

ASSESSMENT COMMITTEE REPORT ON RESEARCH
IN
TECHNOLOGY, POLICY AND MANAGEMENT
2016-2021
DELFT UNIVERSITY OF TECHNOLOGY



MAY, 2023

ASSESSMENT COMMITTEE REPORT ON
RESEARCH
IN
TECHNOLOGY, POLICY AND MANAGEMENT
2016-2021
AT THE
DELFT UNIVERSITY OF TECHNOLOGY

**“A strong and thriving faculty that will need explicit strategies to
guide further growth”**

MAY, 2023

Colophon

Title:

Assessment Committee Report on Research in Technology, Policy and Management,
2016-2021 at the Delft University of Technology

Editors:

Prof. dr ir. H. van Lente (Chair), Dr ir. C. Alma, Mr. A. Brasil, Prof dr J. Duggan, Prof. dr A.
Pyka, Dr L. Reardon, Prof. dr S. Yeh, ir. S. Laudy (Process consultant)

Quicken Management Consultants

Brinkstraat 286

7541 AV ENSCHEDE

info@quickenadvies.nl

www.quickenadvies.nl

ISBN 978-94-64910-13-1

69 pages (including appendices)

Date: May 2023

© 2023 Quicken Education and Management Consultants – for smooth transitions

SUMMARY

The Assessment Committee assessed the research of the Department Engineering Systems and Services (ESS), the Department Multi-Actor Systems (MAS) and the Department Values, Technology and Innovation (VTI) of the Faculty of Technology, Policy and Management (TPM). This assessment covers research in the period 2016-2021. The Assessment Committee Report is approved by all Committee members.

Overall Conclusion

The Committee was thoroughly impressed by what they observed during their visit to TPM. The workplace exudes an extremely supportive atmosphere and fosters a friendly, collaborative, and dynamic academic culture that undoubtedly makes it a joy to work here. The quality of research and its impact on society are exemplary, and it was particularly impressive to witness the organic and natural evolution of various processes such as the labs. Through their unique approach TPM contributes significant added value to TUD. While the Committee appreciates this achievement, they have concerns that TPM's future growth and development may take undesired directions without explicit strategies in place. To address this, it is crucial to implement clear and well-defined choices. The Committee recognises that the process of jointly defining these choices is equally crucial and is convinced that TPM's team science approach makes it well-suited to do so successfully.

ESS

ESS shows very good to excellent research quality and a strong international reputation. The ESS department conducts cutting-edge, innovative and creative research, as demonstrated by many research papers published in relevant scientific journals. The Committee sees comprehensive system engineering as a clear common denominator in

the department. The ESS department conducts research that has a significant societal impact, as evidenced by its engagement with relevant stakeholder groups. Good examples of demonstrated research products were shown. The Committee sees that ESS can even further enhance its viability by using its successes in applied research to foster its research on fundamental methods and theories. The Committee recognises that controlling and guiding the growth of the Department is a critical challenge ahead, and the new Reward and Recognition policy provides a good opportunity for such a strategy.

The Committee recommends ESS to¹:

- exploit its research successes in a variety of application domains to articulate and strengthen its fundamental knowledge and methods of comprehensive system engineering [1]²;
- develop a strategy to control and guide the growth of the Department [3].

MAS

The Committee acknowledges that the research area and chosen topics are very relevant and match the queries of these turbulent times. The research that was presented was very good to excellent. The department presented impressive projects that demonstrated interdisciplinary collaboration and notable social impact. The Committee greatly appreciated the department's efforts to link to the grand challenges, such as climate change. The funding plans look strong and viable, and there is a clear idea of future strategy. However, the overall rationale of the set of approaches within MAS could be better

¹ A detailed list of recommendations is given at the end of each Department section and in the Faculty section.

² The numbers between the brackets refer to the recommendations in the main text.

articulated. A related goal is to strengthen the fundamentals of these approaches. The Committee suggests MAS to reflect more on the conducted research and consider the theoretical and methodological gains. Methodological strengths form the foundations for MAS's performance. They could be more prominent in the internal vocabulary, and in the dialogue with scientific partners. The department's outreach to the media appears to be primarily local, targeting the Netherlands and conducted in Dutch. The Committee observes that, although MAS is able to do the research on its own, and many internal collaborations take place. Engagement in international alliances, however, seems low and the Committee believes there is a potential here.

The Committee recommends MAS to:

- to articulate a strategy of how the goal of strengthening fundamentals might be achieved [4];
- to expand its media outreach efforts to the international level to enhance its global visibility [7].

VTI

The research quality of VTI is very good to excellent, as evidenced by the consistently high citation rates for outputs over the assessment period. VTI's research is both highly relevant and demanding, reflecting the complexity of the challenges that urgently need to be addressed in our society. The committee sees possibilities for VTI to engage more in interdisciplinary and transdisciplinary projects. The Committee would welcome VTI exploits its position in TPM by becoming more interdisciplinary. There is potential to establish a closer link between research topics and teaching. VTI's overarching aim and focus on responsible innovation (and its three underpinning themes) have clear and important societal relevance. The topic of responsible innovation, however, is continuously developing and seems to be absorbed by wider approaches like the mission-oriented approach or the sustainability

transformation approach. The Committee has observed that there is potential for exploring grounds beyond its disciplines, in particular in the economics and philosophy groups. The growth in funds in relation to the balance of the sections is a point of attention for VTI. The Committee observed several noteworthy examples of cross-fertilisation, collaboration, and interdisciplinarity within VTI.

The Committee recommends VTI to:

- incorporate more innovative and unconventional approaches into VTI's research endeavours [10];
- streamline the current mission statement in order to communicating VTI's vision more effectively and to provide greater clarity and direction for the group's research [12].

The Faculty of TPM

The faculty management has demonstrated a strong and cohesive vision, along with ideas to keep the team moving forward. The Committee was impressed by the lab-concept; faculty-wide labs, as well as labs organised around people that grow organically (bottom-up). Overall, the Committee appreciated the close collaborations with stakeholders. The Committee's question regarding TPM's growth ambitions for the next five years remained largely unanswered. Although collaboration is already taking place at an intense level, there is still potential for greater synergy between departments. While the Committee observed several instances of valorisation and technology transfer, they did not perceive a clear and explicit strategy in this regard, which seems like a missed opportunity.

In general, the PhD policy and training is well-organised with the discontinuation rate and the long time-to-thesis, being the main concerns. The Committee would like to highlight that during the site visit, the PhD candidates whom the Committee had the opportunity to

interact with were overwhelmingly positive about their experiences and the level of involvement they have in their respective departments and faculty.

The Committee noticed that there is a fierce national and international competition for talent and that TU Delft is actively participating in it by seeking to attract the best candidates worldwide. The Committee observed a lack of female representation at the associate level. While there has been an improvement in closing the gap at the tenure track level, there is still room for progress.

The Committee has noticed that postdocs are least supported. Although postdocs are essential for conducting research, they are often overlooked in terms of career and welfare support. The Committee believes that greater attention and resources are required to better support this group.

The Committee had the pleasure of meeting with a satisfied group of tenured staff who find TPM to be an attractive workplace. The atmosphere at TPM feels safe and welcoming, allowing for open communication between the tenured staff and the (guiding) supervisors.

TPM displays boldness by deviating from strictly quantitative measurements for promotion measures, allowing tenure-track staff to prioritise quality over quantity. The Committee observed that these measures are generally well-received by tenure-track staff. According to the tenure-track staff, TPM takes work-life balance very seriously. They feel that there is a lot of attention given to this matter and that they are genuinely cared for.

The Committee applauds the TU Delft's initiative of setting targets (25% women in 2025). The Committee appreciates the onboarding process, but is concerned that the rapid growth may be putting pressure on it. The culture within TPM is often informal, and while this may work for Dutch staff, it may pose a challenge for international staff to find their way.

The Open Science work conducted at TPM deserves praise, and there seems a further opportunity for TPM to play a leadership role in adopting Open Science within TU Delft.

There is a strong sense of research quality and research integrity and formal policies are in place but the extent to which they are at the forefront of practice are unclear.

The Committee recommends the Faculty of TPM to:

- develop a more articulate growth strategy by which TPM retains its leading edge [14];
- foster even more synergy between departments, for instance by developing tools and connecting them with topics from other departments [15];
- develop plans to improve PhD success rates [17];
- place more emphasis on competence management in order to address the “war-on-talent” [23];
- establish a specific, higher target than current “25% women in 2025-goal” [26];
- broaden its perspective on Open Science to achieve more comprehensive results that can serve as a model to inspire and educate the rest of the university [29].

CONTENTS

Summary.....	3
Contents	9
Preface	11
1. Assessment Committee and Assessment Procedures	12
1.1 Assessment Scope.....	12
1.2 Committee Composition	13
1.3 Impartiality.....	13
1.4 Data provided to the Committee	14
1.5 Committee Procedures	15
2 Assessment of the Department Engineering Systems and Services (ESS)	17
2.1 Research quality	18
2.2 Relevance to society	19
2.3 Viability	20
2.4 List of recommendations	21
3 Assessment of the Department Multi-Actor Systems (MAS).....	22
3.1 Research quality.....	23
3.2 Relevance to society	24
3.3 Viability	25
3.4 List of recommendations	26
4 Assessment of the Department Values, Technology and Innovation (VTI)	28
4.1 Research quality	29
4.2 Relevance to society	31

4.3 Viability	32
4.4 List of recommendations	34
5 Remarks for the Faculty of TPM.....	35
5.1 Collection of general remarks.....	35
5.2 Labs.....	38
5.3 TPM Stakeholder involvement.....	38
5.4 PhD Policy and Training.....	39
5.5 Human Resources Policy	43
5.6 Open science	48
5.7 Academic culture	50
6. Executive's Board extra questions	51
Conclusion As TPM grows and matures it can benefit from explicit strategies	53
Appendix A Curricula vitae of the Committee members	54
Appendix B Site visit programme	58
Appendix C SEP-data on Research staff.....	64
Appendix D SEP-Data on Research funding.....	66
Appendix E SEP-Data on PhD Candidates.....	68

PREFACE

The Assessment Committee was assigned the task of evaluating the research carried out in the Faculty of Technology, Policy and Management at Delft University of Technology over the period 2016-2021. The Committee, composed of Colette Alma, André Brasil, Jim Duggan, Andreas Pyka, Louise Reardon, Sonia Yeh and myself covered a broad range of expertise that matched well with the topics of the review.

The committee held in-depth deliberations on all aspects of the evaluation, addressing research quality, societal impact and viability, management, and as well as strategic planning. The final conclusions in this report that result from our discussions are unanimously supported by all Committee members.

