology is covered much more broadly in the university (departments ME, EE and IE&IS), which is not referred to in the plan. As a result, a broader future-oriented TU/e perspective for the area is lacking and the plan only focuses on filling positions in the CPT cluster. This provides too limited direction, meaning the plan does not offer a long-term solution. The assistant professor positions may contribute to reducing the workload in the cluster in the short term, but they lack the perspective for implementing a future-oriented TU/e-wide research program and contributing to an associated innovative educational program.

PPD. The department provides the 2-year technological designer program Process and Product Design (PPD). A large part of this program is carried out in the CPT cluster. The influx of PPD students has decreased in recent years, which has raised questions in the department about the efficiency, the feasibility and the financial situation of the program. The doubts that have arisen about this among the department board have recently led to a conflict with the director of the program. This is not good for the image of the program. It would therefore be good if the department board and the PPD director jointly plan for the future of the PPD program. This can be done by a) requesting the usual quality review from the Dutch Certification Commission for Technological Designer Programs (CCTO), b) evaluating the industrial and societal support for the program by questioning the industrial advisory council about this, and c) developing different financial scenarios. Through the joint evaluation of these three points by the department board and the PPD director, in consultation with the Dean of the Graduate School, a balanced decision can be made about the future of the PPD program.

Viability. At this moment I consider the viability of the CPT cluster to be sub-critical. There is a real business risk due to the high teaching load, possible dropout or departure of staff members, the small number of staff members who teach a large number of courses, the uncertain situation of the PPD program, the lack of a resilient CPT future plan, and the disrupted working relationship of the CPT professors with the department board. In part 3 (section 3.3.1) I propose to ask a team to draw up a plan for the field of chemical engineering within TU/e. Accommodating a TU/e-wide chemical engineering cluster in a new Faculty of Engineering (section 3.3.4) can be an important step in offering the CPT cluster a future-oriented position within TU/e.

2.3 Young staff.

Potential. I am impressed by the potential of the young academic staff in the department. While the current reputation of the department (within TU/e, nationally and internationally) is mainly based on the track record of the over-60s in the department, the young staff of the department has a lot of quality to look at the future of the department with confidence. However, the department will still have to take the necessary steps to this end (section 2.5). At the moment, the potential of the young staff is not being sufficiently addressed. The young staff generally do not or hardly feel heard, experience little involvement in their (career) development, and do not always feel taken seriously. They experience that a lot is arranged top-down, or is not arranged at all, causing uncertainty about rules and procedures, which is seen as arbitrariness. In general, the young assistant professors who have been appointed in recent years (0-5 years) feel at home in their own research group and feel supported by the professor in whose group they work.

Workload. The subject of workload was discussed in almost all conversations with the assistant and associate professors. In section 2.2, much has already been said about this specifically for the CPT cluster. Almost all assistant and associate professors experience great pressure to obtain research grants and to meet the teaching demands of the department, which sometimes leads to concerns about the balance between education and research. In some cases, the high workload also has consequences for the quality of the supervision of graduate students and PhD students. For example, some groups have many PhD students, whose daily supervision lies with young assistant professors who do not always have sufficient time for this if they also have to shape their own research program in addition to teaching. It therefore does not help if it is not clear how responsibilities are allocated when assigning education to capacity groups and individual assistant professors. In addition, the current generation of university employees places much greater demands on work-life balance than previous generations, which in some cases leads to extra stress and unwanted work pressure. Everyone feels it crack. For many, it is a search for how to deal with this, with little attention from direct colleagues and little support from the department.

Feedback. Everyone needs feedback and reflection on their own performance at regular intervals. This certainly applies to the young academic employees in the department who are at the start of their academic career or who are thinking about the next steps in their academic career after having worked in the department for a number of years. It is therefore worrying that not all young employees have an annual appraisal ('jaargesprek'). Those to whom this applies explicitly express their need for this. This involves recognition of their qualities and awareness of areas for improvement, attention to performance, reflecting on ambitions, and recording agreements. In addition, some of the young employees express the need for mentoring and coaching opportunities. The department has only one thing to do: actively facilitate this need and ensure that the annual appraisals take place!

Uncertainty. In almost all conversations with the young staff members at some point a cry was expressed for clarity about the rules and procedures in the department career policy. It is unclear what the requirements are for promotion, where what is recorded by whom and when, who takes the initiative in appointment procedures, what the role is of the professor or head of the capacity group, the dean, the UHD committee, etc. Then there is also the lack of clarity about the implementation of the PI policy. Here too, the department has only one thing to do: provide this clarity in the career policy as quickly as possible (see also paragraph 2.5 and paragraph 3.2.1)!

Generations and cultures. My conversations with the members of the department community, from people in their 20s to being in their 60s, made me once again aware that the university is the home of many different generations, from baby boomers to the Einstein generation. While solidarity is felt between peers in the same generation, there can at the same time be major differences in values, beliefs, expectations, habits and behavior between members of different generations. These differences partly determine how hierarchical relationships, leadership style, way of dealing with each other, individual development, taking responsibility, work attitude, giving meaning to one's own actions, meaning in work and the balance between work and private life are viewed. In addition, the department community has people of different nationalities who bring their own experiences and cultural background. Dealing with different generations and cultures requires leadership at all levels in the organization that can connect, support and inspire people (M. Risseuw, Zo-XI, 2011). This is about becoming aware of the similarities and differences between colleagues, other employees and managers ('leidinggevend') and about an honest conversation about each other's ambitions, preferences and expectations. It requires the ability to empathize with the situation and feelings of others, the recognition of the differences that exist, and respect for each other's views.

2.4 Management support and services.

Uncertainty. I also start this paragraph with the heading of 'uncertainty'. In this case it concerns the lack of clarity that was often mentioned in my conversations with department members about the rules and guidelines that seem to be missing in many areas in the department and university in relation to management support and central services. There are often no underlying documents in which agreements are recorded and administrative procedures are often insufficiently documented. In addition, in the experience of many, there are quite a few *ad hoc* agreements in which matters are arranged without a clear motivation. This gives the feeling of arbitrariness, with privileges that would only apply to a few without verifiable agreements on which they are based. Employees point out that the necessary clarity must be provided in this regard, without limiting the speed and the efficiency of management support and business operations.

Central services. Many express concerns about the permanent reorganization and significant growth of the central university services, which has also taken up a growing share of TU/e resources in recent years. It is often unclear what is arranged where and who can be held accountable for what. Sometimes responsibilities are assigned to several central services, and partly also to the department,

for example when it comes to building-related matters, so that everyone points fingers at each other and no one takes the lead and progress is delayed. There is the feeling that people are often asked to do a trick for a central service, without it being clear what the purpose is, after which nothing is ever heard again or there is no concrete follow-up to the procedure followed. Many people therefore question the professionalism of the central services. That is a worrying development. It is always preferable to organize the support of the primary process as close to the work floor as possible. Perhaps an obvious statement, but no less true. Good coordination between what can be done centrally and what needs to be done locally is in everyone's interest and can prevent a lot of friction and unnecessary work.

