

ASSESSMENT COMMITTEE REPORT ON RESEARCH  
IN  
COMPUTER SCIENCE  
2015-2020  
DELFT UNIVERSITY OF TECHNOLOGY



March, 2022



ASSESSMENT COMMITTEE REPORT ON RESEARCH  
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COMPUTER SCIENCE, 2015-2020  
AT THE  
DELFT UNIVERSITY OF TECHNOLOGY

**“Toward an Empowered and Inclusive Workplace”**

*MARCH, 2022*

Title:

Assessment Committee Report on Research in Computer Science, 2015-2020 at the Delft University of Technology

Editors:

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## SUMMARY

The Assessment Committee was asked to assess the research of the Intelligent Systems (INSY) department and the Software Technology (ST) department (further referred to as CS@Delft) of the Faculty of Electrical Engineering, Mathematics & Computer Science (EEMCS) at Delft University of Technology (TUD). This assessment covers research in the period 2015-2020. The Assessment Committee Report is approved by all Committee members.

The Committee wishes to make it upfront clear that they were very positive on many things – such as the very high research quality, the high quality of the staff as well as the energy, drive and potential of the primarily junior research staff – and that the Committee deliberately put more focus in the report on what needs to be addressed.

### *Research Area*

There is a very natural blending and cross-fertilization between the two departments, which could be further exploited and increased. CS@Delft refers to “human-centred computer science”, which deserves more attention as an opportunity to increase cross-disciplinary and high-impact research. There are many opportunities for interdisciplinary work and teams, e.g. the AI Labs.

### *Research Quality*

The overall research quality is very good, and even often excellent. The venues where CS@Delft publishes are internationally competitive and of very high quality. The Committee would like to have seen narratives explaining why the publications in the self-study were selected. The Committee noted an absence of people saying that they were striving for excellence. It would be appropriate to be more explicit about this goal, e.g. competing for ERC grants and other competitive awards. The Committee observes that CS@Delft pays much attention to open

access, yet seems to have a more narrow view on open science than what is currently being considered within science in general. In terms of open access the Committee thinks that CS@Delft is well on track. Regarding open science, the Committee thinks CS@Delft has the potential to move forward more strongly than is currently the case, and there is evidence already in this direction when looking at participation in externally funded AI innovation labs.

#### *Relevance to society*

Many research topics and research areas of CS@Delft are societally relevant and the Committee saw examples of research with excellent societal impact. However, societal relevance at CS@Delft, as presented by the two departments, mainly follows an inside-out approach. The Committee believes that there are ample opportunities to take a stronger outside-in perspective and allow societal imperatives to influence the research agendas. Although the Committee encourages both departments to continue making contributions to various research products and their applications, there is a risk of jumping into too many areas or participating in application areas that do not contribute to knowledge development in the computer science domain itself.

#### *Future strategy*

The Committee formed the impression that the strategic process designed for selecting and realising future research topics at CS@Delft can be improved regarding its implementation as much originates from a bottom-up approach. Although this type of organisation certainly has advantages, an approach with involvement of all (senior, mid-level, and junior) staff, might provide focus and direction to the departments' activities and empower all levels of the staff.

#### *Organisation*

The organisational structure is described by different interviewees as hierarchical and obstructive for the path of individual research and career development. The committee noticed that some junior staff do not feel self-employed or empowered and attribute this to a large extent

to the governance of the departments. A hierarchical structure inhibits communication, flexibility and proactivity. Empowerment and autonomy could increase the attractiveness of the departments and are a necessity for successful recruitment and retention. The Committee strongly recommends CS@Delft to reflect on its current organisation and to make changes to ensure maximal viability. Moreover, diversity is an important aspect of an attractive working environment, in particular gender diversity. If CS@Delft really wants to maintain and increase the quality of research and maintain its long-term viability, the Committee recommends CS@Delft to strongly consider its organisation and diversity programmes, especially in terms of cultural awareness and strong willingness and commitment to change across CS@Delft.

As a general remark, the Committee observed that the performance indicators in the self-evaluation report only covered the topics of research quality and societal relevance, and not viability.

#### *Governance*

The Committee noticed during the interviews that strategic information is not shared across the hierarchical structure. The middle management seems to be uninvolved in strategic decision making, while at the same time the ambitions and commitment of the middle level are very high.

#### *Resources and facilities*

The Committee formed the impression that CS@Delft aims at relieving its (educational) work load by hiring more people. This pressure could also be countered by saying 'no more students'. There seems to be no clear plan or limits as to how much education effort is required of staff members. A potential rule could be to supervise PhDs for 20% of staff time.

CS@Delft has very good infrastructure and facilities and is housed in a new (refurbished) building that has an open and inviting structure that facilitates collaboration.