I would like to express my heartfelt gratitude to the Committee members for their unwavering dedication and collaborative spirit during these intense three days. I also extend my sincerest thanks to our secretary, Sven Laudy, for his exceptional preparation and support throughout the process. Moreover, I want to express our appreciation to the TPM departments for fostering a warm and inviting atmosphere. We greatly appreciate the staff's structural willingness to improve and their open and collaborative approach during our recent site visit to Delft.

The positive experience we had during the visit has left a lasting impression, and we are grateful for the opportunity to witness first-hand the dedication and commitment of the TPM departments to their work.

Harro van Lente
Committee Chair

1. ASSESSMENT COMMITTEE AND ASSESSMENT PROCEDURES

1.1 ASSESSMENT SCOPE

The Assessment Committee was asked to assess the research of the Departments Engineering Systems and Services (ESS), the Department Multi-Actor Systems (MAS) and the Department Values, Technology and Innovation (VTI) of the Faculty of Technology, Policy and Management (TPM). This assessment covers research in the period 2016-2021. In accordance with the Strategy Evaluation Protocol 2021-2027 for Research Assessments in the Netherlands (SEP), the Committee's tasks were to assess the quality, relevance to society, and viability of the research programmes on the basis of the information provided by the Faculty and interviews with Faculty management and research Departments. In its evaluation of these three criteria, the Committee took care to include the following specific aspects, as described in the SEP protocol: Open science, PhD Policy and Training, Academic culture and Human Resources Policy.

Following this, the Committee was to make recommendations for the future.

1.2 COMMITTEE COMPOSITION

The members of the Committee were:

Prof. dr ir. H. (Harro) Van Lente, Committee Chair, Professor of Science and Technology Studies, Maastricht University, The Netherlands

Dr ir. N.C.M. (Colette) Alma, independent consultant at QuerCa, The Netherlands

Mr. A. (André) Brasil, PhD Candidate, Centre for Science and Technology Studies, Leiden University, The Netherlands

Prof. dr J. (James) Duggan, Professor of Computer Science, University of Galway, Ireland

Prof. dr A. (Andreas) Pyka, Professor of Innovation Economics, University of Hohenheim, Germany

Dr L. (Louise) Reardon, Associate Professor in Governance and Public Policy, University of Birmingham, United Kingdom

Prof. dr S. (Sonia) Yeh, Professor of Transport and Energy Systems, Chalmers University of Technology, Sweden

A short curriculum vitae of each Committee member is included in Appendix A.

Ir. Sven Laudy of Quicken Management Consultants was appointed as an independent and qualified process consultant to the Committee.

1.3 IMPARTIALITY

All Committee members signed a statement of impartiality and confidentiality to ensure that they would assess the quality of the research programmes in an impartial and independent way. Committee members reported any existing personal or working relationships

between Committee members and members of the programmes under review before the interviews took place. The following relationships have been reported:

- Professor Van Lente intends to have a future cooperation with Professor Van de Poel.
- Dr Reardon has a collaboration with Drs. Veeneman and Nihit Goyal. She is the editor of a book, for which both staff members are contributing authors. No further contact exists.

The Committee discussed these relationships at the first Committee meeting. The Committee concluded that there exist no unacceptable relations or dependencies that could lead to bias in the assessment.

1.4 DATA PROVIDED TO THE COMMITTEE

The Committee received the following detailed documentation:

- Self-evaluation report of the unit under review, including all the information required by the Strategy Evaluation Protocol 2021-2027 (SEP), with appendices,
- Previous assessment report 2010-2015,
- Additional requested information regarding the relation between the three assessment aspects (Quality of research, Societal relevance and Viability) and the four aspects (Open science, PhD Policy and Training, Academic culture and Human Resources Policy) within the Departments,
- Additional requested information regarding the first employer of graduated PhD candidates, and the age distribution of tenured staff in 2021.

These documents together with the interviews during site visit formed the Committee's key basis for the assessment.

1.5 COMMITTEE PROCEDURES

The Committee followed the Strategy Evaluation Protocol, 2021-2027 (SEP). On December 16, 2022 the secretary of the Committee briefed the Committee on the Strategy Evaluation Protocol for research assessments in an online meeting with the Committee. Prior to the site visit, two assessors were asked to evaluate each programme. These assessors independently formed a preliminary assessment for each programme.

At the start of the site visit, the Committee discussed the preliminary assessments. For each interview, the Committee prepared a number of comments and questions. All Committee members were actively involved in the interviews. After each interview, the Committee discussed comments and recommendations. The Committee spoke with the Rector Magnificus of the TU Delft and interviewed the management team of the Faculty of TPM, as well as the three departmental management teams, and external stakeholders, research staff of the three departments and PhD candidates and post-docs. Interviews took place on February 15 to 17, 2022 at the Faculty of TPM in Delft. The full interview schedule appears in Appendix B. The Committee presented preliminary general impressions to the Faculty on the last day of the visit.

Unfortunately, Professor Van Lente, the Committee Chair, was unable to attend the site visit due to illness. As a result, the Committee members decided to share the responsibility of chairing the Committee. Furthermore, due to COVID-19 travel restrictions, Professor Duggan was unable to physically attend the site visit on campus, but was able to participate in critical meetings via video conferencing. Despite these challenges, both Professor Van Lente and Professor Duggan were actively involved in the preparation of the site visit as well as the final report.

The Committee also reflected on a separate request for advice to the Executive Board of the TU Delft regarding the Faculty's approach to stimulate and enhance interdisciplinary cooperation between researchers with different disciplinary backgrounds on cross-cutting topics, and 'team science', both informally and formally.

After the site visit, the Committee members who attended the interviews prepared a preliminary report, which was reviewed by the Chair in subsequent meetings with the Committee's secretary. The preliminary report was then discussed in detail during a video call with the entire Committee. During this call, the Chair monitored the overall findings and ensured that the assessment of all three departments was balanced and thorough.

The Committee finalised the report through email and video conferences. Final assessments are based on documentation provided by the Faculty, preliminary assessments and interviews. Following approval by all Committee members, the Executive Board received a copy of the first version with the invitation to correct factual errors. In response, the Committee discussed these comments, made several modifications to the text and then presented the final report to the Board of the University. This was printed after formal acceptance.

2 ASSESSMENT OF THE DEPARTMENT ENGINEERING SYSTEMS AND SERVICES (ESS)

Head of Department
Research staff 2021

Prof. dr ir. M.F.W.H.A. (Marijn) Janssen
25.6 Research FTE (excluding PhD)

The self-evaluation report states: ‘the mission of the Department ESS is to improve the understanding of complex engineering systems and services, and the ability to change them for the better’.

ESS does this by developing, testing, and applying theories, methods and tools that are rooted in (system) engineering disciplines as well as in the (empirical and quantitative) social and behavioural sciences. ESS’s work is based on real-world domain knowledge, with a particular focus on the domains of energy & industry, ICT, and transport & logistics; with a growing focus on the domain of health & well-being; and with a special interest in the role which AI plays in these domains and their convergence.

The strategic aim of the ESS department is to be a highly reputed research entity that is recognised worldwide as a thought leader in modelling, analysing, and designing real-world complex engineering systems.

Some of the areas in which the Department ESS is particularly active and has the critical mass that is needed to make an impact internationally are:

1. Energy systems, the energy transition and climate change
2. System solutions for industrial and material cycles
3. Digital government, platform economies and information architectures

4. Open data, distributed algorithms, trustworthy AI
5. Sustainable personal mobility and freight transport
6. Choice models and decision analysis for travel behaviour and beyond

The research staff is composed of 13.1 FTE scientific staff³, 12.6 FTE post-docs and 86 PhD candidates (2021)⁴.

2.1 RESEARCH QUALITY

ESS shows very good to excellent research quality and a strong international reputation. The ESS department conducts cutting-edge, innovative and creative research, as demonstrated by many research papers published in relevant scientific journals. Theories, models and methods developed by the ESS department are widely used by other researchers from different countries demonstrated by the number of research papers which are built on the research outputs of the ESS department.

Various examples of recognition are provided, including prizes, such as the incorporation of the Random Regret Minimisation model in at least five software packages, is a direct testament to the impact of ESS's work.

The Committee sees comprehensive system engineering as a clear common denominator in the department. Although this may not have been evident in the report, it became apparent through the interviews conducted. In general the Committee considers ESS a strong group.

³ Comparable with WOPI categories HGL, UHD and UD; tenured and non-tenured staff.

⁴ FTE has been multiplied by the research factor: 0.4 for scientific staff and 0.8 for post-docs.

The Committee recommends that ESS establish a goal and develop a strategy to use its success in numerous application domains to also articulate and strengthen its fundamental research [1]⁵. While applied research is often new, exciting, and easily attracts funding and attention, ESS should strive to profit from these strengths to further develop robust insights, general methodologies, and tools to ensure profound and long-term impacts. Such knowledge broadens the research portfolio and will be taught in classes in universities worldwide and will be the ultimate measure of success. The Committee recognises that this type of work can be challenging to fund, but suggests that ESS leverage resources such as ERC consolidator or advanced grants, which aim to promote this type of research.

Comments about PhD Policy & Training and ESS can be found in section 5.4 of the Faculty chapter under the PhD Policy and Training subsection.

2.2 RELEVANCE TO SOCIETY

The ESS department conducts research that has a significant societal impact, as evidenced by its engagement with relevant stakeholder groups.

Good examples of demonstrated research products were shown, such as a strategic bidding model being used by the Swedish Transmission System Operator, and papers that break new grounds (Bayesian Best-Worst Method) whose authors come from different ESS sections. Several professors, senior and junior, are among the stars whose contributions to research and publication are well recognised internationally.

⁵ The numbers between the brackets throughout the main text refer to the list of recommendations at the end of each section.

The “experience ESS” presentations were pathbreaking and showed the depths and the impact of the research conducted at the Department. The exciting new paths also point to great potential for cross-creativity and greater interactions with the rest of the faculty.

Comments about Open Science and ESS can be found in section 5.6 of the Faculty chapter under the Open Science subsection.

2.3 VIABILITY

The site visit revealed an even better ESS performance than indicated in the report. Initially, the committee had some doubts regarding ESS's research focus, but after conducting interviews with Faculty management and research Departments, it became apparent that ESS has a distinct and strong research profile that revolves around an adaptive approach that may be characterised as "comprehensive engineering systems." Given the clarity and strength of this profile, the committee recommends that the university explicitly communicate this research approach to the relevant stakeholders. This research profile is clear and robust, and it would be valuable to communicate this research approach more explicitly [2].