Finances. The department has been operating at the limits of its financial capacity for many years. In recent years, the department has still managed to present a (more or less) balanced budget due to its great success in indirect and contract funding ('tweede en derde geldstroom'). Sector plan resources and ERC grants in particular appear to be a necessary source of financing. External resources are also used where possible to finance the basic costs of laboratories, equipment and additional building costs, leaving virtually no room for necessary investments in new infrastructure. The department's financial capacity cannot be stretched much further. Growth of the department in student numbers does not provide substantial additional resources due to the position of the (small) department CEC within TU/e and the priorities in the central financial distribution model. The department has an expensive research infrastructure, expensive laboratories that are also used for educational purposes, and a building capacity that is no longer possible to grow. This means that the critical mass and flexibility for facilitating changes and expansions have become very limited. This largely determines the limited ability of the research groups to accommodate their research infrastructure, with the new groups in particular having difficulty setting up additional laboratories or even fume hoods. This requires the willingness of research groups to share space with each other and an active, coordinating and guiding role by the department management and business operations ('bedrijfsvoering'). In addition, building-related obstacles to collaboration with other departments, such as with the department BME, must be removed.

2.5 Career development.

Career policy. The department lacks a clearly formulated career policy for assistant professors and associate professors. There is no clear document in which the guidelines and requirements for promotion are formulated. The PI model has not been introduced in the department. There are documents about the PI model, including a document drawn up by young staff members, but nothing has been done with it. There was also no follow-up to the discussion about PI policy during the last research day. This means there is no clear perspective for career development of the young staff. One does not know where one stands. That is of course a situation that is undesirable and is no longer sustainable. In part 1 I provided quotes from young staff members who mention this situation, with some indicating that they may consider continuing their careers elsewhere if there is no clarity about the career policy.

Hoop. Almost all young staff members state that in their experience there is only one criterion for promotion to associate professor, namely obtaining a prestigious (personal) grant. They experience this as having to jump through a hoop held up outside TU/e by third parties (NWO, ERC). If they are successful, they may be promoted to associate professor. If they are not successful, they will continue to struggle in the same way as assistant professor. A number of young staff members indicate that they experience this as a bad development, because it does not do justice to their entire academic portfolio of research and education, in addition to possible valorisation activities. The current situation and organization of the department mean, and have done so for many years now, that young employees are largely dependent on others in the research group in which they work for obtaining and participating in research projects. However, they also contribute their own expertise,

which the research group uses and from which it benefits, and why the young scientist was recruited in the first place. In short, justice must be done to the complete package that a young employee has to offer and not just to her or his success at NWO or ERC. In addition, the requirements and expectations for career development should be clear and well communicated at the start of an appointment.

Career paths. In line with the previous paragraph, there is also uncertainty among assistant professors, and in many cases this is expressed in frustration and dissatisfaction, about which career paths can lead to promotion to associate professor. Nowadays, the perception among assistant professors in the department is that only a strong research portfolio (with a prestigious (personal) grant) is a condition for promotion. Assistant professors in particular who have been working in the department for a long time argue that a strong education portfolio should also be a condition for promotion. Various career paths should be possible, in addition to research and education, also one with a strong valorisation portfolio, in order to be eligible for promotion to associate professor. The national development on recognition and rewards also focuses on this. It would be good if the department CEC also did this and quickly provided clarity about this so that assistant professors who want to shape their education portfolio are also given clear requirements and expectations for promotion. By analogy, there should also be clear guidelines for associate professors who have the ambition to become full professor with an education portfolio.

Senior management. The department currently has a layered structure in the composition of the academic staff, which, viewed somewhat from a distance, consists of four layers. First of all, there are the young assistant professors (and one associate professor) who have been appointed to the department in recent years (approx. 0-5 years). Much has been said about this group in the previous paragraphs. They are searching, need clarity about expectations about their career, need feedback and guidance (mentor/coach). An ambitious group with a lot of potential. Then there is the group of slightly older assistant professors (and two associate professors) who have been working in the department for many years (5-15 years or more). They struggle with the career policy that I discussed in the previous paragraphs. They provide a lot of education and contribute significantly to the research programs in the groups they are part of by supervising PhD students and graduate students. Sometimes they obtain research grants themselves, however they mainly use their expertise and experience in other research projects in the group. Then there are the professors aged up to 60, many of whom in the MSMC cluster come from the school formation around one capacity group. In the CPT cluster, this concerns professors who mainly come from one current and one former capacity group. These are professors who have developed or are still developing their own line of research and have now, to a greater or lesser extent, taken their own place in the department. Finally, there are the professors over 60 who will retire in the foreseeable future, but still fully participate in research and education. More than 15 years ago, the department also had the second layer of 'slightly older assistant professors', but at the time these were almost all associate professors. They were authoritative, had their own profile, mainly focused on education, but made an important contribution to the guidance of PhD students and graduate students, fulfilled a mentor role for younger assistant professors, had an exemplary role for younger colleagues and PhD students, and fulfilled a signalling role for the professors in their group and in the department. They formed a buffer in the organization, enjoyed great recognition of their position, could address colleagues based on their authority, and knew what was going on. This layer, the senior management as I call this layer, no longer exists in the current department. However, this senior management plays a crucial role in any organization, and certainly also in a knowledge-intensive organization of individual professionals, such as a university department. It would be good if this layer was given its own place in the department again. The potential candidates for this role as senior management are already there: they currently form the current group of 'slightly older assistant professors', who, as soon as they receive the necessary recognition and deserved appreciation, will fill this role of senior management with gusto. The department will benefit greatly from it!

2.6 Culture.

Involvement. Culture of an organization is about the habits, norms, values and behavior of people. In part 1 I already mentioned some aspects of this that came up in my conversations. One of them is about the lack of a shared sense of joint responsibility for the situation in the department. And related to that is the missing sense of ownership: it is my department, I am going to do something about it! Many lack involvement in the whole ('betrokkenheid bij het geheel') of others and also of themselves, of standing up for the department, and of having sincere attention for each other. Standing up for something and paying attention to others is not dependent on how a professor or manager behaves or on the functioning of the department board. That is something everyone can do themselves. Of course, genuine interest from others and a well-functioning management do help with this, but still.

Aftercare. In particular, employees who have been involved in one way or another in situations of social insecurity in the department indicate that aftercare, attention to each other, even after an incident has been handled, is important. If there is no feedback or interest is no longer shown, even after a longer period of time, employees may feel left alone. They still have many questions, even after a long time, and would like the opportunity to share them with others. Of course, the department board can facilitate this, but the colleague in the next room can also play a role in this. By just asking how things are going. Sometimes it is that simple. And of course, this is not just about the aftercare of situations of social insecurity. It is called collegiality. Helping and supporting each other when necessary.

To hold accountable. The previous point is related to the observation of employees that holding each other accountable for responsibilities and behavior happens too little or not at all. This involves applying standards of decency and discussing (socially) unsafe situations in an atmosphere of mutual trust. Who fulfils the role model and who has the authority to fulfil this role? If no one does this and no one takes up this role, a culture is created in which 'letting it go' becomes a habit and the consequences of unpleasant incidents drag on and unwanted behavior continues. It is important to discuss this with each other and not to wait. This conversation is often difficult and does not happen automatically. Those who are in charge sometimes may have to take the initiative in this.