### *Gender diversity*

For CS@Delft, gender diversity is seen as an issue. The reflections on the topics remain rather generic and a CS-specific diversity plan was not presented. Although CS@Delft is taking gender diversity seriously, this is insufficiently expressed in terms of tangible actions.

### *Tenure track*

Staff who are on a tenure track have possibilities of getting tenured early, e.g. after 2.5 years. From a short-term point of view, early tenure seems reasonable, since it reduces uncertainty among tenure trackers – and it might help retain people who would otherwise have left. But for the long term, this abbreviated process may have negative organisational implications, lowering academic and research quality if the standards are inappropriate or applied inconsistently.

The Committee noticed a good team spirit among the tenure trackers and that tenure trackers receive a lot of trust from the staff. It was reported that the start of the tenure track is insufficiently guided and supported. CS@Delft has a development track plan in use. A clear set of criteria/ standards is needed to get tenured.

### *Tenured staff*

The Committee noticed that a section head may act as mentor of tenured staff and advises that mentoring be decoupled from formal dependencies.

### *Academic culture*

The Committee saw clear indications that CS@Delft is an organisation that is willing to change and learn. The advice and recommendations from the mid-term Review Committee were taken very seriously, as they led to changes in procedures, e.g. for the tenure track system.

### *PhD Program and Training*

New PhD-candidates face an administrative burden, especially at the start. The committee sees lots of variety in teaching load among PhD-candidates; there seems to be no general rules for the quantity of



teaching. The Committee formed the impression that the awareness and knowledge of the Graduate School (GS) is relatively poor, and is even declining. The Committee notices that staff is perhaps not putting enough effort into using GS as a mechanism to improve training and supervision of PhD candidates.

### *Summary of recommendations<sup>1</sup>*

- [1] Reflect on the current organisation to see which changes can be made to ensure maximal viability;
- [2] Set diversity goals and plan actions that are explicit and transparent;
- [3] Implement a CS@Delft Technology Fellowship;
- [4] Strive to compete at the top levels of EU science, as recognised by highly competitive programmes;
- [5] Develop a more strategic, outside-in approach toward identifying societal relevant subjects.
- [6] Define indicators for viability, taking into account empowerment, autonomy and attractiveness;
- [7] Bring younger faculty into the management processes including offering education and training for management;
- [8] Promote active sharing of information among all staff levels;
- [9] Empower and involve middle management in decision making;
- [10] Ensure transparency and openness in the Development Track Plans;
- [11] Take a detailed look at the teaching load, and make it transparent and fairly distributed among departments and levels;
- [12] Take the GS-system seriously and allocate enough resources to make the GS work;
- [13] Train the staff in guiding PhD-candidates;
- [14] Balance teaching load among PhD-candidates and provide a general rule for this;
- [15] Make good supervision and mentoring a high priority and take

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<sup>1</sup> The recommendations are summarised in order of importance and priority, in the Committee's view

courses on supervising seriously;

[16] Look into ways of getting Open Science better into the culture of CS@Delft;

[17] Reflect on the current policy on getting early-tenured.

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# PREFACE

The Assessment Committee was assigned the task of evaluating the Computer Science research carried out by the Intelligent Systems (INSY) department and the Software Technology (ST) department in the Faculty of Electrical Engineering, Mathematics & Computer Science at Delft University of Technology over the period 2015-2020. The committee, composed of Susanne Boll, Rita Cucchiara, Elena Demidova, Chris Hankin, Jelmer Koorn, Jim Larus 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 wish to thank the committee members for their hard work and the collaborative spirit in these three intense days, and our secretary Sven Laudy for excellent preparations and support. We especially thank the Computer Science departments for the very welcoming and positive atmosphere, the structural willingness from the staff to improve and the open interaction that we experienced during our site visit in Delft.

Prof. Dr. Ir. Maarten van Steen  
Chairman of the Committee

# 1. ASSESSMENT COMMITTEE AND ASSESSMENT PROCEDURES

## 1.1 ASSESSMENT SCOPE

The Assessment Committee was asked to assess the research of the Intelligent Systems (INSY) department and the Software Technology (ST) department (together CS@Delft) of the Faculty of Electrical Engineering, Mathematics & Computer Science (EEMCS) at Delft University of Technology (TUD). This assessment covers research in the period 2015-2020. 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. Because of the ambition to further strengthen the collaboration between the INSY and ST departments, the committee is also requested to assess the domain of Computer Science at TU Delft as a whole, yet only on criterion Viability.

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

## 1.2 COMMITTEE COMPOSITION

The members of the Committee were:

**Prof. Dr. Ir. M.R. (Maarten) van Steen**, Committee Chair, Scientific Director Digital Society Institute, University of Twente, The Netherlands.