The Committee believes that ESS can further enhance its viability by utilizing its success to foster research on fundamental methods and theories. The development of fundamental methods can significantly increase the potential and reputation of ESS. In this regard, the Committee suggests the implementation of various strategies such as ERC grants (consolidator, advanced), NWO grants, or the creation of TPM labs to support the advancement of fundamental methods. These strategies can not only improve ESS's potential but also facilitate its reputation growth. Therefore, the Committee recommends that ESS

consider a strategic focus on the development of fundamental methods and explore funding opportunities to support these initiatives.

The Committee acknowledges that managing and directing the growth of the Department is a significant challenge that lies ahead. This challenge is not only a measure of success but also poses a threat to the sustainability of the research achievements and culture. The Committee recognises that it is essential to ensure that the Department's growth is controlled and guided appropriately to maintain its reputation and continued success. Therefore, the Committee recommends that the Department prioritize effective management and guidance in its growth strategy to sustain its research successes and culture. [3].

Comments about HR and ESS can be found in section 5.5 of the Faculty chapter under the Human Resource Management subsection.

Comments about Academic Culture and ESS can be found in section 5.7 of the Faculty chapter under the Academic Culture subsection.

2.4 LIST OF RECOMMENDATIONS

The Committee recommends ESS to⁶:

- [1] exploit its research successes in a variety of application domains to articulate and strengthen its fundamental knowledge and methods of comprehensive system engineering;
- [2] consider whether ESS should explicitly communicate its overarching research approach;
- [3] develop a strategy to control and guide the growth of the Department.

⁶ The list of recommendations is limited to the Committee's most crucial observations.

3 ASSESSMENT OF THE DEPARTMENT MULTI-ACTOR SYSTEMS (MAS)

Head of Department
Research staff 2021

Prof. dr M.E. (Martijn) Warnier
25.0 Research FTE (excluding PhD)

The self-evaluation report states: ‘the research mission of the Department MAS is to improve the understanding of how decision-making, change and coordination of and within sociotechnical systems happens.’ MAS does this with the goal of designing systems interventions that do justice to the multiple values inherent to modern societies and to provide actors within these systems with sufficient perspectives to act. In doing so, MAS describes systems and processes empirically, models them (analytically and computationally), analyses them, and designs interventions using a variety of quantitative and qualitative approaches.

The central premise of MAS’s research is that the design and management of system change is subject to continuous tensions.

The ambition of MAS is to provide a novel or improved action perspective to those functioning within sociotechnical systems. MAS particularly focusses on transdisciplinary governance issues in which tensions exists between sociotechnical systems on the one hand and governance structures and governance mechanisms on the other.

MAS’s overall strategic aim as a department is to excel in researching and teaching novel theories and methods in policy analysis, design, and governance of complex sociotechnical systems, and to achieve societal impact through the application of these theories and methods for today’s societal grand challenges – such as climate change and the energy transition – in both research and teaching.

The research staff is composed of 13.9 FTE scientific staff⁷, 11.1 FTE post-docs and 57 PhD candidates (2021)⁸.

3.1 RESEARCH QUALITY

The Committee acknowledges that the research area and chosen topics are very relevant and match the queries of these turbulent times. The research that was presented was very good to excellent. The individual projects that were showcased were impressive.

The Committee considers it valuable to see how current methods/foundations map to the different labs and sections. It is helpful to know, for example, for each lab, what its core methodological strengths and weaknesses are. Are there methods and foundations that a lab has identified as having high potential?

The overall rationale of the set of approaches within MAS could be better articulated. A related goal is to strengthen the fundamentals of these approaches. It would be important to articulate a strategy of how this might be achieved [4]. Such a strategy would document the “as-is” and the “to-be” for methodological foundations. A subsequent goal would be to identify the fundamentals that would lead to more opportunities for research income, be complimentary to existing research teams, and enhance collaboration with stakeholders.

The Committee suggests MAS to reflect more on the conducted research and consider the theoretical and methodological gains. This will allow to define more opportunities, such as translating among domains and disciplines. In terms of objectives, it is interesting to see the focus on

⁷ Comparable with WOPI categories HGL, UHD and UD; tenured and non-tenured staff.

⁸ FTE has been multiplied by the research factor: 0.4 for scientific staff and 0.8 for post-docs.

strengthening fundamentals (self-evaluation report, p77) and this should be an important area to develop into the future [4].

Furthermore, the Committee encourages exploring how the learnings from the successful ERC grant could be leveraged for other staff to explore these opportunities to strengthen fundamentals [5].

The opportunity is to create a virtuous circle between research fundamentals and applied research. Methodological strengths form the foundations for MAS' performance. They could be more prominent in the internal vocabulary, and in the dialogue with scientific partners. To this end an inventory of methodological strengths would be valuable [6].

Comments about PhD Policy & Training and MAS can be found in section 5.4 of the Faculty chapter under the PhD Policy and Training subsection.

3.2 RELEVANCE TO SOCIETY

During the site visit, the department presented impressive projects that demonstrated interdisciplinary collaboration and notable social impact. Furthermore, the positive feedback from stakeholders serves as a commendable example of the department's commitment to engaged research.

The department's outreach to the media appears to be primarily local, targeting the Netherlands and conducted in Dutch. This strategy is understandable, given the intense competition in the international arena. However, the next step for the department could be to expand its media outreach efforts to the international level to enhance its global visibility [7].

The Committee greatly appreciated the department's efforts to link to the grand challenges, such as climate change. One of the department's

key strengths is its interaction with societal actors and its focus on addressing significant societal grand challenges.

The case studies provided informative examples of how the department has developed research that is relevant to society, e.g. Theatre and MOOC. Also, good examples of practical impact were demonstrated, e.g. the Covid-19 project.

The Committee was impressed by the societal relevance and impact of the projects showcased. However, the Committee gathered the impression that, in general, there is no explicit strategy in place to guide or maximise impact. Sharing best practices from successful projects may help increase the visibility and impact of other projects, too.

The Committee suggests looking for opportunities to provide technical workshops in methods/tools to the wider community, national and international. These could provide ways to identify future collaborations and application areas, and also enhance the profile of the department.

Comments about Open Science and MAS can be found in section 5.6 of the Faculty chapter under the Open Science subsection.

3.3 VIABILITY

The funding plans look strong and viable, and there is a clear idea of future strategy. MAS is a financially healthy department with a diverse funding portfolio. The research funding is impressive, with twelve major EU grants funded, including an ERC Grant.

It is essential that computational resources are also available, to support areas such as computational modelling.

The Committee considers the area of Citizen Science to provide very good potential for future MAS research.

The Committee observes that, although MAS is able to do the research on its own, many internal collaborations (department/ faculty, university) take place. Engagement in international alliances, however, seems low and The Committee believes there is a potential here.

The Committee noted that MAS intends to further reflect on their way of thinking and working. The Committee welcomes this, and suggests to open up this reflection process to include external stakeholders and representatives of adjacent scientific groups. Such an inclusive approach would also contribute to the Open Science process. The Committee recommends implementing a more coherent strategy for the geographical distribution of application areas and case studies [8]. Currently, it appears that individual researchers are solely responsible for making these choices, and that a cohesive and coordinated approach is lacking.

Comments about HR and MAS can be found in section 5.5 of the Faculty chapter under the Human Resource Management subsection.

Comments about Academic Culture and MAS can be found in section 5.7 of the Faculty chapter under the Academic Culture subsection.

3.4 LIST OF RECOMMENDATIONS

The Committee recommends MAS to⁹:

- [4] articulate a strategy of how the goal of strengthening fundamentals might be achieved;
- [5] explore how the learnings from the successful ERC grant could be leveraged for other staff to explore these opportunities to strengthen fundamentals;

⁹ The list of recommendations is limited to the Committee's most crucial observations.

- [6] create an inventory of methodological strengths;
- [7] expand its media outreach efforts to the international level to enhance its global visibility;
- [8] implement a more coherent strategy for the geographical distribution of case studies.

4 ASSESSMENT OF THE DEPARTMENT VALUES, TECHNOLOGY AND INNOVATION (VTI)

Head of Department
Research staff 2021

Prof. dr S. (Sabine) Roeser
24.2 Research FTE (excluding PhD)

The self-evaluation report states: ‘the research mission of the Department VTI is to contribute to responsible innovation by:

1. Identifying, analysing and improving awareness of the value and responsibility dimensions of governance, research and design of engineering and technology from a sociotechnical systems perspective. Important values that we study are safety, security, efficiency, equity, justice, privacy, sustainability, democracy, diversity and inclusiveness.
2. Studying the institutional design and policy dimensions of large sociotechnical systems and innovation processes, while paying special attention to their value dimension, with the aim of identifying opportunities for making innovations and innovation processes and policies (more) responsible.
3. Developing, empirically testing and applying theories, methods, approaches, tools and conceptualisations for, or contributing to, responsible innovation and responsibly managing the risks of these innovations, with scientific methods and techniques to identify, quantify, predict, prescribe, visualise and optimise risk and hazard levels to acceptable levels, also explicitly incorporating normative aspects and values.’

The Department of Values, Technology and Innovation (VTI) studies sociotechnical systems from a values perspective. It focuses on the overarching research theme of responsible innovation that is 1) of the

highest academic quality, 2) inter-/multidisciplinary and based on a diversity of perspectives, and 3) engaged with societally relevant questions in order to create societal impact, while also being optimally informed about specific sociotechnical challenges.

It is VTI's ambition to be an internationally leading research group in responsible innovation. VTI addresses these complex challenges of responsible innovation through three main research themes that intersect the department: Design for Values, Management of responsible innovation, and Responsible risk management.

The research staff is composed of 14.7 FTE scientific staff¹⁰, 9.6 FTE postdocs and 55 PhD candidates (2021)¹¹.

4.1 RESEARCH QUALITY

The research quality of VTI is very good to excellent, as evidenced by the consistently high citation rates for outputs over the assessment period¹². This achievement can be attributed in part to the group's strong and consistent collaborations both nationally and internationally. In terms of international visibility and impact on the field, VTI is performing very well.

¹⁰ Comparable with WOPI categories HGL, UHD and UD; tenured and non-tenured staff.

¹¹ FTE has been multiplied by the research factor: 0.4 for scientific staff and 0.8 for post-docs.

¹² Although citation rates may have decreased in importance under the new SEP-protocol, TPM has exercised its freedom to choose relevant indicators for measuring research quality. As such, TPM has opted to utilise the metrics 'Output in top 10% citation percentiles (field-weighted)' and 'Citation impact (field-weighted)' to gauge the quality of its research. Hence, the Committee has evaluated the quality of TPM's research in accordance with these selected indicators.

In addition, the research quality, leadership, and influence of VTI is demonstrated through the involvement of its staff in editorial boards and other important professional contexts. The group has secured significant research funding over the assessment period, with an upward trend in recent years, indicating a healthy research trajectory and sustained quality. The research project case studies provide evidence of ambitious, original, and collaborative research initiatives.