Leadership style. Very different leadership styles are used in the capacity groups in the department. On the one hand there is the leadership style that is strictly hierarchical - the Christmas tree model - with the professor at the top and below that the assistant professors and below that the technicians and other support staff, and furthermore the PhD students and graduates. This style has strict reporting lines with strict rules about the organization of the work, planning of meetings, communication between employees, management of technicians and support staff, supervision of PhD students and graduates, and writing publications. This style is characterized by a structure in which the professor or capacity group chair often gives detailed assignments, and the employee then carries out those assignments and reports on them. On the other hand, there is the style that is based on facilitating, motivating, inspiring and coaching leadership - the flat model - in which the professor or capacity group chair fulfils the role that best suits the situation at that moment and best serves the employee. My observation is that the hierarchical model can sometimes lead to serious restrictions on the employee, where the employee does not feel the freedom required to handle his or her own responsibility and act accordingly. This hierarchical model therefore leads to limitations in the employee's actions that do not fit with, for example, the desired, independent interpretation of the role of an assistant professor. This leadership style is no longer appropriate in the current times and is therefore no longer appropriate in the department. This style therefore does not fit with the proposal I make for the organizational structure of the department with three clusters (section 3.2.2). It is therefore necessary to hold discussions with all professors of the current research groups and

capacity groups and all scientific employees about the interpretation of their roles in this new organizational structure.

2.7 Department board.

Credibility. The role of the department board has been discussed in almost all my conversations. In general, employees expect the board to mainly provide direction and formulate frameworks for policy making. However, this often appears not to be the case in daily practice. People generally consider the board to be invisible and it is not tangible what the board wants. This feeling is reinforced by the lack of targeted communication by the board about current affairs. As a result, it is unclear what is going on and there appears to be no urgency in handling files. There is too much discussion about proposed measures and proposed decisions. The department board mainly focuses on finding compromises acceptable to everyone and not on administrative decisiveness, which is sometimes attributed to inexperience. Sometimes the department board may want to do things too well for everyone, whereby the search for consensus takes a lot of time and gets in the way of decision-making, which ultimately serves no one. The lack of clear guidance, concrete decisions and smooth progress on important files puts the credibility of the department board at risk.

Decisiveness. Many find the department board hesitant and indecisive. The slow decision-making and lack of decisiveness ensure that the department is gradually coming to a standstill. The conversation is not about what the department stands for and where the department is going. This means that progress on important policy areas is stalling.

Faltering management operations. It is often mentioned in the conversations that management operations, represented by the department's managing director, are not sufficiently moving forward. No priorities are set, which means that many issues continue to drag on. People experience procedures as complex and opaque, which means that making decisions takes (too) long. As a result, employees experience the support to be far from the work floor. The pursuit of uniformity, transparency and standardization of procedures is, on the one hand, to be commended because it treats everyone equally, but on the other hand it also leads to irritation because of the limited progress, which risks losing sight of the fact that sometimes customization is needed instead of one size fits all.

Fulfilling of roles. There is uncertainty about the roles of the members of the department board. Who does what? What division of tasks has been agreed? What are the portfolios of the vice deans? Which responsibilities are assigned to whom? What mandate does the managing director have? These questions have no clear answers. As a result, employees go to both the dean and the managing director with questions about the same practical matters. As a result, the different roles become mixed, and it is unclear where the ownership of files lies. A consequence is that both dean and managing director are sometimes busy with the same matters without coordination. As a result, the dean has a full to-do list, which includes many points that actually fall under the mandate of the managing director. This does not promote efficient handling of matters. This can be significantly improved by agreeing on a division of roles and strictly adhering to it. I will discuss this further in the next part 3.

Part 3. And what now?

In the following sections 3.1, 3.2 and 3.3, I make concrete proposals for restoring confidence in the leadership in the department, proposals for the academic personnel policy in the department and for the organizational structure of the department, and proposals for the positioning of the process technology field and the materials field within TU/e, and for the organizational structure of TU/e.

3.1 Restoring confidence in leadership.

An important cause for some of the current problems in the department, as described in parts 1 and 2, is that the members of the department board do not strictly adhere to the roles they fulfil in the department board.

Entrepreneurship, leading, managing. In his book *Leiding geven aan professionals? Niet doen!* the Eindhoven organizational expert Mathieu Weggeman states that leading professionals in a knowledge organization has three parts: entrepreneurship, leading and managing. The entrepreneurship part is about ideation, making plans, formulating strategy, pursuing innovation, creation and renewal. These are important aspects of leadership that Weggeman considers to be part of the primary process in an organization. The professionals who work there are ideally equipped to fulfil the entrepreneurial role ('ondernemen'). The leadership of the organization only needs to pose the question to these professionals, and then the desired answer will automatically follow (if the frameworks and preconditions have been set correctly by the organization's leadership) that only the professionals can give (they are the experts), and which then only needs to be executed. The leadership of the organization delegates this implementation of the answer to the managers who 'manage', i.e., facilitate and take charge of the implementation and draw up the appropriate rules and guidelines for this. The leadership of the organization has done two things in this process so far: asking the questions to the professionals (entrepreneurship) and submitting the answers to the managers for implementation (managing). However, the leadership of the organization has also done something essential: it formulated the frameworks and preconditions within which the professionals can give their answers. In the further process of 'leading', the leadership of the organization limits itself to keeping a distance from the two other parts entrepreneurship and management (by delegating and mandating). It limits itself to the important task of walking around and talking to all those involved in order to connect, stimulate, inspire and motivate. In short, its role is to ensure that everything runs smoothly. So not substantive, but binding.

Division of roles. When we project this organizational view of Weggeman onto the department CEC, we get the figure in Appendix 2. The primary process of the organization in the department consists of education, research and valorisation activities. The professionals in the 'entrepreneurship' section are the members of the academic staff of the department. The leadership of the organization is the dean who occupies the 'leading' part. The dean therefore delegates all questions regarding education, research and valorisation to the members of the academic staff. In the case of education, the dean can also mandate the education director to do this (see below). I purposely limit the 'leading' part to only the dean. The department board also has a vice dean, or until recently two vice deans in the department CEC. However, the vice dean usually has a particular portfolio and therefore fulfils the same role as the dean. For the sake of simplicity, I will limit the 'leading' part to the dean who fulfils this role. The 'managing' part of the department is assigned to the 'bedrijfsbureau' where the department's managing director fulfils the role of manager, and to the 'onderwijsinstituut' where the education director fulfils the role of manager. The education director and the 'onderwijsinstituut' manage everything that concerns education. The managing director and the 'bedrijfsbureau' manage everything else. The dean mandates the education director and mandates the managing director to manage, and therefore does not have to worry about this herself. The dean only has to ensure that

everything runs smoothly by implementing the last aspect of the 'leading' part, which includes connecting, stimulating, inspiring and motivating, and above all: keeping a distance from what the education director and the managing director are doing. This makes the role of the dean clearly defined and framed. She refers all activities that belong to 'managing' to the relevant managers, which leaves her time to fulfil her own role.

Dean and managing director. By adhering to this strict division of roles, it is clear which responsibilities belong to the dean and which responsibilities belong to the managing director. The managing director can now independently set and implement his own priorities within the boundaries of his mandate, without having to return to the dean, which significantly increases his decision-making abilities.