**Prof. Dr. S. (Susanne) Boll**, Professor of Media Informatics and Multimedia Systems, University of Oldenburg, Germany.

**Prof. Dr. R. (Rita) Cucchiara**, Professor of Computer Engineering and Science, Università di Modena e Reggio Emilia, Italy.

**Prof. Dr. E. (Elena) Demidova**, Professor of Computer Science, University of Bonn, Germany.

**Prof. Dr. C. (Christopher) Hankin**, Professor of Computing Science, Imperial College London, United Kingdom.

**J.J. (Jelmer) Koorn MSc**, PhD Candidate, University of Utrecht, The Netherlands.

**Prof. Dr. J. (James) Larus**, Professor of Computer Science, EPFL (École Polytechnique Fédérale de Lausanne), Switzerland.

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

Ir. Sven Laudy MSc 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 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 2009-2014,
- Additionally requested data on teaching load, gender distribution of PhD-candidates, PhD-duration and influx of BSc- and MSc-students over the years,
- TU Delft reaction on “Possible mismatch between self-evaluation report and Terms of Reference”.

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 October 7, 2021 the secretary of the Committee briefed the Committee on the Standard Evaluation Protocol for research assessments in an online meeting with the Committee. Prior to the site visit, three assessors were asked to evaluate each programme. These

assessors independently formed a preliminary assessment for each programme and Computer Science as a whole.

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 TUD and the acting dean of the Faculty of EEMCS and interviewed the two department heads in the Faculty management team, and research staff of the two departments. Interviews took place on November 10 to 12, 2021 at the Faculty of EEMCS in Delft. The interview schedule appears in Appendix B. The Committee chair presented preliminary general impressions to the Faculty on the last day of the visit.

The committee also discussed a separate request for advice to the Executive Board of the TUD regarding three questions: 1) Considering the growth and transition period ahead for TU Delft Computer Science, what does the committee view as the main risks to maintain scientific excellence? 2) In view of society's ongoing digital transformation, what additional steps can TU Delft Computer Science take to effectively embed itself in the local, regional, national and European context to achieve impact we strive toward? And 3) How can TU Delft Computer Science further improve itself as being an attractive, diverse and inclusive academic environment?

Following the on-site visit, the Committee finalised the report through email. 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 COMPUTER SCIENCE AT TUD

### 2.1 COMPUTER SCIENCE AT THE FACULTY OF EEMCS

Research and education in Computer Science at TUD (CS@Delft) is carried out in two departments: Software Technology (ST) and Intelligent Systems (INSY). These departments are part of the Faculty of Electrical Engineering, Mathematics and Computer Science (EEMCS), being one of the eight faculties of TU Delft.

As written in its Self-evaluation Report, the joint mission of CS@Delft is:

1. to conduct world-class research in selected computer science core areas;
2. to maximize opportunities for socio-economic impact of its research;
3. to provide rigorous, research-inspired engineering education in computer science;
4. to contribute to an international academic culture that is open, diverse and inclusive, and that offers openly available knowledge.

Regarding the first item of the mission above five research themes have been defined that build on the two research lines Intelligent Systems and Software Technology anchored in the two departments. These five research themes are: Decision Support, Data Management and Analytics, Software Systems Engineering, Networked and Distributed Systems, and Security and Privacy.

The research mission of the Intelligent Systems (INSY) department is to enable human and machine, in close cooperation with their environment, to deal with the increasing volume and complexity of data and with the increasing role that the AI-driven decision-making systems are taking up. The department pursues its mission by integrating fundamental research, engineering and design in the interlocking fields

of processing, interpretation, visualization of and interaction with data using model- and knowledge-based methods and algorithms.

The research mission of the Software Technology (ST) department is to advance the design, engineering and analysis of complex, distributed and data-intensive software and computer systems. Society is on its way to be completely dependent on such systems, which include online payment systems, smart grids, smart cities, and self-driving cars. In its research, the ST department wants to contribute both to the foundations of software and computer systems, and to the understanding of the operation of such systems. Therefore, its research approach is both fundamental — designing algorithms and abstractions, developing new concepts and theories, and identifying principles, as well as experimental — engineering and analysing the behaviour of actual systems.

The composition of the research staff and the funding at level of CS@Delft, INSY and ST are found in Appendix C and Appendix D, respectively.

## **2.2 REMARKS AND RECOMMENDATIONS: RESEARCH QUALITY<sup>2</sup>**

The Committee wishes to make it upfront clear that they were very positive on many things – such as the very high research quality, the high quality of the staff as well as the energy, drive and potential of the primarily junior research staff – and that the Committee deliberately put more focus in the report on what needs to be addressed.