VTI has demonstrated robust evidence of research quality and activity across all three of its research themes and sections. The research outputs showcase originality and innovation that transcend disciplinary boundaries. A notable example is the group's work on frugal innovation for sustainable global development.

Efforts to establish a closer link between research topics and teaching are appreciated, as these topics are not only relevant to students of social sciences but are also of utmost importance to all engineering disciplines. Anchoring these topics in the curriculum is therefore the right approach, and will help ensure that students across different fields are adequately prepared to address the complex challenges facing our society today.

The ESDiT project award is a tremendous opportunity to expand the scope and reach of EPT, a strategic theme of VTI, and is a testament to the group's research quality and strength. Nevertheless, there is a risk that this project may create an imbalance in resources and research focus within VTI, which could have unintended consequences. It will be crucial to carefully monitor and manage this potential risk to ensure that VTI continues to thrive and maintain a well-rounded research portfolio [9].

The committee sees possibilities for VTI to engage more in interdisciplinary and transdisciplinary projects. The Committee would welcome VTI exploiting its position in TPM by becoming more interdisciplinary (particularly EPT and ETI) and building on current

strengths to forge collaboration within and outside the university. The health systems example is a very good show case that deserves following.

Comments about PhD Policy & Training and VTI can be found in section 5.4 of the Faculty chapter under the PhD Policy and Training subsection.

4.2 RELEVANCE TO SOCIETY

VTI's research is both highly relevant and demanding, reflecting the complexity of the challenges that urgently need to be addressed in our society. VTI has the depth of knowledge and expertise required to tackle them effectively. It is therefore imperative that VTI continues to provide cutting-edge research to addresses these challenges.

VTI's overarching aim and focus on responsible innovation (and its three underpinning themes) have clear and important societal relevance. VTI showcases positive social impacts, in particular in relation to influencing policy guidance and frameworks, public debate and research-informed teaching. It is also clear that VTI faculty are playing important roles in societal debates and decision making in the Responsible Innovation space.

The topic of responsible innovation, however, is continuously developing and seems to be absorbed by wider approaches like the mission-oriented approach or the sustainability transformation approach. It would be wise to connect early with these developments.

The potential pathways to societal relevance are clearly stated, although the impact itself could be more clearly detailed/defined in the report. In addition, it is not clear what (if any) Department level mechanisms are available to enhance and embed societal relevance.

VTI has demonstrated numerous successful collaborations, including those with government, which are a testament to the group's strong commitment to working closely with stakeholders. These collaborations serve as excellent examples of VTI's ability to engage with partners across different sectors.

Broader communities should be involved in the research – e.g. citizen and community groups – wherever possible. There are pockets of innovation in this regard, e.g. the Art track within ESDiT, but more could be done in terms of citizen science.

Comments about Open Science and VTI can be found in section 5.6 of the Faculty chapter under the Open Science subsection.

4.3 VIABILITY

The Committee has observed that there is potential for exploring grounds beyond its disciplines, in particular in the economics and philosophy groups. Therefore, incorporating more innovative and unconventional approaches into VTI's research endeavours could help the group achieve even greater success in the future [10]. The Committee recognises the high standard set by all departments, and that this observation is made in the context of rigorous evaluation.

Without doubt, the VTI Department is excellent in exploiting existing competences and knowledge. However, the committee noted that, next to that, the exploration of new methods, questions, and approaches should be more pronounced. In addition, the ambidextrous nature of the research process should receive greater attention from the management team. From this observation follows room for improvement of the portfolio management. The growth in funds in relation to the balance of the sections is a point of attention for VTI.

The Committee observed several noteworthy examples of cross-fertilisation, collaboration, and interdisciplinarity within VTI. One such example is a project that involves two PhD candidates: one with a background in psychology and a keen interest in modelling, and the other with a mathematics background and a strong interest in behaviour. The ownership of the project by the PhD candidates and their collaborative efforts were highly appreciated.

The Committee encourages VTI to connect much more with MAS, as there is unexploited potential, e.g. psychology, behavioural modelling, systems theory [11].

VTI's mission statement is currently lengthy and complex. As such, the Committee recommends that the group considers developing a more concise and focused statement that clearly articulates its core values and goals. A more streamlined mission statement can help to communicate VTI's vision more effectively to a broader audience and provide greater clarity and direction for the group's research activities [12]. Also, it might help the further positioning of VTI, which is very clear to TPM, but less so for the external world.

The topics of political systems and social justice are currently underdeveloped within VTI's research portfolio, but the group is making strides towards addressing this issue. There is an opportunity for VTI to expand its research focus in these areas, which are of critical importance to society.

The Committee has questions about the research agenda and activities of ETI. In the Committee's view there is the need for a group that starts reforming economics; complementing the incentive-orientation with a knowledge-orientation, and apply (innovation) systems theory. Also long-term developments, e.g. structural change and sustainable transformation could be considered as complements for the research on responsible innovation.

Comments about HR and VTI can be found in section 5.5 of the Faculty chapter under the Human Resource Management subsection.

Comments about Academic Culture and VTI can be found in section 5.7 of the Faculty chapter under the Academic Culture subsection.

4.4 LIST OF RECOMMENDATIONS

The Committee recommends VTI to¹³:

- [9] carefully monitoring and managing a well-rounded research portfolio;
- [10] incorporate more innovative and unconventional approaches into VTI's research endeavours;
- [11] exploit the potential of connecting much more with MAS;
- [12] streamline the current mission statement in order to communicating VTI's vision more effectively and to provide greater clarity and direction for the group's research.

¹³ The list of recommendations is limited to the Committee's most crucial observations.

5 REMARKS FOR THE FACULTY OF TPM

During the site visit, the Committee conducted a comprehensive investigation of four key SEP-aspects at the departmental level. After careful consideration, the Committee has determined that there are no significant differences among the three departments regarding these aspects. This outcome is not unexpected, as the majority of these aspects are governed by TU Delft-wide or Faculty-wide policies, the latter indicating that the TPM-faculty functions as a cohesive strategic unit.

In light of these findings, the Committee has decided to consolidate the discussion of these aspects into a single section, while any differences that may arise will be highlighted. Moreover, by giving joint remarks the Committee hopes it enhances the collaborative spirit – by working side by side on the topics, and may be even on the Faculty level - and eventually will let the three Departments grow further together.

5.1 COLLECTION OF GENERAL REMARKS

The Committee was impressed by what they have seen: novel ways of working in projects, intensive, very intertwined collaborations, really working in an integrated manner. The rector acknowledges the change of the role of the faculty at TU Delft, and TPM therefore has become invaluable to TU Delft, which is important. The presentations on research projects were exceptionally articulate and effectively showcased world-class research. The atmosphere at this workplace is extremely supportive, which undoubtedly makes it a joy to work here.

Based on the above assessment, the Committee recommends that TPM should prioritise promoting its unique offerings both within Delft and to the wider world [13]. This will enable TPM's image to better align with

the overall image of the university. Additionally, TPM should continue to leverage its focus on socio-technical systems, which is a valuable contribution to the transformation of engineering. Finally, the committee recommends that TPM should further explore potential opportunities to collaborate with other departments and institutions to achieve broader impact.

The Committee expects that other more traditional groups around the world will replicate (part of) TPM's niche, also in view of the large societal need for this type of research. While this is certainly a compliment to TPM's success, it also raises the question how TPM wants to position itself among their peers. The Committee would welcome a strategy by which TPM retains its leading edge [14].

The faculty management has demonstrated a strong and cohesive vision, along with ideas to keep the team moving forward. TPM prioritises symbiotic relationships, placing greater importance on collaboration between engineers and social scientists rather than transferring from one place to another. The Committee is highly impressed with the team's overall cohesion, particularly the management team's open and dynamic leadership style. The following remarks could help to enhance the functioning of the management team:

- The Committee's question regarding TPM's growth ambitions for the next five years remained largely unanswered. While the Committee acknowledges that TPM's growth is influenced by external factors, it is still important to develop a more articulate strategy to accommodate it;
- In light of the potential growth mentioned above, the Committee believes that the scale of TPM could be leveraged as an advantage if TPM proactively shapes the field;
- Although collaboration is already taking place at an intense level, there is still potential for greater synergy between departments. For instance, developing tools and connecting

them with topics like governance from other departments could foster more synergy [15];

- TPM possesses a wealth of tacit knowledge that requires codification to further leverage and create impact with this knowledge [16]. One possible solution could be the use of personal grants to facilitate this process;
- While the Committee observed several instances of valorisation and technology transfer, they did not perceive a clear and explicit strategy in this regard, which seems like a missed opportunity.

The Committee would like to conclude this section by expressing a note of caution: TPM's current way of operating works well in a situation of growth in funding and student enrolment. It is important to recognise that this may not be a sustainable trend in the long term, and thus, poses a potential threat to the institution's stability and continued success.

LIST OF RECOMMENDATIONS

The Committee recommends TPM to¹⁴:

- [13] prioritise promoting its unique offerings both within Delft and to the wider world ;
- [14] develop a more articulate strategy by which TPM retains its leading edge;
- [15] foster even more synergy between departments, for instance by developing tools and connecting them with topics from other departments;
- [16] codify the wealth of tacit knowledge at TPM to effectively leverage and create impact with this knowledge.

¹⁴ The list of recommendations is limited to the Committee's most crucial observations.

5.2 LABS

The Committee was impressed by the lab-concept; faculty-wide labs (top-down, providing a framework for aligning with the faculty strategy) but also labs organised around people that grow organically (bottom-up). The Committee thinks that the requirement that bottom-up labs have to appeal to more than one member of staff is also encouraging team science and that flexible funding fosters innovation. There could be additional opportunities to extend such processes to include the full spectrum of academics, in particular early career researchers whose work might not fit within a lab theme or with national funder priorities.

5.3 TPM STAKEHOLDER INVOLVEMENT

Overall, the Committee appreciated the close collaborations with stakeholders, such as employees starting a PhD-trajectory, sponsoring chairs, liaison-roles to step in research, doing experiments together. Three good examples of engaged research were presented, with a good added value for the stakeholder. In the Committee's view it is very unusual to see this high-level engagement (meeting very often, sharing highly confident data). These experiences are a fruitful ground to expand to a broader range of stakeholders, including citizen science.

Some suggestions for improvement regarding stakeholder involvement that came across are:

- In a few perhaps isolated incidences, professional agenda planning, budgeting, preparation of meetings with stakeholders could be improved;
- Include even broader stakeholders within projects to cover different aspects including policy, research and industry;

- Making the results more practical and recognising that publishing papers is not the end game. Follow up on the study results, conduct follow-up studies or continue with longer monitoring periods;
- Find ways to start collaborating before money and paperwork is in place, given the bureaucracy that can get in the way and take 12-18 months to put everything in place.