For the managing director this means:

- Determine your mandate in consultation with the dean
- Make working agreements with the dean (what do you report on, and what do you not report on)
- Set your priorities (what to tackle first, what next, and what not)
- Pick your battles (what are you going for, what are you letting go)
- Take on your role as managing director ('managing')
- State what you need, from whom, and actively ask for it
- Take action on files that are still on your to-do list, clean up what has been left behind
- Communicate your decisions, explain what you are doing, and why you are doing it

And a similar list applies to the dean:

- Mandate the managing director, and document the mandate in clear wording
- Make working agreements with the managing director (what do you want to know, what do you not want to know)
- Take on your role as dean ('leading')
- Set clear frameworks and preconditions for 'entrepreneurship', limit yourself to the main points
- Leave to the education director what belongs to him ('managing')
- Leave to the managing director what belongs to him ('managing')
- Keep your distance from 'entrepreneurship' and 'managing'
- Communicate about what you do, explain what you do, and explain why you do it

I have not made a similar list for the vice dean. The activities of the vice dean are linked to a specific portfolio that the vice dean agrees and coordinates with the dean.

New administrative situation. Last July, the executive board decided to reappoint the dean and one of the vice deans for a period of 2 years. One of the vice deans has indicated that he is not available for reappointment. This has created a new administrative situation and also marks the end of the previous administrative period. This moment coincides with the publication of this report with my findings and advice. The recommendations in my advice have, as I mentioned in the Accountability section of this report, been adopted by the executive board and the department board has committed itself to this. The dean, the vice dean and the managing director can therefore immediately fulfil their roles in the department board as outlined in the previous paragraphs when implementing these proposals. Due attention will be paid to how the members of the 'new department board' take up and implement their roles. There is therefore a clear marker in time that, when looking back in a few months, should be recognizable as a turning point in the functioning of the members of the department board. This puts pressure on the performance of the dean, vice dean and managing director, which comes under a magnifying glass. This is a logical consequence of the situation that has arisen in the department in the last period. However, this new situation also offers new opportunities for the members of the department board and department members to work

together from this moment on. Only then will there be room to restore confidence. There is no other way forward at this point. It is important that all involved are fully aware of this.

3.2 Offering perspective.

3.2.1 Team 1: shaping career development & PI policy.

Composition of team 1. During my conversations it became apparent that there is a great need for a clear perspective for academic career development, especially among the young scientific employees in the department (section 2.5). The department currently lacks a clear policy for this. It is necessary that this is clearly formulated and fully documented, with all aspects associated with it. I therefore propose that the department board appoint a team to implement this. It is important that the young employees to whom this policy applies are represented in this team, so that they can provide their input and actively help shape the policy. In addition, this team 1 has a chairman (professor) and a secretary (HRM representative).

TU/e-wide scientific personnel and PI policy. During the presentation of my findings and advice to the executive board on July 11, the rector indicated that she intends to re-examine the academic personnel and PI policy within TU/e and wants to unify and document it TU/e-wide. This will create one joint and uniform TU/e policy for the career development of academic staff, including the PI policy. I warmly welcome that. The rector takes the initiative to set up a TU/e-wide committee to implement this. Team 1 will implement the results of the work of this TU/e-wide committee and focus on the situation in the department. I propose that the chairman of team 1 takes a seat on the TU/e-wide committee.

PI policy: not from scratch. Team 1 will not have to start from scratch to shape the PI policy in the department. Team 1 will first use the results of the TU/e-wide committee. In addition, two documents are already available that team 1 can also draw from: i) the *Position paper – the scientific staff at TU/e* (September 2017) by Bert Meijer, and ii) the memo *Recommendations Think Tank of young staff CE&C* (March 2021) of five young scientific employees from the department. These two documents together form an excellent basis for describing the role and position of the Principal Investigator as part of the scientific personnel policy in the department. I propose that the chairman of team 1 submits both documents to the TU/e-wide committee as a basis for the TU/e-wide policy.

Position of scientific employees. A key point from both PI documents is that justice is done to the scientific position of young employees when it is separated from their organizational position. This means that the extent to which, for example, an assistant professor independently completes and showcases her or his scientific profile is independent of her or his position in the research group in which she or he participates. Discussions should therefore be held here with all scientific employees about the scientific position they aspire to and what degree of independence is appropriate for the phase of their career they are currently in. This conversation is also about reciprocity: what do you come to get, what do you bring; what do you take with you, what do you add; what does the group take care of, what do you arrange yourself; do you act in the group or operate independently; are you mainly part of the team, or do you act more as an individual? This is an essential conversation that helps shape the structure of the group and that of the cluster of which the employee is a part. This conversation takes place at regular intervals so that it is continuously assessed whether the ambitions and expectations of the employee and those of the group are still being met. It is tailor-made. Building together the individual career of the employee and the collective strength of the group.

Personnel policy: recognize and reward. Since 2019, the document *Room for everyone's talent – towards a new balance in the recognition and rewards of academics* has been the starting point for formulating academic personnel policy at Dutch universities. It is now high time that this is

implemented at TU/e and in the department CEC. Waiting longer is not an option, as that does not do good to the young scientific staff members of the department, who have waited long enough!

Own career path. The core is that the recognition and rewards of academic employees is based on their own unique academic qualities. This does not only concern qualities for conducting scientific research, but here the full range of qualities is explicitly meant. In addition to research qualities, this concerns qualities in the field of education, qualities for realizing impact, and leadership qualities. Criteria must be developed and applied for the design of career paths for assistant and associate professors based on each of these four qualities, or combinations thereof. These career paths are equivalent, and each offer their own opportunities for promotion from assistant professor to associate professor to professor on the basis of their own characteristic academic profile. These profiles will often include combinations of qualities, for example research and impact, or education and leadership. Discussions must therefore be held with all academic employees about the interpretation of their own academic profile, about the design of their own career path, and about the development of the individual qualities required for this. This is also custom work. The conversation will be about ambitions and competences: what do you want to achieve, what are you good at; what knowledge, skills and attitudes do you have, or which do you want to develop further? This again in the light of reciprocity: what is necessary for one's own development, and what is necessary for the functioning of the group.

Development of leadership talent. When designing career paths, ample attention should also be paid to the development of leadership talent. Young staff members who have the potential and ambition to grow into future leadership positions in the department or university must be identified and encouraged in a timely manner. In this way, young employees can be prepared for positions as cluster leader (section 3.2.2) or education director. The university currently lacks this specific career planning, which means that too many important leadership positions in the departments are filled on an *ad hoc* basis. This means that at present there is a shortage of people who take on these responsibilities and the university misses opportunities. Participating in and filling management positions in national and international science organizations also requires the necessary leadership qualities for which employees can be specifically equipped. Attention must also be paid to the diversity in the international background of the staff and the implications of this for taking up positions in department boards and other leadership and management roles.

Document and record. It is important that what is discussed and agreed in the aforementioned conversations about the career development of employees, in addition to the regular annual appraisal ('jaargesprek'), is properly recorded and documented. So, career development agreements are properly established, and progress can be monitored. This provides a good basis for a follow-up discussion. Open, honest, clear and not without obligation. Discussions certainly do not only have to take place with the professor of the group, but sometimes preferably also with several people involved (e.g., professor from another group, or the education director), so that all relevant aspects can be discussed, and the outcome is widely supported and not without obligation.