### **Research area**

There is a very natural blending and cross-fertilization between the two departments. The Committee applauds this and recommends continuing along this path. This can be even further exploited to increase collaboration between them. The five research themes of CS@Delft are well chosen and position the departments to have strong societal impact. The themes support the cross-fertilization between INSY and ST, with the exception of Software Systems Engineering, which could benefit from stronger input from INSY's cybersecurity section given the wider societal focus on security-by-design.

CS@Delft calls attention to “human-centred computer science”. The Committee thinks that this goal should receive more attention, not because it is trendy, but because of the impact that computer science and digitalisation are having on our future society; it is an opportunity

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<sup>2</sup> Although the assessment of Research Quality and Societal Relevance took place on the level of the two Departments, the Committee concluded that most of the observations were valid for both departments. The main distinctions surfaced when discussing matters with the INSY and the ST section leaders. This is where the Committee also saw that gender diversity was approached differently. Beyond this, the Committee did not see obvious differences: apparent to the Committee, the two departments were effectively operating as one. Therefore, it was decided – for reasons of readability – to describe the Research Quality, and also Societal Relevance, jointly and differentiate in the text whenever possible.

to explore and contribute to this discussion more deeply, which is challenging yet essential for a technical university. The Committee therefore recommends to reflect this human-centred focus in the CS@Delft mission statement or in the mission of the individual sections.

There are many opportunities for interdisciplinary work and teams. The Committee appreciates the natural willingness of staff members to collaborate in interdisciplinary teams.

For ST specifically, the organisation provides reasonable coverage of software technology, although the emphasis is clearly on application-oriented areas. The staff identify a lack of time to develop foundations as a potential threat, and we believe it could limit opportunities for developing new application areas in the future. The production of software tools is a good basis for societal impact but requires adequate software development support so that academic staff are not diverted from their main duties.

The Intelligent Systems (INSY) is addressing highly relevant and timely research fields in at the interface of humans and complex intelligent systems of the future. It is encouraged that the interplay of humans and complex, AI-driven systems would be amplified and extended as it bears many opportunities for fundamental research in Computer Science.

## **Research quality**

The overall research quality of both INSY and ST is very good and often even excellent. The venues where CS@Delft publishes are generally of very high quality.

The Committee would like to have seen explanations as to why the publications in the self-study were selected. This could be accomplished by providing short (100-word) descriptions of the impact of each cited publication. A good, positive example is the motivation for the “Bluesky Workshop,” which is linked to publications.

ST has had exceptional growth in the value of research projects (Tier 2 and 3) over the last 5 years. The publications from the two themes that are led by ST are in very good to excellent conferences and journals.

The scientific highlights demonstrate the many areas where INSY addresses highly relevant research challenges and has achieved already excellent results in fundamental research. It can demonstrate the visibility of their results and the societal impact of these. The INSYGHT lab is an excellent platform for developing and showcasing the results across the different disciplines of INSY.

The Committee also noted that few of the faculty members are striving for the top levels of EU science, as recognised by highly competitive programmes such as the ERC. It was unclear from the report and from the interviews to what extent staff are competing for such grants, and if and how they are encouraged and supported in preparing proposals. The focus on national funding is understandable, but it limits the size of the funding pool as well as gives the indication that the staff is not world-class, and – while this is not necessarily true – it might be difficult to prove or disprove unless CS@Delft goes head-to-head with the best [4]<sup>3</sup>.

## **Open Science**

CS@Delft considers open science a key ingredient to scientific success that also contributes to the aim of a world-class research portfolio. CS@Delft therefore embraces the ambition of the TU Delft Open Science Programme as their own, namely to be an international open science frontrunner.

The Committee observes that CS@Delft pays much attention to open access, yet seems to have a more narrow view on open science than

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<sup>3</sup> The numbers between the brackets throughout the main text refer to the list of recommendations in the Summary

what is currently being considered within science in general. Open science is more than making publications and products, including data, openly accessible. It notably deals with actively engaging stakeholders in shaping and executing research programmes, a keyword being co-creation. Open science also has strong links with Societal Relevance, see also Section 2.3.

In terms of open access the Committee thinks that CS@Delft is well on track – and even ahead of some other Dutch Technical Universities. Good policies concerning open access seem in place. PhD candidates are not all aware of the topic and they see room for improvement. Especially when it comes to the sharing of code and data there is a need for more up-to-date and accessible repositories.

With regard to the FAIR Principles, the curation and offering of large data sets from research could contribute to the visibility of the departments. Beyond data collection, data management and data stewardship is essential.

ST is now publishing over 80% of its papers in Open Access venues, a marked improvement over the review period. They have also published some large datasets and produced GHTorrent to support exploration of GitHub data. It is slightly disappointing to notice a decline in participation in Editorial Boards – these are a forum to contribute to the public discussion of open access.