5.4 PHD POLICY AND TRAINING¹⁵

The TU Delft University Graduate School (UGS) and its local branch, the TPM Faculty Graduate School (FGS), provides a structured Doctoral Programme with a PhD Development Cycle, which includes a clear assessment timeline and a course-based Doctoral Education (DE) Programme. It is the ambition of the UGS to facilitate doctoral candidates to become highly qualified, autonomous, and leading researchers and skilled professionals. At TU Delft, a Doctoral Programme consists of Research and Doctoral Education (DE). The research is embedded in research Departments. The DE Programme is an integral part of the preparation for the doctorate and the graduate's further career. It ensures and enhances the development of scientific quality along with the needed proficiency for interpersonal skills.

The success rates of the PhD candidates at the three Departments are found in Appendix E.

¹⁵ For TPM, PhD Policy and Training is essential in order to deliver *high research quality*.

REMARKS

In general, the PhD policy and training is well-organised. There are two main concerns regarding the aspect of PhD Policy and Training: the discontinuation rate and the long time-to-thesis, with the first being the most pressing issue. TPM should develop plans to improve PhD success rates, as execution of the policy in place is failing [17]. Furthermore, the consequences of failure fall mostly on the PhD candidates.

The Committee recommends that TPM conducts a review on the factors impacting the discontinuation rates and graduation time of PhD trajectories, taking into account the differences between employed, scholarship and external PhD candidates [18].

The Committee noticed that the Graduate School and Faculty management is proactive, working on a plan to improve issues. In particular, the emphasis on making supervisors accountable for timely completion of theses and evasion is a positive step. The Committee strongly encourages TPM to actively follow up on the GS plans to monitor progress and to seek methods of holding supervisors accountable [19].

Furthermore, training programs are being offered to new staff, which the Committee commends. However, to ensure that all staff members are equipped with the necessary skills, the Committee recommends making this training compulsory for everyone with a supervision role, keeping in mind that those who would refuse to take the training might be the ones that would need it the most [20].

The Committee noted a drop in the number of PhD candidates in MAS and VTI, mostly by decline in the number of external candidates. Nevertheless, the Committee recommends a thorough selection of candidates, to improve the chances of successful trajectory [21].

The Committee would like to highlight that during the site visit, the PhD candidates whom the Committee had the opportunity to interact with

were overwhelmingly positive about their experiences and the level of involvement they have in their respective departments and faculty.

Nonetheless, a few remarks can be made to further improve the PhD Policy and Training:

- The Committee noted that transferable skills courses appear to have limited added value for students with prior work experience. These students have expressed a desire to explore alternative topics, which is challenging as transferable skills courses are mandatory;
- The Committee noted that externally funded projects have a high degree of autonomy, allowing for a flexible distribution of student workload between wider project and PhD project. However, more attention needs to be paid to ensuring the PhD gets sufficient priority in student workload. Moreover, workload needs to be negotiable over the period of the PhD to ensure sufficient time is being given to the PhD and not the wider project. It should not just be left to students to advocate for themselves;
- The Committee formed the impression that the mentoring scheme requires improvement, as it is offered to some PhD candidates, while others miss out on this opportunity;
- The Committee received mixed feedback regarding the Go/No-Go meeting, ranging from easy-pass to highly intense. Therefore, more uniform guidance and messaging on expectations should be provided [22];
- The Committee noted that adequate supervision was not always readily available. However, there were also instances where students reported extremely positive experiences with their supervisors;
- During the site visit, the Committee learned that a formal process of changing supervisors exists and that this has been done recently and effectively. However, the Committee believes

that the underlying issue is that students may not feel comfortable escalating concerns, and that there is a need for more accountability mechanisms to address instances of poor supervision. For example, having an independent chair for the Go/No-Go meeting may be helpful. Additionally, as a suggestion, a general anonymous survey organised by the PhD council could be useful in identifying any underlying problems and exploring potential solutions.

LIST OF RECOMMENDATIONS

The Committee recommends TPM to¹⁶:

- [17] develop plans to improve PhD success rates;
- [18] conduct a review on discontinuation rates for the various types of PhD-trajectories;
- [19] actively following up on GS plans of monitoring progress and holding supervisors accountable;
- [20] make the training programme for new staff compulsory for everyone;
- [21] thoroughly select candidates, to improve the chances of successful trajectory;
- [22] provide more uniform guiding and messaging on expectations of the Go/No-Go meeting for PhD-candidates.

¹⁶ The list of recommendations is limited to the Committee's most crucial observations.

5.5 HUMAN RESOURCES POLICY¹⁷

TALENT MANAGEMENT

The Committee noticed that there is a fierce national and international competition for talent and that TU Delft is actively participating in it by seeking to attract the best candidates worldwide. The following remarks relate to this “war-on-talent”:

- The Committee was informed that TPM currently follows a mix of recruitment approaches, including a single candidate approach for recruitment, which involves relying on personal networks. Although it was noted that this approach was more in line with the rector's recommendations rather than TPM's own preference, it's worth considering the potential drawbacks of this approach. While this may be suitable in some circumstances, a word of caution is required here as this approach could limit the diversity of candidates considered for positions at TPM.
- The Committee observed a lack of female representation at the associate level. While there has been an improvement in closing the gap at the tenure track level, there is still room for progress. The Delft Technology Fellowship program appears to be a helpful initiative in addressing this issue.
- Recruiting postdocs seems challenging as they tend to aim for tenure-track positions in a highly competitive market.

To address the issues highlighted above, the Committee recommends that TPM places more emphasis on competence management [23]. The current recruitment process appears to be quite organic, and therefore,

¹⁷ According to TPM, Human Resource Management mainly contributes to research quality and viability, and in a lesser extend to societal relevance.

the Committee suggests that TPM should be more explicit in terms of process and strategy.

Specific for MAS:

- During the assessment period, MAS hired twenty new staff members, but also saw six employees leave, which appears to be an unusually high turnover rate. The Committee suggests that MAS reflects whether their HR policy is competitive enough to retain valued staff [24];
- It is important for MAS to become strong on fundamentals and strong on stakeholder engagement. One way to achieve this is by facilitating early career faculty;
- The MAS management team recognised that in the past they had been slow to promote staff, but it is unclear to the Committee how this issue is currently being addressed.

Opportunities for staff to acquire individual grants (next to opportunities to participate in large projects) could add to competitive edge in the "war on talent".

Post-docs

The Committee has noticed that many individuals receive support from TPM, but it appears that postdocs – the group with the most uncertain future – are least supported. Although postdocs are essential for conducting research, they are often overlooked in terms of career and welfare support. The Committee believes that greater attention and resources are required to better support this group, including increased mentorship, opportunities to apply for small pots of internal funding to develop research agendas/ ideas, c.v. building etcetera to ensure their professional development and well-being. Furthermore, having a supporting community would be helpful for the postdocs.

In regards to the issue of the "war-on-talent," the Committee recommends that TPM better utilise postdoc positions as a stepping stone for a tenure position [25].

Tenured staff

The Committee had the pleasure of meeting with a satisfied group of tenured staff who find TPM to be an attractive workplace. These individuals value the opportunities for collaboration, the freedom to pursue their own research interests, and the multidisciplinary environment. It was noted that the tenured staff highly prioritise cooperation, which exemplifies effective team science in action.

The atmosphere at TPM feels safe and welcoming, allowing for open communication between the tenured staff and the (guiding) supervisors.

The Committee found that promotions based on factors beyond fixed checklists seem to work well at TPM. The emphasis on the quality of publications rather than quantity is appropriate. This point, as mentioned on page 64 of the self-assessment report, was further supported by the interviews conducted. It was noted that staff are encouraged to prioritise quality in their work.

Tenure track

TPM displays boldness by deviating from strictly quantitative measurements for promotion measures, allowing tenure-track staff to prioritise quality over quantity. The Committee observed that these measures are generally well-received by tenure-track staff. However, it is important to note that such an approach opens up the subjective nature of assessments and uncertainty regarding criteria.

Although the Committee is aware that TPM adheres to formal objective criteria in the promotion procedure, the Committee would like to express a concern regarding the weight of the negotiation between

tenure-track staff and their line managers regarding promotion. This approach could potentially lead to feelings of unfairness among other individual staff members and different expectations between different groups. While flexibility is desirable, it is important to calibrate expectations, especially as TPM continues to grow.

According to the tenure-track staff, TPM takes work-life balance very seriously. They feel that there is a lot of attention given to this matter and that they are genuinely cared for. The open discussion of work-life balance further adds to the positive work environment. Additionally, TPM encourages parental leave for its employees.

DIVERSITY

The Committee applauds the TU Delft's initiative of setting targets (25% women in 2025) and – since TPM already achieved this goal – recommends establishing a specific, higher target for TPM [26].

The Committee learned that plans are on the way to implement mentoring programme more systematic and recommends to make serious work of this [27].

The Committee appreciates the onboarding process, but is concerned that the rapid growth may be putting pressure on it. Therefore, the Committee recommends establishing a monitoring system, such as reviews or feedback from staff members, to evaluate the effectiveness of the onboarding process [28].

As mentioned earlier in the report, the culture within TPM is often informal and works on the basis of share understanding of best practice. However, while this may work for Dutch staff, it may pose a challenge for international staff to find their way. This shared understanding may also weaken as TPM grows. This is particularly relevant from a diversity standpoint, and therefore warrants attention.

Overall, TPM shows that they are aware that their strategy is very dependent on a successful HR policy (both in recruitment and in creating a safe, creative and cooperative working environment). Continued focus on HR skills for supervisors is therefore recommended.

LIST OF RECOMMENDATIONS

The Committee recommends TPM to¹⁸:

- [23] place more emphasis on competence management in order to address the “war-on-talent”;
- [24] reflect whether HR policy is competitive enough to retain valued staff (MAS);
- [25] utilise postdoc positions as a stepping stone for a tenure position;
- [26] establish a specific, higher target than current “25% women in 2025-goal”;
- [27] make serious work of implementing a systematic mentoring programme;
- [28] establish a monitoring system to evaluate the effectiveness of the onboarding process.

¹⁸ The list of recommendations is limited to the Committee's most crucial observations.

5.6 OPEN SCIENCE¹⁹

The Committee acknowledges that TPM is adhering to TU Delft policies in regards to Open Science (OS), which is fitting. However, it is important to note that the TU Delft policy is a limited perspective and the Committee recommends expanding the pillars of Open Science at TPM to ensure a more comprehensive approach.