Promotion procedure. It is important that the procedure and criteria for promotion of a scientific employee are communicated clearly, preferably when the employee is appointed. There must be clarity about who is making the promotion proposal. In other departments, a procedure is used for this whereby this promotion proposal can be made not only by the professor of the group that the employee is in, but also by the employee her or himself. To this end, the employee sends her or his portfolio to the dean, who then submits it to an assessment committee that assesses this portfolio confidentially and provides confidential feedback on this to the employee only. He or she can then decide again whether or not to continue the promotion procedure, depending on the comments of the assessment committee. If the employee decides to continue the appointment procedure, the dean will submit the portfolio to the appointment advisory committee (UHD committee). With this

uniform procedure, the initiative in the promotion procedure is separated from alone the subjective judgment of the professor of the group the employee is in. I would like to propose that this uniform approach is also part of the promotion procedure in the department CEC.

Appointment advisory committee. There are different variants of the working method and composition of appointment advisory committees (in department CEC: UHD committee) at the TU/e departments that provide advice to the dean on the possible promotion of academic employees. I assume that the TU/e-wide scientific personnel policy committee, to be established by the rector, will make proposals for the working method and composition of this appointment advisory committee, which can then be adopted by team 1 for the department. It is important that there is a uniform and transparent working method that is used in the same way for all scientific employees.

Catching up. In my impression, there is room for a catching up effort in the department with regard to the promotion of assistant professors to associate professor. This is certainly the case when looked at from the perspective of the different academic career paths (as described above). I therefore propose that a catch-up effort be made whereby the department board sets up an assessment committee that confidentially assesses assistant professors' portfolios and provides advice, in accordance with the procedure I have outlined above. Assistant professors can confidentially submit their portfolio to this assessment committee via the dean and then decide for themselves whether they want to submit their portfolio via the dean to the appointment advisory committee (UHD committee), and thus initiate the promotion procedure themselves.

Timetable for team 1. I propose that the department board set up team 1 in September, so that this team can get to work immediately, as much as possible simultaneously with the TU/e-wide committee to be set up by the rector. In the period September - December, team 1 can carry out an important part of the work, after which (gradual) implementation of the new academic career and PI policy can take place from January 2024.

In conclusion 1. I would like to conclude with two comments. This section 3.1 on academic career and PI policy is essentially about how the department and the university deal with academic talent. In many cases, a one-sided approach is used, in which academic talent is mainly interpreted on the basis of the following characteristics (Rathenau Institute, 2014): -has acquired prestigious (personal) grants, -has published extensively, -is able to work hard, -is ambitious, -is creative, -has a wide scope, -has international experience. These are certainly useful characteristics that can help track and assess academic talent. These are hard and partly measurable characteristics that invite candidates to be measured against a benchmark. In addition, academic talent is also characterized by other characteristics, less measurable, but very recognizable as soon as they manifest themselves (Rathenau Institute, 2014): -builds upon social, professional and individual capital, -has excellent communication skills, -has ability to motivate others, -fits in a team, -has leadership potential. In the selection and assessment of academic talent, we are usually guided mainly by the first set of characteristics, while the second set is equally decisive for the successful functioning of an academic employee. It is not one or the other, but rather both, one and the other to a certain extent. When recognizing and rewarding the qualities of young scientists, both sets of characteristics should therefore be assessed equally.

In conclusion 2. This section 3.1 is about how the department and the university deal with the most important capital of an academic institution: the people who work there. Without wanting to be too moralizing, I will mention here three adages that I would like to propose as a guideline in organizing academic personnel policy:

1. value your people – they are all you got;
2. talk to each other – communicate;
3. look after one other – just like you do everywhere else.

3.2.2 Team 2: implementing 3 clusters & setting up management team.

Capacity groups. The department currently has two thematic clusters, namely the Chemical & Process Technology (CPT) cluster and the Molecular Systems & Materials Chemistry (MSMC) cluster. These clusters are not organizational units. They do play, however, an important role in the design of the master's education in particular. The capacity groups ('capaciteitsgroepen') are the formal organizational units in the department. Capacity groups are led by a capacity group chair with legally established tasks and powers. The size of the different capacity groups in the department varies greatly. There is one capacity group with one scientific employee, a professor who is also the capacity group chair. In addition, there are a number of capacity groups with two academic staff members, a professor and an assistant or associate professor. And then there are the medium-sized capacity groups with several academic employees, including a professor and two or more assistant professors. Finally, there is one large capacity group with several professors and assistant and associate professors, with one of the professors acting as capacity group chair.

Evolution. This organizational structure with many (smaller) capacity groups has evolved over the years. After the promotion of a scientific employee to professor, a new capacity group was formed for the new professor, who then independently developed her or his own group. Professors who came from outside the department were given their own capacity group. In most cases, the department board subsequently allocated a vacancy for an assistant professor to the new capacity group. As a result, the department CEC now has 14 capacity groups, with an average of three scientific employees per capacity group.

Community of practice. In addition, there are other organizational structures in which scientific employees have united within the department, and also across department boundaries, in which they collaborate on scientific themes and share technicians, support staff, facilities and laboratories. In fact, there are two such organizational structures that can be recognized in the department. One in the MSMC cluster that includes multiple capacity groups. And one in the CPT cluster that coincides with one large capacity group. These are not formal organizational structures, but they do play an important role for the participating scientific staff as an informal way to collaborate. In fact, they form so-called communities of practice. A community of practice can be seen as a recognizable group of scientific employees who organize themselves around a number of related scientific disciplines. Within this group, the affiliated members work together to develop and apply scientific theories, models, methods, techniques, tools, instruments and devices. Appendix 4 provides a number of criteria that can be used to further characterize a community of practice. I formulated these criteria years ago, together with a former fellow dean, for organizing TU/e into research areas (OGB), comparable to the two informal organizational structures I mentioned above.

Benefits and burdens. In a community of practice, the motivations and ambitions of the members determine the topics on which they collaborate. There is often informal leadership that is provided by one or more of the participants and that is aimed at encouraging, supporting, inspiring and coaching the participants in the community of practice. The participants often decide jointly which responsibilities they assign to the community of practice, with individual members being assigned ownership of carrying out the associated tasks or ensuring that these tasks are carried out by others. The informal leader is often responsible for the coordination of activities and for the representation of the community of practice to the outside world. It is a powerful collaboration model that balances the benefits and burdens for the participants. The participants contribute their own skills, expertise and experience, and get a lot in return, namely that of the other participants. Participants work together to submit research proposals and jointly ensure the acquisition of resources for facilities and equipment. The maintenance and technical support of equipment is shared, and priorities are determined together.

Three clusters. I see important advantages in shaping the organizational structure of the department CEC in accordance with the principles of the community of practice as a collaboration model. I propose to set up three clusters, in fact three communities of practice, which I now refer to as clusters. The 3-cluster model is not new. It is mentioned in the *Blueprint Department Chemical Engineering and Chemistry 2022-2032*, and the *Research Review Committee* also mentions the possible design of a “third domain” in the evaluation report (December 2022). In my advice I present a cluster as a formal organizational unit in the department. It could of course also be set up as a capacity group, in which case there would be three capacity groups in the department, but I adhere to the name 'cluster' to indicate that it is something different from the current capacity groups. The number of three clusters is of course not sacred. If the criteria in Appendix 4 were strictly applied, it could well be the case that multiple communities of practice, or clusters, would be possible. However, the number of three clusters seems to me to be the most appropriate at the moment, but above all also the most practical and workable in the department.