Regarding open science, the Committee thinks CS@Delft has the potential to move forward more strongly than is currently the case, and there is evidence already in this direction when looking at participation in externally funded AI innovation labs. The Committee had some concerns about how well the policies have been implemented and whether open science is truly embraced by CS@Delft. The Committee recommends the management to look into ways of better embedding open science into the culture of CS@Delft, e.g. by educating young faculty and PhD candidates [16].

## 2.3 REMARKS AND RECOMMENDATIONS: RELEVANCE TO SOCIETY<sup>4</sup>

The work of CS@Delft is very relevant and we have seen ample examples of research with excellent societal impact. However, societal relevance at CS@Delft as presented by the two departments mainly has an inside-out feel, formulated along the lines of what has been, or could be, delivered by science itself. This included research products, their usage by others, and various marks of recognition. The Committee noticed that because of this limited perspective on societal relevance, many opportunistic choices have been made. This by itself is not bad, yet the overall impression is that of an inside-out view on societal relevance.

At the same time, the Committee believes that there are ample opportunities to take a stronger outside-in perspective. One approach, identified in the departments' report, is to focus on a number of application domains. However, such a focus incurs the risk of developing computer science as an instrument for problem solving without clear scientific contributions to its own domain. A possible middle ground is to consider the societal impact of digitalisation in general and focus on a number of relevant issues from an computer-science-first approach. Subjects that easily come to mind and which seem to fit the strengths of the two departments include explainability of AI techniques and applied cybersecurity. We believe there are more.

The Committee recommends to develop a more strategic, outside-in approach toward identifying societal-relevant subjects that need further research by computer science and align with relevant research (sub)programmes of the two departments [5].

Open Science and especially involving the stakeholders at an early stage of the research, could greatly help to get this outside-in approach into

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<sup>4</sup> See also Footnote 1.

working practice. In this respect, the Committee would like to recommend the Roland Berger Report “Valorisatie Ontketend (November 2021)<sup>5</sup>.

Although the Committee encourages both departments to continue to make contributions to various research products and their usage, we see a risk of jumping into too many activities or into specific application areas that do not contribute to knowledge development in the computer science domain itself. CS@Delft must be cautious not to become (known as) a service organisation for other research areas instead of a fully mature research field on its own.

The partnerships/ collaborations with Leiden and Rotterdam are excellent opportunities to explore further societal relevance. The Committee also noticed that there are ample and good opportunities for contributions through interdisciplinary work, such as the various AI labs set up across the TUD.

There has been recent growth in staff exchanges with industry, PhDs supported by industry and spin-off activity. The most significant software product is GHTorrent (2015) which has received financial support from Microsoft and high profile users such as the European Commission. An example of an outside-in topic is that of software verification, which contributes to the societal expectation to improve trustworthiness of digital systems; Iris and the RustBelt work are good first steps.

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<sup>5</sup> <https://www.rolandberger.com/nl/Insights/Publications/Van-technologietransfer-naar-samen-innoveren.html?btc=NL>



## **2.4 REMARKS AND RECOMMENDATIONS: VIABILITY<sup>6</sup>**

### **Future strategy**

The report shows that a structured and strategic process has been designed to come to choices of focus areas. The committee appreciates the design, yet also notices that there is still room for improvement when it comes to its implementation. Most of the research still seems to be aligned along the choice of (often long standing) sections and their respective leaders. Within the sections, research appears driven in a bottom-up manner; critical mass defines if new research topics emerge. The departments as a whole may need to reevaluate the effective implementation of the current strategy. Involvement of all (senior, mid-level, and junior) staff is important. Part of the process of thinking about future strategy involved a benchmarking exercise with TU Darmstadt. This was a good initiative. Whilst the selection of TU Darmstadt was made on rational criteria such as comparable size and type, it might have been interesting to benchmark against at least one department that is already where CS@Delft aspires to reach. It is notable that there are differences between the two organisations with regard to foundational research.

### **Organisation of Research**

The Committee agrees that it is important that faculty members find a thematic group where they feel at home, e.g. for community building and learning each other's language. In that sense, the value of sections within the two departments is clear .

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<sup>6</sup> Since the strategies of the two departments have been closely aligned for the past six years, the Committee assessment on Viability took place jointly. Nevertheless, where possible the Committee commented on the specific situation in each of the Departments.

Three key elements needed for CS@Delft to move forward are empowerment, autonomy and attractiveness. **Empowerment** and **autonomy** include the distribution of responsibility to all staff – not just the senior staff – to enable everyone to flourish. Related to empowerment and autonomy, workload distribution and resource allocation should be reconsidered as well. It is not only about giving staff space so they can do what they want – the focus that the Committee heard during the site visit – it is also about having the resources, encouragement, and support to be independent, and being supervised and coached to move ahead. The section about HR-policy will go into further detail about supervision.