The Open Science programme at TU Delft seems to be well established, following the broader developments in the Netherlands, but with a limited focus, based on seven pillars: Open Education; Open Access; Open Publishing Platform; FAIR Data; FAIR Software; Open Hardware; Citizen Science. Those pillars do not cover the current, broader OS perspectives seen, for instance, in the UNESCO OS recommendations or the European Commission movement to integrate Responsible Research and Innovation (RRI) in OS.

Reading the self-assessment report, the Committee sees OS is clearly supported in those aspects related the University's pillars. However, elements such as the engagement with stakeholders in the design, doing, delivery and dissemination of research could be clearer. Those were points of concern before the site visit, when it became clear that TPM was indeed doing a very nice job regarding the broadness of OS, although this was not fully reflected in the reporting, e.g. the unit being opened in The Hague.

Thus, the OS work conducted at TPM deserves praise; meanwhile, there is a further opportunity for TPM to play a leadership role in adopting Open Science within TU Delft. Therefore, the Committee recommends that TPM broaden its perspective on Open Science to achieve more

¹⁹ According to TPM, Open science mainly contributes to societal relevance, and in a lesser extend to research quality and viability.

comprehensive results that can serve as a model to inspire and educate the rest of the university [29].

Furthermore, there is a lot of potential impact in pursuing broader OS at TPM, given the fact that TPM is very much involved in connecting to external stakeholders.

We encourage TPM to:

- go further on the OS path. Work on a structured process to expand pillars, also investigating ways to evaluate every pillar;
- actively create projects and ideas that generate data that serve the public needs. For example, using state-of-art approaches such as machine learning and AI to create synthetic data that replicate difficult-to-obtain data that are critical for certain research domains.

LIST OF RECOMMENDATIONS

The Committee recommends TPM to²⁰:

- [29] broaden its perspective on Open Science to achieve more comprehensive results that can serve as a model to inspire and educate the rest of the university.

²⁰ The list of recommendations is limited to the Committee's most crucial observations.

5.7 ACADEMIC CULTURE²¹

At TPM a prolific and friendly - collaborative and dynamic also - academic culture is prevailing. To some extent, TPM might consider to increase its internationalisation efforts, e.g. inviting more guest researchers, visiting professors and developing more opportunities for TPM researchers to spend longer time in laboratories/ faculties/ research institutes in other places of the world.

There is a strong sense of research quality and research integrity - but primarily underpinned by a collaborative culture and informal processes. Formal policies are in place but the extent to which they are at the forefront of practice are unclear.

Once again, the staff described TPM as having an inclusive culture with a good work-life balance. However, this may be challenged as the faculty continues to grow, and it is essential to reflect upon and sense-check this perception to ensure that it remains accurate.

International PhD-students face challenges with adapting to the Dutch (informal) working culture. Foreign students may find it particularly difficult to approach Dutch senior staff members, as they expect a more hierarchical structure that is not present. Consequently, these students may miss out on non-written information that is crucial for the progression of their PhD trajectory.

²¹ According to TPM, Academic culture mainly contributes to research quality and viability, and in a lesser extend to societal impact.

6. EXECUTIVE'S BOARD EXTRA QUESTIONS

The Executive Board requests the committee to offer its reflections on the Faculty's approach to stimulate and enhance interdisciplinary cooperation between researchers with different disciplinary backgrounds on cross-cutting topics and 'team science', both informally and formally.

Committee's reflection on the Faculty's approach to stimulate and enhance interdisciplinary cooperation between researchers with different disciplinary backgrounds on cross-cutting topics.

TPM has created a unique environment for cooperation between multiple disciplines in the context of projects. Multiple disciplines are really integrated to achieve a common project result.

Since it requires an investment to create mutual understanding between disciplines, a careful selection of projects is needed so that added value justifies this investment. TPM has succeeded to do this well. In some cases there seem to be additional opportunities where projects could benefit from involvement of competence and learnings from other departments. A structured approach to monitor which of the established TPM disciplines/methodologies/approaches are relevant for a certain project may be beneficial.

Committee's reflection on 'team science', both informally and formally

The faculty focus on grand societal challenges provides a positive environment for pursuing team science. The Committee thinks the overall strategy at the faculty level provides a positive context for team science, with the focus on grand challenges. This approach fosters cohesion and unifies the work of the various labs within TPM.

The interdisciplinary approach within TPM supports the development of team science. The Committee was pleased to hear that staff members have emphasised the importance of having core expertise while also seeking opportunities for collaboration. Collaboration is actively encouraged within TPM.

Formally, the two different lab structures aim to bring people together and promote team science within TPM. Specifically, the bottom-up labs are designed to have a broader relevance to more than one member of staff in order to facilitate collaboration and interdisciplinary work.

CONCLUSION AS TPM GROWS AND MATURES IT CAN BENEFIT FROM EXPLICIT STRATEGIES

The working environment at TPM is characterised by a highly positive and supportive atmosphere that cultivates a thriving academic culture. During the site visit, the Committee had the pleasure of experiencing this first-hand and was impressed by the overall atmosphere. The visit was a joy for the Committee to participate in, and it was evident that TPM's commitment to excellence is deeply ingrained in the organisation's culture. The quality of research and its impact on society are exemplary at TPM. It was impressive to see how various processes, such as the labs, operate organically and evolve naturally. While this approach is highly appreciated, the Committee has concerns that TPM's further growth and development may take undesired directions in the absence of explicit strategies.

To address this, it is crucial to implement clear and explicit choices. As highlighted in the report, explicit strategies are needed for at least the following topics: transitioning mature applied research into fundamental research (ESS, MAS), maximising impact (MAS, VTI), geographically distributing of case studies (MAS), future growth ambitions (TPM), valorisation and technology transfer, and recruiting PhD candidates; positioning in growing competitive field (TPM).

While articulating these strategies is essential, the Committee recognises that the process of jointly defining them is equally crucial. The Committee is convinced that TPM's team science approach makes it well-suited to do so successfully. By working collaboratively to develop and implement these strategies, TPM can continue to grow and excel in various areas, as outlined in the Committee's report.

APPENDIX A CURRICULA VITAE OF THE COMMITTEE MEMBERS

Prof. dr ir. H. (Harro) van Lente, Committee Chair, was trained in Physics and Philosophy at the University of Twente, The Netherlands, and graduated in both disciplines. His PhD thesis led to the rise of the Sociology of Expectations, which studies how representations of the future shape current socio-technical developments. He published extensively about the dynamics of technology-society interaction, technology assessment, foresight and the politics of knowledge production. Between 1999 and 2014 he taught Innovation Studies at Utrecht University. From 2010 to 2014 he also occupied the Socrates chair on Philosophy of Sustainable Development at Maastricht University. Since 2014 he is full professor of Science and Technology Studies at the Faculty of Arts and Social Sciences, Maastricht University. He is Chair of the Board of the Netherlands Graduate Research School of Science, Technology & Modern Culture (WTMC) and member of the Dutch Health Council. In 2018 he received the Freeman prize for the co-edited book *Emerging Technologies for Diagnosing Alzheimer's Disease: Innovating with Care*.

Dr ir. N.C.M. (Colette) Alma-Zeestraten studied molecular sciences at Wageningen University. She received her PhD in Biophysical Chemistry at Radboud University in 1982. In 2001 she completed an MBA at the UK Open University. From 1981 she worked for Shell in a variety of roles in R&D, HSE, HR and Government relations. Between 2000 and 2004 she acted as director of the National Initiative for Sustainable Development (a not-for-profit organisation). From 2004-2015 she was director of VNCI, the Dutch Association of the Chemical industry. Presently she is an independent consultant, with a focus on safety, the climate transition, innovation and the (chemical) industry.

Mr. A. (André) Brasil is a final-stage PhD candidate at the Center for Science and Technology Studies (CWTS), Leiden University, where he is a member of the UNESCO chair on Diversity and Inclusion in Global Science and co-leads the Centre's research hub on Open Science. He is also a research associate at the Research on Research Institute (RoRI), a consortium of 21 partners from 13 countries, focused on improving how research is funded, practiced, communicated, and evaluated, so that it works better for everybody. In his work, he is concerned with issues such as responsible evaluation, geographical diversity in science, multilingualism, and responsible research and innovation. His research combines methods focused on scientometrics and science and technology studies, and for that he counts on a multidisciplinary background, with degrees in public policy, education, business intelligence, marketing and also languages/literature. He is originally from Brazil, where he spent 15 years as a policy officer, ten of those dedicated to research evaluation at CAPES, the country's main funding agency also responsible for regulating and evaluating the National System of Research and Graduate Education (SNPG).

Prof. dr J. (Jim) Duggan is a Personal Professor in Computer Science at the University of Galway, Ireland. Prof. Duggan has held a range of senior academic roles, including Head of Department, Vice-Dean of Research and Graduate Studies, and has served on the Standing Committee and Academic Council. Prof. Duggan is a Funded Investigator at the Insight Centre for Data Analytics, and is a Managing Editor of the System Dynamics Review. His research interests span simulation, mathematical modelling and data science, with applications in public health. Prof. Duggan is a member of the Irish Epidemiological Modelling Advisory Group (IEMAG), and also a member of the World Health Organisation's Global Outbreak and Response Network (GOARN).

Prof. dr A. (Andreas) Pyka is Professor for Innovation Economics at the University of Hohenheim, Germany. His research interests include transformation processes towards a sustainable and climate neutral economy, the role of innovation for transformation and the application

of new methodologies to overcome the limitations of mainstream economics in the analysis of long run developments. He is involved in several national and international research projects dealing with the impacts of the bioeconomy, artificial intelligence and robots, and mobility and energy change. His theoretical background is evolutionary and complexity economics. He graduated with a PhD in economics at the University of Augsburg where he also finished his habilitation in 2004. In the last years he was visiting professor at the Università degli studi dell'Insubria in Varese and the Université Paris 1 Panthéon-Sorbonne. He is editor-in-chief of the Journal of Innovation Economics and Management (*Revue d'Economie et de Management de l'Innovation*). Andreas Pyka also actively is engaged in scientific associations, he served more than 10 years as editor (elected) of the international Schumpeter Society, he has been President of the Think tank Lisbon Civic Forum and chairman of the Evolutionary Economics Group in Germany and he coordinated the Research Area Innovation and Technological Change of the EAEPE.