Molecules, materials, processes. I propose to set up three clusters: the molecules cluster, the materials cluster, and the processes cluster. I do not want to elaborate here which scientific employees could be part of which cluster. I would like to pass this on to team 2 (see below), which will take care of development and implementation of the 3-cluster structure. And the names of the three clusters can of course also change, I also leave that to team 2. It may be obvious to classify all scientific employees of the current CPT cluster in the new processes cluster, except for the scientific employees of the current capacity groups Inorganic Materials and Catalysis and Membrane Materials and Processes, these can become part of the new materials cluster. Which scientific employees from the current MSMC cluster could be accommodated in the new materials cluster is also up to team 2 to determine in consultation with all those involved. The clusters form the home of the scientific employees. Their specific place in the cluster is in line with their own career path. The clusters therefore have a diverse range of academic positions that are subject to change due to the personal development of the individual members.

Team 2. I propose that the department board set up a team 2 with the task of developing and implementing the 3-cluster structure. In addition to an independent chairman, three members of the scientific staff, one from each of the planned clusters, are part of team 2. Furthermore, the managing director is member of team 2, in addition to a secretary. The management director specifically brings management and operational expertise to team 2, which is important for the development of the (legal) organizational structure of the clusters, the working methods of the clusters, which business aspects are assigned to the cluster (finance, HRM, safety, etc.), and for the description of the mandate and powers of, among others, the cluster leader.

Cluster plans. Team 2 will also draw up the framework for the cluster plans that the clusters make every year and which form the basis for the consolidated department budget. The cluster plans describe the vision, goals and future prospects for the cluster, what is needed to implement this (such as scientific disciplines, bachelor's and master's education, technical support, laboratories and infrastructure, scientific and industrial collaborations, etc.), which scientific employees will take care of this (formation plan), what it will cost (cluster budget) and what multi-year investments are required.

Working method cluster. Each of the three clusters is assigned the necessary responsibilities for scientific personnel policy, the bachelor's and master's education that the cluster provides, the support staff including technicians, the cluster's finances and budget, and other relevant matters such as safety. The department board appoints a cluster leader in each cluster with her or his own tasks and powers. The cluster leader may delegate the performance of certain tasks to members of the scientific staff and support staff in the cluster. This concerns, for example, the coordination of

technical support and the construction of experimental setups for all groups in the cluster. The cluster leader is responsible for regular joint consultation between the members of the cluster on current matters, including personnel policy, career development, technical support, education and safety. The cluster leader coordinates educational matters that concern the cluster with the education director and his employees from the 'onderwijsinstituut'. At least once a year, the cluster leader discusses the cluster plan in a joint meeting of all scientific employees in the cluster.

Management team. The three cluster leaders, together with the dean and the managing director, form the management team of the department. The department board consists of the dean and the management director and the permanent advisors, namely the education director and the student representative. The management team prepares the decisions that are taken in the department board. The preparation of the agenda for the management team meetings and the preparation of decision-making in the department board are the responsibility of the managing director and a board secretary who is also secretary of the management team. The role of vice dean will therefore no longer apply. The management team meets every two weeks and discusses relevant current affairs in preparation for decision-making in the department board. In addition, the management team annually discusses the cluster plans of the three clusters in preparation for the consolidated department budget. This is an important task of the management team, which involves coordination between the cluster leaders on personnel policy (cluster formation plans: vacancies, appointments, promotions), education (filling of bachelor's and master's subjects and courses, allocation of teachers to subjects and courses), finances (cluster budgets: personnel costs, equipment, investments) and other relevant matters from the cluster plans.

Role of the dean. The role of 'leading' the department in this 3-cluster structure is vested in the dean and the three cluster leaders in the management team (appendix 3). The dean delegates tasks and authorities to the cluster leaders, each of whom can delegate part of these tasks and authorities to the members of the scientific and support staff in the clusters. In addition, the cluster leader, or the employee in the cluster who has been mandated by the cluster leader, consults with the managing director and his employees from the 'bedrijfsbureau' about personnel, finances, safety and other management matters. This means that responsibilities and associated tasks and authorities are placed low down in the department organization, in the clusters, where they belong. The dean mainly monitors the constructive consultation between the cluster leaders in the management team and ensures that all relevant aspects of the topics discussed are addressed. In cases where no agreement is reached between the cluster leaders, the matter can be escalated to the dean.

Timetable for team 2. I propose that the department board set up team 2 in September, so that this team can get started immediately. In the period September - December, team 2 can carry out an important part of the work, after which (gradual) implementation of the new 3-cluster structure can take place from January 2024.

Finally, 1. In the above I have certainly not mentioned all relevant aspects for the design, implementation and working methods of the clusters. Team 2 has the task of further substantiating this.

Finally, 2. The 3-cluster structure enables that employees speak to each other again outside the boundaries that have often been erected, consciously or unconsciously, between the current capacity groups. There is a joint responsibility for the course of events in the cluster and in the department. Facilities, technicians and other support are shared and not claimed. There is attention for each other's needs, concerns, interests, social safety and workload. Collegiality and involvement in each other's affairs are key concepts and partly determine everyone's well-being. Here, in a broader context than just academic personnel policy, it is also about recognizing each other's personal qualities and expressing sincere appreciation for each other's individual efforts.

3.3 Working on the future of the department within TU/e.

Succession of three chairs. Part of my advisory assignment is to advise on the possible succession of three professors in the department who will retire in the foreseeable future and who currently occupy three important chairs in the department. The discussion about their possible succession and the filling of new chairs will have to take place in the new clusters. This does not specifically concern just these chairs, but rather a total picture of the future of these three clusters as communities of practice (viz., vision, goals, new scientific directions, required disciplines, formation plan). This extends much further than just the direct succession of these three professors. The cluster plans will have to give concrete substance to this, so that the financial consequences can also be assessed and included in the department budget. The designation of possible new chairs extends beyond just these three clusters, and directly affects the involvement of other departments (molecules: BME; materials: AP; processes: ME, EE). The cluster plans will have to take this into account.

Cluster molecules. In the planned molecules cluster, far-reaching steps have already been taken with regard to the succession of one of the three professors. And recently further strengthened by the appointments of two BME professors in the department CEC. In addition, the activities of the planned cluster molecules are closely linked to the Institute for Complex Molecular Systems (ICMS), with which the necessary coordination will have to take place. The existing practice and further ideas about the design of this cluster can be immediately incorporated into an initial cluster plan. This is different for the materials and processes clusters and further actions are therefore required for these clusters first. I make proposals for the processes cluster in section 3.3.1 and for the materials cluster in section 3.3.2.

3.3.1 Team 3: setting up chemical engineering within TU/e.

Needs. In section 2.2 I described the specific needs of the current CPT cluster, which largely coincides with the new processes cluster. I indicated in section 2.2 that a broad approach is needed to achieve a sustainable solution that looks beyond just the size and position of the current CPT cluster in the department. In recent years, the size of the scientific staff of this cluster has decreased significantly. The request from the CPT cluster to appoint a number of assistant professors, preferably immediately, in the current capacity groups in order to alleviate the needs of these groups (work pressure, education, supervision of graduates and PhD students) will meet these needs in the short term, for a while, but will not provide any relief in the long term.