**Attractiveness** relates to an organisation where people very much like to work. Such a working environment is also necessary to attract and retain a diverse mix of people. In light of the special focus CS@Delft has put on gender diversity, the Committee notes that when it comes to attracting female colleagues, more is needed than just funding and targeted recruitment. Equally important is to ensure an attractive scientific and social culture.

The organisational structure reported by different interviewees is hierarchical; it is sub-structured with many layers and mainly internally focussed. The Committee noticed some junior staff referring to their “boss”, an indication of not feeling self-employed or empowered. Likewise, on various occasions, some section leaders made clear that they were the ones exercising control over other members of their section. The organisational layers seem to be (self-maintaining) positions with considerable control. This hierarchical structure does not encourage the three key goals of empowerment, autonomy and attractiveness – especially with the expected growth of staff and the possibility of two departments to become one. It, therefore, needs serious rethinking.

Empowerment, autonomy, and attractiveness also offers considerable value for successful recruitment and retention of a variety of people. The

Committee strongly recommends CS@Delft to reflect on its current organisation and to see what changes should be made to ensure maximal viability [1]. This recommendation should not be taken lightly, as the Committee believes that changes in organisation and cultural awareness are needed to be future-proof and to retain the current scientific excellence.

As a general remark, the Committee observed that the performance indicators in the self-evaluation report covered only the topics of research quality and societal relevance, not viability. Although it is not required to the SEP, the Committee feels it does justice to the quality of CS@Delft to also define indicators for viability on the CS-level, taking into account empowerment, autonomy and attractiveness [6].

## **Governance**

The Committee noticed during the interviews that information flow on departmental strategies and decision making is lacking among junior, mid-career and senior staff [9]. Also, regarding funding, they seem to lack understanding how financial streams within and through the Faculty, departments and sections are organised. As a result, the Committee noticed on various occasions that staff members spoke in terms of solutions to perceived problems without seemingly having fully understood those problems or their contexts. This is a pity, as discussions may easily diverge to less important or less relevant matters or to impractical solutions, while at the same time it was clear that staff members were dedicated to the well-being of the department(s).

The Committee therefore recommends bringing younger faculty into the management processes, as part of improving empowerment [7]. Along the same lines, the Committee recommends actively promoting sharing of information so as to increase transparency and inclusion to the maximal extent that is possible [8]. The Committee firmly believes that

this will contribute to the attractiveness of the departments as employers.

## **Facilities and resources**

CS@Delft has good infrastructure and facilities and is housed in a new (refurbished) building that has an open and inviting structure, and that facilitates collaboration.

Related to resources, the Committee formed the impression that CS@Delft aims at relieving the (educational) work load by hiring more people. This could also be countered by saying ‘no more students’. There seem to be no clear limits on how much education staff members are expected to give. At least a better distribution is needed, since it is also related to retention and attractiveness of CS@Delft as employer. Therefore, the Committee recommends to have a deep look at the teaching load, and make it transparent and fairly distributed [14].

## **Gender diversity**

During the interview with the rector the Committee learned that gender diversity is high on the TUD priority list, together with work pressure. The rector acknowledges that, looking at the numbers, TUD is not doing good enough. Also, retention is not in balance, with more females leaving than males.

For CS@Delft gender diversity is also seen as an issue. The reflections on the topics remain rather generic though, e.g. “CS wants to be in the middle of society”, “CS is dependent on the influx”, and “It is good if it happens”. A CS-specific diversity plan seems not in place - especially having a clear goal vocalised in terms of why gender diversity is important, i.e. what purpose does gender diversity serve CS at TUD? This might help formulate strategies and policies. And although the Committee learned that staff is trying to recruit talented females –

mostly on an individual basis – there seems no system or structured approach for this. At TUD-level a Delft Technology Fellowship programme exists – a format that the Committee recommends also to put forward at CS-level [3].

The Committee formed the impression that although CS@Delft is taking gender diversity seriously, this is insufficiently expressed in terms of tangible actions. The Committee recommends to set explicit diversity goals and plan for actions [2]. The EDIT initiative appears to be a good vehicle for promoting this agenda. Examples include long- and short lists for recruitment that have a minimum number of female candidates, invitations for events always include sufficient female participants, etc. In general the Committee recommends to initiate a culture change by educating all members of the departments on barriers and opportunities for making a change. The GEAR toolkit of the EU can be a great resource for this. It also important to learn from other institutions to understand what has worked and is worth pursuing; for example the Athena SWAN Charter. All goals should be made public and the numbers be reported, e.g. by writing a Gender Equality Plan as this is expected from the EU, on the level of CS@Delft to make clear where the departments stand, what actions they take and what the improvements are.