Dr L. (Louise) Reardon studied Politics, Philosophy and Economics at Durham University (UK), before being awarded a PhD in political science from the University of Sheffield (UK) in 2014. On finishing her PhD she joined the Institute for Transport Studies, University of Leeds (UK) as a Research Fellow, before joining the University of Birmingham (UK) in 2017. Louise is currently Associate Professor of Governance and Public Policy in the School of Government. Louise's research interests include agenda setting, multi-level governance, policy change, and wicked problems and developing interdisciplinary analysis of 'sustainable' and 'smart' transition dynamics. Her work has been published in leading peer-reviewed journals and she has been involved in securing and delivering high-value research awards from funders including the UK Economic and Social Research Council, UK Engineering and Physical Sciences Research Council, and Australian Research Council. She co-Chairs the Special Interest Group on Governance and Decision-Making Processes for the World Conference on Transport

Research Society and is on the Editorial Boards of Research in Transportation Business & Management and Local Government Studies, having previously been co-editor of the latter.

Prof. dr S. (Sonia) Yeh is Professor in Transport and Energy Systems in the Department of Space, Earth and Environment. Her expertise is in energy economics and energy system modeling, alternative transportation fuels, sustainability standards, technological change, and consumer behavior and mobility. Throughout her work, she has advised and worked broadly with U.S. state and international advisers, policymakers, a wide range of stakeholder groups and academic researchers in developing climate policies toward reducing the environmental impacts and GHG emissions from transport. She served as Fulbright Distinguished Chair Professor in Alternative Energy Technology in 2016-2017 and received Håkan Frisinger Award by Volvo Research and Educational Foundations in 2019. She is an adjunct professor at the Department of Engineering and Public Policy, Carnegie Mellon University and a Senior Editor for Energy Policy journal since 2018.

APPENDIX B SITE VISIT PROGRAMME

All interviews are organised in the Boardroom (A1.370) of the faculty of TPM.

The lunches are organised in meeting room A2.380, except the lunch with PhD-candidates: this will take place in corridor A1.

DAY 0 – Tuesday February 14, 2023		
<i>Time</i>	<i>Activity</i>	<i>Participants</i>
17.00 Hotel 17.15 arrival TPM, to A1.330	Arrival of committee and welcome	Committee + Rector Prof. T.H.J.J. van der Hagen
17.30 – 21.30	Working diner: kick-off and preparation of interviews	Committee (private)

DAY 1 – Wednesday February 15, 2023		
<i>Time</i>	<i>Activity</i>	<i>Participants</i>
8.30 – 9.00	Preparation of interviews	Committee (private)
9.00 – 10.00	Interview Management Team Start with a six minutes presentation: 3 biggest achievements, 3 hindrances/dilemmas, cross- roads,	Prof. Aukje Hassoldt Prof. Sabine Roeser Prof. Marijn Janssen Prof. Martijn Warnier Prof. Neelke Doorn Jacqueline Dekker Feiko Kloppenburg Corinne de Vries-Posthoorn
10.00 – 10.15	Reflection	Committee (private)
10.15 – 11.15	Experiences ESS	Prof. Tina Comes (TPM Resilience lab) Dr. Niek Mouter (Populytics: Participatory Value)

		<p>Evaluation) Dr. Katerina Stankova (Evolutionary games to improve the treatment of metastatic cancer - NWO VIDI project)</p> <p>Prof. Kornelis Blok (Delft Energy Initiative)</p>
11.15 – 11.45	Reflection + Break	Committee (private)
11.45 – 12.15	Interview Rector TU Delft	Prof. T.H.J.J. van der Hagen
12.15 – 12.30	Reflection	Committee (private)
12.30 – 13.30	Lunch	Committee (private)
13.30 – 14.15	<p>Interview MT Engineering Systems and Services</p> <p>Start with a six minutes presentation about 3 biggest achievements and 3 cross-roads/dilemma's/hindrances</p>	<p>Prof. Marijn Janssen</p> <p>Prof. Zofia Lukszo</p> <p>Dr. Jafar Rezaei</p> <p>Dr. Mark de Reuver</p> <p>Christine Bel</p>
14.15 – 14.30	Reflection	Committee (private)
14.30 – 15.30	Experiences MAS	<p>Dr. Igor Nikolić (Infrarium)</p> <p>Dr. Gerdien de Vries (TPM Energy Transition lab)</p> <p>Prof. Michel van Eeten (Cyber)</p> <p>Prof. Tatiana Filatova (Climate Adaptation)</p>
	Reflection + Break	Committee (private)
16.00 – 16.45	<p>Interview MT Multi-Actor Systems</p> <p>Start with a six minutes presentation about 3 biggest achievements and 3 cross-</p>	<p>Prof. Martijn Warnier</p> <p>Dr. Els van Daalen</p> <p>Prof. Frances Brazier</p> <p>Dr. Mark de Bruijne</p> <p>Dr. Haiko van der Voort</p> <p>Joyce van Velzen</p>

	roads/dilemmas/hindrances	
16.45 – 17.00	Reflection	Committee (private)
18.00	Refreshing at hotel	Committee (private)
19.00	Working dinner: discussing and writing preliminary judgments	Committee (private)
21.00	Closure	

DAY 2 – Thursday February 16, 2023		
<i>Time</i>	<i>Activity / Assessors</i>	<i>Participants</i>
08.30 – 9.00	Preparation of interviews	Committee (private)
9.00 – 10.00	Experiences VTI	Dr. Irene Grossman (Health@TPM) Dr. Roland Ortt (I am RRI) Prof. Ibo van de Poel (Ethics of Socially Disruptive Technology - NWO Gravitation) Dr. Stefan Buijsman (Digital Ethics Centre)
10.00 – 10.15	Reflection	Committee (private)
10.15 – 11.00	Interview MT Values, Technology and Innovation Start with a six minutes presentation about 3 biggest achievements and 3 cross-roads/dilemmas/hindrances	Prof. Sabine Roeser Dr. Udo Pesch Prof. Genserik Reniers Prof. Cees van Beers Dr. Ilse Oosterlaken
11.00 – 11.30	Reflection + Break	Committee (private)

11.30 – 12.00	Interview Tenured staff	Prof. Andrea Raminez Dr. Aaron Ding Dr. Saba Hinrichs Dr. Iulia Lefter Dr. Zenlin Roosenboom-Kwee Dr. Janna van Grunsven
12.00 – 12.15	Reflection	Committee (private)
12.15 – 13.00 Corridor A1	Lunch with 12 PhD students	Laerke Christiansen (ESS) Ema Gusheva (ESS) Antragama Abbas (ESS) José Ignacio Hernández (ESS) Irene van Droffelaar (MAS) Supriya Krishnan (MAS) Ignasi Cortés Arbués (MAS) Aksel Ethembabaoglu (MAS) Anna Melnyk (VTI) Dimmy van Dongen (VTI) Nynke van Uffelen (VTI) Martijn Wiarda (VTI)
13.00 – 13.15	Reflection	Committee (private)
13.15 – 13.45	Interview Tenure trackers	Dr. Ir. Kenneth Bruninx (ESS) Dr. Baiba Pudane (ESS) Dr. Rolf van Wegberg (MAS) Dr. Nazli Aydin (MAS) Dr. Amir Pooyan Afghari (VTI) Dr. Andrea Gammon (VTI)
13.45 – 14.00	Reflection	Committee (private)
14.00 – 14.30	Interview Post-docs	Dr. Marcus Westberg (ESS) Dr. Francesco Lombardi (ESS) Dr. Sanghamitra Chakravarty (MAS) Dr. Sofia Gil Clavel (MAS) Dr. Tristan de Wildt (VTI) Dr. Camilo Benitez Avila (VTI)

14.30 – 15.00	Reflection + Break	Committee (private)
15.00 – 15.30	Interview on Diversity	Prof. Nitesh Bharosa Feiko Kloppenburg Claudia Werker
15.30 – 15.45	Reflection / Break	Committee (private)
15.45 – 16.15	Interview on PhD Policy and Training	TBM Graduate School board Prof. Hans de Bruijn Dr. Rolf van Wegberg Dr. Anneke Zuiderwijk Dr. Eleonora Papadimitriou Olivie Beek Janine Drevijn
16.15 – 16.30	Reflection	Committee (private)
16.30 – 17.00	Interview on Open Science	Different groups Prof. Martijn Warnier Dr. Nicolas Dintzner Dr. Anneke Zuiderwijk-van Eijk
17.00 – 17.15	Reflection	Committee (private)
17.15 – 17.45	Interview stakeholders (online)	
17.45 – 18.00	Reflection	Committee (private)
18.00	Refreshing at hotel	Committee (private)
19.00 Hotel	Working dinner: discussing and writing preliminary judgments	Committee (private)
21.30	Closure	

DAY 3 – Friday February 17, 2023		
<i>Time</i>	<i>Activity / Assessors</i>	<i>Participants</i>
8.30 – 9.00	Preparation of interviews	Committee (private)
9.00 – 9.30	Interview on valorization and grants	Dr. Cornelis van de Kamp Prof. Behnam Taebi
9.30 – 9.45	Reflection	Committee (private)
9.45 – 10.15	Interview on Research Integrity	Prof. Ibo van de Poel Dr. Nicolas Dintzner
10.15 – 10.45	Reflection + Break	Committee (private)
10.45 – 11.45	Summarizing findings and first conclusions	Committee (private)
11.45 – 12.15	Concluding meeting with management team TPM	Prof. Aukje Hassoldt Prof. Sabine Roeser Prof. Marijn Janssen Prof. Martijn Warnier Prof. Neelke Doorn Jacqueline Dekker Feiko Kloppenburg Corinne de Vries-Posthoorn
12.15 – 14.00	Discussing and writing preliminary judgments (including lunch)	Committee (private)
14.00 – 14.30 Lecture hall A	Oral presentation on first impression by committee	Committee All faculty members invited
14.30 – 15.00 Board room	Closure	Refreshments with Committee and MT

APPENDIX C SEP-DATA ON RESEARCH STAFF

	2016		2017		2018		2019		2020		2021	
	#	FTE	#	FTE	#	FTE	#	FTE	#	FTE	#	FTE
Assistant professor	15.25	5.33	15.08	5.04	15.83	5.33	15.75	5.36	14.33	4.96	17.33	5.81
Associate professor	8.92	3.05	8.67	2.95	9.00	3.05	11.00	3.39	11.75	3.58	13.58	4.08
Full professor	8.17	2.92	8.58	3.11	9.00	3.25	8.00	2.92	8.00	2.79	9.33	3.19
Scientific staff	32.33	11.29	32.33	11.10	33.83	11.63	34.75	11.67	34.08	11.33	40.25	13.08
Postdocs	8.00	4.95	6.83	4.20	8.58	5.73	8.83	5.68	12.92	8.67	17.00	12.56
Total research staff	40.33	16.24	39.17	15.30	42.42	17.36	43.58	17.35	47.00	20.00	57.25	25.64
¹ PhD candidates - Group 1	44.47		58.07		58.21		54.80		52.71		56.82	
² PhD candidates - Group 2	30.72		26.37		21.45		23.96		28.44		29.52	
Total PhD candidates	75.19		84.44		79.66		78.76		81.15		86.34	