Future-proof plan. There is a need for a future-proof plan that includes the position of the current scientific employees in the CPT research groups. This plan will have to be formulated TU/e-wide for the field of chemical engineering that is not only implemented in the department CEC, but also by research groups in the Mechanical and Electrical Engineering departments. One of the CPT professors will retire in the foreseeable future. The question has been asked whether he should be succeeded. The answer to this question can only be given within the context of this TU/e-wide plan for chemical engineering. For example, it can already be stated that part of the scientific research and education provided by this professor's group will continue through the current three assistant professors in the group, while part of the research has in fact already been invested at a research group in the Mechanical Engineering department. This once again argues for a TU/e-wide plan in which these aspects are considered before a decision is made to fill new positions in the department CEC.

Team 3. I propose that the rector, together with the deans of the departments CEC, ME and EE set up a team 3 that draws up a TU/e-wide and future-proof plan for the field of chemical engineering. This will include themes such as sustainability, circularity and electrification. This plan must provide a detailed description of the vision, mission, goals and long-term strategy for this area. This will then need to be followed by a short-term action plan for research, education, impact and leadership. This

will result in proposals for the required disciplines and chairs, filling positions (staffing plan), detailing infrastructure and technical support, multi-year budget and necessary investments. It is important that team 3 coordinates this plan with the Eindhoven Institute for Renewable Energy Systems (EIRES), in which the research groups involved already work closely together. At least three professors from the departments CEC, ME and EE will take part in team 3.

Timetable for team 3. I propose that team 3 be established in September, so that this team can start working immediately. In the period September - December, team 3 can carry out an important part of the work. Then around the turn of the year there will be an overview of which new disciplines and chairs have been provided and where they could be placed. The consequences of this for the filling of new positions in the CPT cluster can then be examined and form part of the cluster plan for the new processes cluster. Naturally, filling new positions requires the multi-year availability of sufficient financial resources. The budget of the department CEC does not currently provide for this. It is therefore inevitable that the executive board should consider a targeted investment in the field of chemical engineering, on the condition that it is based on a broadly supported and future-oriented plan.

3.3.2 Team 4: mapping the materials field within TU/e.

Cluster materials. The contours for the new materials cluster as a community of practice are the least clear. In the *Blueprint Department Chemical Engineering and Chemistry 2022-2032*, the groups Energy materials, Materials for conversion and Materials for separation are grouped under the materials cluster with 'Materials for Sustainability' as the unifying theme. This results in a very diverse range of scientific expertise where there is no coherent picture of which disciplines are required to shape this community of practice. The area is not clearly defined, so further direction and focus are required. As an example, I would like to mention the specific expertise in the field of electrochemistry, electrocatalysis and electrochemical conversion that is held by an assistant professor and an associate professor in this materials cluster. This expertise would also still fit well in the processes cluster, in line with the collaboration that already exists with an associate professor in this cluster in the field of electrochemical engineering, electrolysis and electrochemistry. In short, it is necessary to provide further clarity about the design of the materials cluster. This is also in view of the upcoming retirement of one of the professors who, in addition to an appointment in the department CEC, also has an appointment in the department of Applied Physics. The position of this chair and the design of the materials cluster will therefore require coordination with this department.

Team 4. I would like to propose that the rector, together with the deans of the departments CEC and AP, sets up a team 4 of one or more scouts ('verkenners') who will map the area of materials at TU/e and provide advice on the desired layout of this area. In the assignment description for this team 4, the materials area will of course have to be further defined and limited, for example, to hard materials or materials for energy, in consultation between the two deans and the professors most involved. A scout from outside TU/e could be sought who knows the materials field in the Netherlands and at TU/e well and can provide specific advice from an outside perspective. The former director of AMOLF could be a good candidate for this. In addition, a scout from within TU/e could also be sought who would draw up this advice, possibly together with the external scout. Both scouts would fit well as a duo and might be preferred.

Timetable of team 4. I propose that team 4 be established in September. The scouts can then carry out the exploration and prepare advice in the period September - December 2023. This advice can then form the basis for the design of the materials cluster. Here too, filling new positions requires the multi-year availability of sufficient financial resources. The budget of the department CEC does not currently provide for this. It is therefore inevitable that the executive board should also consider a

targeted investment in the field of materials, with the condition that this is based on a broadly supported and future-oriented plan.

3.3.3 Time planning and sequencing with respect to teams 1-4.

In the previous paragraphs I have made proposals for setting up four teams with a strict timetable for the work of these teams. Team 1 and team 2 are appointed by the board of the department CEC. Team 3 and team 4 are appointed by the rector together with the deans of the departments CEC, ME, EE and AP, respectively. In addition, the rector has indicated that she will set up a TU/e-wide committee that will consider shaping the TU/e-wide scientific personnel and PI policy.

It is important that the appointment of the four teams is managed, and the correct order of activities is pursued. This will therefore require further consultation with all those involved in the coming weeks and months, such as the members of the four teams and the deans of the four departments and the rector.

I propose that this coordination be led by the dean of the department CEC, who will draw up an action plan to this end, so that it is clear who does what, when and what is expected of whom and when. The tight time schedule requires this tight management.

3.3.4 Joining forces in Faculties.

Faculties. The idea of bundling the current nine departments into a limited number of larger units circulates regularly within TU/e in order to simplify the organizational structure of the university and thus increase the university's manageability. The executive board recently discussed this with the deans and decided to further explore such a bundling. The idea now is that three or four larger units, Faculties, can be formed into which (parts of) the current nine faculties will be housed. These are a Faculty of Sciences, a Faculty of Engineering, and, for example, a Faculty of Humanities, in addition to possibly a fourth Faculty. The precise details will be further developed by a committee in the coming months. I would like to support this.

Advantages. The advantages of bundling departments are quickly mentioned. With fewer departments, the executive board consults with fewer deans, making this administrative consultation more efficient, less operational and more strategic. The size of the current central services, which now serves nine departments, will be limited and the various components will be placed directly within the Faculties. This is managed by the Deans of these Faculties. They ensure that the services are set up and carried out in the right places in the Faculties, so that the service provider and service user meet each other directly, namely on the work floor. When allocating financial resources to Faculties, the nature of the educational and research activities specific to the Faculties is taken into account. A Faculty with mainly research infrastructure has a different financing requirement than a Faculty with mainly educational infrastructure. Collaborations with external partners become clearer by assigning responsibilities to the Dean most involved. The institutes, such as ICMS and EIRES, will have a recognizable place in the university organization. Faculties are responsible for the scientific disciplines for education and research (timeline 10-20 years or longer). Institutes initiate collaboration and innovation in research, often with shorter-term research programs (<5-10 years) and facilitate the acquisition and use of (large-scale) research infrastructure.