The Committee noticed that gender diversity seems to be less of an issue in the INSY department than in the ST department. The Committee also observed that INSY seems to be less hierarchical than ST which might be an indicator that rigid and less flexible structures of an organisation have a negative direct impact on the way diversity unfolds.

## **Talent management**

### *Tenure track*

Staff who are on a tenure track have possibilities of getting early tenure, e.g. after 2.5 years. The Committee spoke to different people who got tenured early; staff were very positive about this possibility. It was perceived as supportive for the personal situation and reducing uncertainties, e.g. when they want to start a family or buy a house. From a short-term perspective, early tenure seems reasonable since it reduces uncertainty among tenure trackers – and it may also retain people that would otherwise have left to other universities offering tenure. However, there is a risk that staff tenured early might never get promoted later. For example, this may happen due to the high teaching load and the resulting focus on teaching rather than on meeting high research standards in the long run. Although the Committee understands the motivation behind the policy of offering tenure at relatively short notice, it also recommends to reflect on this policy in light of meeting long-term goals on high standards for teaching and research and evaluate its results [17].

The Committee noticed a good team spirit among the tenure trackers. They feel they are trusted with the assigned tasks, are offered much freedom in choices of topics, and are given many opportunities for further development.

The workload is perceived as very high, and sometimes simply too high. This is well-recognised by the management, and a lot of support, e.g. the teaching team, is put in place; this support was even positively overwhelming for some tenure trackers.

However, the start of the tenure track has been reported to be perceived as insufficiently guided and supported. Initially, the structure was missing; tenure-tracker meetings were set up (locally) to counter this and were welcomed. The Committee recommends to see how tenure trackers can be better structurally guided and supported [15]. This

includes offering a package that gives young faculty the resources they need to get started. (At the site visit, the Committee learned that this mechanism is structurally offered from 2019).

Senior management leaves daily supervision of PhD students to young faculty. Although this trust is appreciated, it can also easily impose unnecessary pressure in the lack of sufficient mentoring by senior staff. The Committee recommends to at least better train and mentor staff in supervising PhD candidates, especially to support the PhD completion within the foreseen duration [13]. Offering courses may not be enough or even counter-productive as they simply take time. On-the-job training with a special role for senior staff (who may also need to be trained when it comes to mentoring younger staff) may be necessary.

CS@Delft has a development track plan in use. The Committee appreciates that such a plan is personalised and contains more than just a checklist of minimum requirements to be tenured. However, personalisation bears the risk of loss of transparency, and the Committee recommends to see where and how transparency and openness can be improved [10]. Finding such criteria and applying them uniformly and transparently is essential. Based on what has been communicated, the Committee considers the current tenuring process to be a potential risk to the long-term quality of the departments and recommends evaluating the results, for example, by assessing if the early tenured staff will be promoted in the coming years[17].

#### *Tenured staff*

The Committee noticed that a section head may act as mentor of tenured staff (including tenure-trackers). Although senior staff are recognised to play an important role in supporting junior and mid-level staff, regardless the formal relationship, the Committee advises to improve on ensuring that mentoring is sufficiently decoupled from formal dependencies.

## **Research Integrity**

CS@Delft's approach is driven by the TU Delft DIRECT values. Their approach to integrity is built on compliance with TU Delft's Code of Conduct and relevant codes from professional bodies such as the ACM and IEEE. Their interpretation of research integrity is founded on the transparency achieved through open science – the Committee commented on this earlier.

## **Academic culture**

The Committee saw clear indications that CS@Delft is an organisation that is willing to change and learn. The advice and recommendations from the mid-term Review Committee were taken very seriously, as have led to changes in procedures, e.g. for the tenure track system. This Committee thinks this academic culture definitely helps in building a viable future for CS@Delft.

## **2.5 REMARKS AND RECOMMENDATIONS: PHD POLICY AND TRAINING<sup>7</sup>**

The TU Delft University Graduate School (UGS) and its local branch, the EEMCS Faculty Graduate School (FGS) provides a structured Doctoral Program with a PhD Development Cycle, with a clear assessment timeline and a course-based Doctoral Education (DE) Program. It is the ambition of the University Graduate School (UGS) to prepare and train doctoral candidates to become highly qualified, autonomous and leading researchers and skilled professionals. At TUD, a Doctoral Programme

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<sup>7</sup> The SEP requires to assess the PhD Policy and Training as part of one of the three main criteria. For readability this aspect is described in a separate section. CS sees educating PhD's as one of the key indicators of its societal relevance.



consists of Research and Doctoral Education (DE). The research is embedded in one of the 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 CS@Delft level are found in Table 1.