Table 1: Staff embedded in the ESS department. FTE has been multiplied by the research factor: 0.4 for scientific staff and 0.8 for post-docs

	2016		2017		2018		2019		2020		2021	
	#	FTE	#	FTE	#	FTE	#	FTE	#	FTE	#	FTE
Assistant professor	16.17	5.61	15.42	5.39	13.75	4.92	13.92	4.99	16.17	5.76	20.00	7.41
Associate professor	14.67	5.11	15.83	5.23	16.42	5.60	16.58	5.75	13.58	4.58	13.33	4.21
Full professor	8.00	2.72	8.00	2.72	6.83	2.42	6.00	2.04	5.00	1.81	6.00	2.23
Scientific staff	38.83	13.45	39.25	13.34	37.00	12.94	36.50	12.78	34.75	12.15	39.33	13.85
Postdocs	15.75	9.75	16.08	10.18	16.08	9.99	16.08	9.62	18.42	11.80	17.42	11.13
Total research staff	54.58	23.20	55.33	23.52	53.08	22.93	52.58	22.40	53.17	23.95	56.75	24.99
¹ PhD candidates - Group 1	49.51		47.15		47.21		48.62		42.35		44.82	
² PhD candidates - Group 2	32.69		26.91		22.69		18.89		15.50		12.61	
Total PhD candidates	82.20		74.06		69.90		67.51		57.85		57.42	

Table 2: Staff embedded in the MAS department. FTE has been multiplied by the research factor: 0.4 for scientific staff and 0.8 for post-docs

	2016		2017		2018		2019		2020		2021	
	#	FTE	#	FTE	#	FTE	#	FTE	#	FTE	#	FTE
Assistant professor	20.00	7.14	15.75	5.83	13.83	5.24	15.33	6.00	14.25	5.54	19.33	7.39
Associate professor	14.42	5.05	14.58	5.17	13.67	4.82	11.92	4.00	12.33	4.47	9.08	3.47
Full professor	7.42	2.77	8.42	3.03	9.17	3.11	10.00	3.31	10.00	3.40	10.67	3.80
Scientific staff	41.83	14.96	38.75	14.03	36.67	13.17	37.25	13.31	36.58	13.41	39.08	14.66
Postdocs	12.08	7.87	16.75	9.95	13.33	7.67	14.83	9.23	15.08	10.51	13.25	9.58
Total research staff	53.92	22.82	55.50	23.98	50.00	20.84	52.08	22.54	51.67	23.92	52.33	24.24
¹ PhD candidates - Group 1	28.89		31.01		26.77		27.12		30.36		34.85	
² PhD candidates - Group 2	38.63		36.02		32.93		30.96		25.67		20.45	
Total PhD candidates	67.51		67.02		59.70		58.07		56.04		55.30	

Table 3: Staff embedded in the VTI department. FTE has been multiplied by the research factor: 0.4 for scientific staff and 0.8 for post-docs.

¹ PhD candidate Group 1: employed and scholarship

² PhD candidate Group 2: other categories

APPENDIX D SEP-DATA ON RESEARCH FUNDING

TOTAL	2016		2017		2018		2019		2020		2021	
	k€	%	k€	%	k€	%	k€	%	k€	%	k€	%
Direct funding ¹	3313	51%	3472	51%	3770	57%	3802	55%	3849	58%	4322	51%
Research funding ²	831	13%	1349	20%	1256	19%	865	12%	1222	18%	1750	21%
Contract research ³	1984	31%	1769	26%	1436	22%	1702	25%	1216	18%	2001	24%
Other ⁴	323	5%	223	3%	185	3%	564	8%	364	5%	384	5%
Total funding	6452	100%	6813	100%	6647	100%	6932	100%	6650	100%	8457	100%
Personnel costs	5682	94%	5819	91%	5838	95%	6439	94%	6566	98%	7728	97%
Other costs	337	6%	575	9%	317	5%	399	6%	166	2%	258	3%
Total expenditure	6019	100%	6394	100%	6155	100%	6837	100%	6732	100%	7985	100%

Table 4: Total funding at level of the ESS department. All amounts in k€.

TOTAL	2016		2017		2018		2019		2020		2021	
	k€	%	k€	%	k€	%	k€	%	k€	%	k€	%
Direct funding ¹	3218	45%	3296	48%	3306	45%	3555	44%	4037	55%	4444	55%
Research funding ²	1470	21%	1526	22%	1859	25%	1598	20%	1305	18%	1439	18%
Contract research ³	2211	31%	1758	25%	2054	28%	2680	33%	1678	23%	1956	24%
Other ⁴	256	4%	357	5%	207	3%	279	3%	259	4%	228	3%
Total funding	7154	100%	6936	100%	7425	100%	8113	100%	7280	100%	8067	100%
Personnel costs	6171	90%	6072	90%	6368	89%	6697	90%	7082	95%	7635	94%
Other costs	684	10%	649	10%	775	11%	728	10%	391	5%	486	6%
Total expenditure	6854	100%	6721	100%	7143	100%	7425	100%	7473	100%	8120	100%

Table 5: Total funding at level of the MAS department. All amounts in k€.

TOTAL	2016		2017		2018		2019		2020		2021	
	k€	%	k€	%	k€	%	k€	%	k€	%	k€	%
Direct funding ¹	3705	67%	3508	54%	3484	54%	3555	53%	4121	60%	4755	57%
Research funding ²	932	17%	984	15%	720	11%	405	6%	495	7%	788	9%
Contract research ³	856	15%	1806	28%	2075	32%	2513	37%	1994	29%	2482	30%
Other ⁴	71	1%	218	3%	126	2%	293	4%	222	3%	360	4%
Total funding	5564	100%	6515	100%	6404	100%	6765	100%	6832	100%	8385	100%
Personnel costs	5679	96%	5792	95%	5819	95%	5927	95%	6609	100%	7581	97%
Other costs	243	4%	328	5%	321	5%	330	5%	28	0%	238	3%
Total expenditure	5923	100%	6120	100%	6140	100%	6257	100%	6637	100%	7820	100%

Table 6: Total funding at level of the VTI department. All amounts in k€.

1 Direct funding by the University, obtained directly from the University, and the financial compensation for educational efforts.

2 Research funding obtained in national and international scientific competition (e.g. grants from NWO, KNAW, ESF).

3 Research contracts for specific research projects obtained from external organisations, such as industry, governmental ministries, European Commission, charity organisations, and ERC.

4 Funds that do not fit into the other categories.

APPENDIX E SEP-DATA ON PhD CANDIDATES

Enrolment (#)				Success rates (%)						
Starting year	Male	Female	Total (male + female)	<= 4 years	<= 5 years	<= 6 years	<= 7 years	# Total	Not yet finished	Discontinued
2014	2	3	5		60%	60%	80%	4		20%
2015	5	7	12	8%	50%	58%	58%	7	8%	33%
2016	11	6	17		29%	47%	x	8	41%	12%
2017	12	10	22		14%	x	x	3	55%	32%
2018	3	3	6		x	x	x		83%	17%
Total	33	29	62	2%	x	x	x	22	40%	24%

Table 7: Success rates of the PhD candidates at the Department of ESS. Note: This table only includes employed and scholarship PhD candidates.

Enrolment (#)				Success rates (%)						
Starting year	Male	Female	Total (male + female)	<= 4 years	<= 5 years	<= 6 years	<= 7 years	# Total	Not yet finished	Discontinued
2014	3		3						67%	33%
2015	4	1	5				20%	1	40%	40%
2016	2		2	50%	50%	50%	x	1	50%	
2017	1		1							100%
2018	1	2	3		x	x	x		67%	33%
Total	11	3	14	7%	x	x	x	2	50%	36%

Table 8: Success rates of the PhD candidates at the Department of ESS. Note: This table only includes external PhD candidates and externally financed PhD candidates.

Enrolment (#)				Success rates (%)						
Starting year	Male	Female	Total (male + female)	<= 4 years	<= 5 years	<= 6 years	<= 7 years	# Total	Not yet finished	Discontinued
2014	5	7	12	8%	50%	83%	83%	10		17%
2015	5	4	9		22%	44%	56%	5	22%	22%
2016	6	2	8		25%	25%	x	2	38%	38%
2017	3	8	11	9%	18%	x	x	2	82%	
2018	4	3	7		x	x	x		86%	14%
Total	23	24	47	4%	x	x	x	19	43%	17%

Table 9: Success rates of the PhD candidates at the Department of MAS. Note: This table only includes employed and scholarship PhD candidates.

Enrolment (#)				Success rates (%)						
Starting year	Male	Female	Total (male + female)	<= 4 years	<= 5 years	<= 6 years	<= 7 years	# Total	Not yet finished	Discontinued
2014	1	2	3			33%	33%	1		67%
2015	3	2	5		40%	60%	60%	3	20%	20%
2016	2		2	50%	50%	50%	50%	1		50%
2017	1	2	3			x	x		67%	33%
2018	2	2	4	25%	x	x	x	1	50%	25%
Total	9	8	17	12%	X	x	x	6	29%	35%

Table 10: Success rates of the PhD candidates at the Department of MAS. Note: This table only includes external PhD candidates and externally financed PhD candidates.

Enrolment (#)				Success rates (%)						
Starting year	Male	Female	Total (male + female)	<= 4 years	<= 5 years	<= 6 years	<= 7 years	# Total	Not yet finished	Discontinued
2014	7	1	8	13%	50%	63%	63%	5	13%	25%
2015	1	4	5			40%	40%	2	40%	20%
2016	3	3	6	17%	50%	67%	x	4	17%	17%
2017	4	1	5	40%	40%	x	x	2	60%	
2018	3	1	4		x	x	x		100%	
Total	18	10	28	14%	x	x	x	13	39%	14%

Table 11: Success rates of the PhD candidates at the Department of VTI. Note: This table only includes employed and scholarship PhD candidates.

Enrolment (#)				Success rates (%)						
Starting year	Male	Female	Total (male + female)	<= 4 years	<= 5 years	<= 6 years	<= 7 years	# Total	Not yet finished	Discontinued
2014	3	1	4			25%	25%	1	25%	50%
2015	8		8		13%	38%	38%	3	25%	38%
2016	2	1	3		33%	33%	x	1	33%	33%
2017	1	2	3			x	x		33%	67%
2018	1	1	2		x	x	x		100%	
Total	15	5	20		x	x	x	5	35%	40%

Table 12: Success rates of the PhD candidates at the Department of VTI. Note: This table only includes external PhD candidates and externally financed PhD candidates.



Quicken ORGANISATIE ADVISEURS
bureau voor organisatieontwikkeling