Clusters. An important advantage of bundling departments is that similar communities of practice, or clusters, that are currently housed in different departments, will be part of one cluster of one Faculty. This combines forces, promotes the efficiency of work processes and creates critical mass that was not possible before. The benefits are evident for the filling of new positions, personnel policy, financing, the design of laboratories, the use of infrastructure, and much more. For the three clusters

mentioned in the department CEC, this would mean that the molecules cluster, together with its counterpart from the department BME, would be placed in the Faculty of Sciences. The cluster materials, together with the counterpart from the department Applied Sciences, and possibly other departments, also in the Faculty of Sciences. And the processes cluster is brought together with its counterparts from the departments ME and EE in the Faculty of Engineering. Of course, there are still many questions to be answered. The most important one that presents itself first: what does this bundling mean for the current educational programs in the departments? And of course, there are more similar questions. The starting point should be: don't throw the baby out with the bathwater. Maintain what is going well, adapt what could be improved now that groups with, for example, comparable education programs or other comparable activities are housed in one Faculty. The committee that will be working on this will make proposals for this.

Leadership. The success of this new TU/e organizational structure with three or four Faculties will largely be determined by the leadership of the people within the new Faculties. This concerns the Dean of Faculty, the cluster leaders, the employees who direct and manage the groups within the clusters, the managers and employees of the support services within the Faculties, the educational program directors and their employees, and other stakeholders within the university. Special attention should be paid to this when setting up the Faculties. These positions must be filled with care and the required professional qualities for filling these positions should be clearly formulated. Adequate recruitment and appropriate remuneration of employees should ensure that TU/e can retain the right people for these positions. This will help to ensure that at every level in the Faculties attention can be focused on the primary process of education, research and valorisation, rather than on administrative and management processes.

And what next?

After reading this report you may now be thinking ... Yes and now? Do teams 1 to 4 offer Columbus' egg, and will all problems disappear from the CEC world from January 2024? No, I do not think so. Then what? I hope that if I were to make another tour of the department sometime next year and speak to more than 70 people again, I would be able to note different quotes than during the past few months. For example:

- + we talk to each other again
- + I get replies to my emails again, which is also useful to me
- + it's nice that my colleague is concerned about whether I can handle teaching all those courses
- + it gives me a good feeling that I have presented my portfolio to the assessment committee
- + for the first time in 5 years I had an annual appraisal ('jaargesprek'), which makes me feel good
- + Since October I have regularly had lunch with three fellow assistant professors to talk things over
- + it works very well now that my colleague and I coordinate the technical support for the cluster
- + I have had useful conversations with my coach, and I am now going to create my education portfolio
- + I can now use four fume hoods on a different floor, which offers me new possibilities
- + good to hear that the plan for chemical engineering has been finalized, now we can fill positions
- + for the first time I have thought about how I want to further shape my career
- + writing a cluster plan is no easy task, but now that it is finished, yes, the result is impressive
- + the discussions in the management team are intense, I underestimated that a bit, but: great!
- + I wish I had read Weggeman's book sooner
- + there is communication again, I know a little more about what is going on
- + it seems like we are finally getting back on track
- + in this way the role of dean can be fulfilled with an acceptable time allocation
- + now it has finally become clear to me what the department means by principal investigator
- + nice that I can now talk to cluster leader and education director about my education program
- + glad that we have more clarity about how we are going to shape materials@TU/e
- + can I also participate in two clusters?
- + I now feel more in control for the first time and know how to set my priorities more clearly
- + fortunately, simple matters are now handled quickly
- + nice to hear that I was also mentioned in the New Year's speech without a large grant
- + finally, the list is here: 'what we would like to know when we start as a PhD'
- + finally, the list is here: 'what we would like to know when we start as assistant professor'
- + I decided to stay after all
- + I have some idea of where we are all going again
- + for the first time there has been clear communication about the new CEC building
- + the tour of the 'bedrijfsbureau' and lunch with new colleagues on my first day at work: yes!
- + I now understand how the procedure for promotion to associate professor works
- + I didn't really like that meeting about workload at first, but it was very well put together
- + finally, the members of the department board are taking up the role they have to fulfil
- + for the first time I spoke to a colleague from the CPT cluster
- + for the first time I spoke to a colleague from the MSMC cluster
- + clear story from the dean about what we are going to do with the results of the Research Day
- + Since October last year we have had regular staff and work meetings
- + luckily we have more attention and time for each other again

I hope so!

Appendix 2. Entrepreneurship, leading, managing: sticking to the division of roles I.



Vrij naar: M. Weggeman, 2007

Appendix 3. Entrepreneurship, leading, managing: sticking to the division of roles II.



Vrij naar: M. Weggeman, 2007

Appendix 4. Criteria for cluster formation – Community of Practice.

I. Global Player

- Heeft een herkenbare, inhoudelijke en gedocumenteerde visie op nieuwe ontwikkelingen en de eigen internationale positie in het vakgebied
- Heeft één of meerdere erkende en gezaghebbende wetenschappelijke boegbeelden met internationale reputatie
- Initieert vernieuwend onderzoek en/of onderwijs dat internationaal competitief is en een grote potentiële impact kent
- Levert een actieve en herkenbare bijdrage aan wetenschappelijke schoolvorming

II. Wetenschappelijke Expertises

- Omvat alle gewenste en noodzakelijke wetenschappelijke expertises en disciplines om adequaat als Community of Practice te kunnen opereren
- Heeft een volledig en omvattend beeld van de wetenschappelijke expertises die nodig zijn om (op termijn) als global player te kunnen opereren
- Reviëwt met regelmaat de borging van de benodigde wetenschappelijke expertises en handelt actief om de vereiste expertises aan te trekken

III. Onderzoek en Onderwijs

- Kent één of meerdere gezamenlijke onderzoeksprogramma's met een sterke inhoudelijke samenhang en focus
- Participeert succesvol in prestigieuze landelijke en internationale programma's gericht op excellentie in onderzoek, onderwijs en toepassing
- Heeft een directe verbinding met het bachelor- en masteronderwijs waarbinnen een samenhangend onderwijspakket wordt aangeboden

IV. Talent

- Heeft een aantoonbare aantrekkingskracht op talentvolle jonge onderzoekers en weet deze aan zich te binden (PhD, post-doc, PI)
- Heeft een significant aantal leden met prestigieuze (zoals persoonsgebonden) grants uit nationale en internationale (excellente-) programma's
- Heeft een significant aantal leden met prestigieuze (zoals persoonsgebonden) wetenschappelijke prijzen en andere blijken van waardering van binnen en buiten de TU/e

V. Faciliteiten & Infrastructuur

- Kent (unieke) faciliteiten en onderzoek- en/of onderwijsinfrastructuur van landelijke betekenis en met aantrekkingskracht voor nationaal en internationaal toptalent (MSc, PhD, post-doc, PI)
- Participeert succesvol in regionale, landelijke en/of Europese programma's voor versterking van de onderzoek- en/of onderwijsinfrastructuur
- Heeft directe aansluiting bij regionale, landelijke en/of internationale onderzoek- en/of onderwijsinfrastructuur via gerichte samenwerkingsverbanden

VI. Positionering in het veld

- Heeft een heldere, gedocumenteerde visie op de positie in het nationale en internationale veld waarin de Community of Practice zich beweegt
- Speelt een herkenbare, stimulerende en coördinerende rol in landelijke en/of internationale verbanden en instellingen
- Is structureel ingebed in landelijke en/of internationale onderzoek- en/of onderwijsgerma, zoals bijvoorbeeld binnen NWO en de EU