Enrolment (#)				Success rates (%)						
Starting year	M.	F.	Total (female + male)	4 years	5 years	6 years	7 years	Total	Not yet finished	Discont.
2012	23	3	26	0%	35%	50%	54%	65%	4%	31%
2013	18	2	20	0%	55%	70%	85%	85%	10%	5%
2014	19	3	22	0%	45%	64%	64%	64%	18%	18%
2015	21	3	24	13%	58%	71%	71%	71%	13%	17%
2016	22	6	28	0%	25%	29%	29%	29%	54%	18%
<b>Total</b>	<b>103</b>	<b>17</b>	<b>120</b>	<b>3%</b>	<b>43%</b>	<b>55%</b>	<b>58%</b>	<b>61%</b>	<b>21%</b>	<b>18%</b>

Table 1: Success rates of the PhD candidates at CS@Delft level

## Remarks and recommendations

PhD candidates face an administrative burden, especially at the very start. The information load seems overwhelming to them. As a result, the PhD candidates run the risk of missing out on elements that are essential.

The Committee has witnessed a seemingly large variety in teaching load between different PhD candidates. The Committee recommends to check whether such an imbalance indeed exists [14]. If this is the case, this imbalance needs correction.

Currently, the goal of the GS is to have a minimum of 70% of PhD candidates graduate within 5 years. Although this is a TUD-wide criterion, the Committee recommends higher ambitions. In addition, the Committee sees a vital role for the training and supervision of PhD

candidates in order to successfully submit a thesis after four years. In particular, efforts should be made to make training for PhD supervisors mandatory [13]. Next to that, more responsibility should be placed with the promotor to comply with these goals, and measures are to be in place when goals are not met.

The Committee formed the impression that the awareness and knowledge about what the Graduate School (GS) does is relatively poor, and is even declining. More forms and standard emails are definitely not the way to combat this issue – the right mechanisms to support PhD supervision and training seem in place, but emphasis should be placed on the staff to embrace the system as intended. The GS is trying to improve the awareness by explaining to all PhD students and research staff how GS works. The Committee recognises that the mechanisms of the GS can be experienced by staff as an administrative burden. In contrast the Committee notices that staff could put more effort into using GS as a mechanism to improve training and supervision of PhD candidates. The Committee strongly recommends that the role of GS, along with the administration that forms part of it, is re-assessed by all staff in light of such improvements [12]. This re-assessment is deemed necessary in order to meet the goals regarding the PhD graduation rates. This includes devoting adequate resources (staff members) to keep track of all of their graduate students independent of the graduate school [12]. In particular, someone should read all of the progress reports (!) and the progress of problematic PhD candidates should be closely tracked. In the latter case, the PhD candidate and their supervisors should be offered assistance (particularly if a supervisor is new to the university or in the role of supervisor).

A remark that the Committee heard during the site visit is that the feedback for the PhD candidates lacks active guidance. At the mathematics department a mentor programme – a peer to peer programme – has been set up. This could work for CS@Delft as well.

## 2.6 FACULTY'S EXTRA QUESTIONS

*QUESTION 1: "CONSIDERING THE GROWTH AND TRANSITION PERIOD AHEAD FOR TU DELFT COMPUTER SCIENCE, WHAT DOES THE COMMITTEE VIEW AS THE MAIN RISKS TO MAINTAIN SCIENTIFIC EXCELLENCE?"*

In short, the main risks for CS@Delft are the hierarchical organisation of research, the governance structure, the gender diversity and the talent management. The answer to this question is fully discussed in the Viability section 2.4 of this report.

*QUESTION 2: "IN VIEW OF SOCIETY'S ONGOING DIGITAL TRANSFORMATION, WHAT ADDITIONAL STEPS CAN TU DELFT COMPUTER SCIENCE TAKE TO EFFECTIVELY EMBED ITSELF IN THE LOCAL, REGIONAL, NATIONAL AND EUROPEAN CONTEXT TO ACHIEVE IMPACT WE STRIVE TOWARD? "*

In short, an explicitly formulated (strategic) outside-in perspective on defining research areas that are societally relevant is needed to make a next step in the embedding of CS@Delft at the various levels. The answer to this question is fully discussed in the Societal Relevance section 2.3 of this report.

*QUESTION 3: "HOW CAN TU DELFT COMPUTER SCIENCE FURTHER IMPROVE ITSELF AS BEING AN ATTRACTIVE, DIVERSE AND INCLUSIVE ACADEMIC ENVIRONMENT?"*

In short, to further improve its inclusive academic environment, CS@Delft needs to put the hierarchical organisation of research, the gender diversity and the talent management higher on the agenda. The answer to this question is fully discussed in the Viability section 2.4 of this report.

## APPENDIX A CURRICULA VITAE OF THE COMMITTEE MEMBERS

**Prof. Dr. Ir. M.R. (Maarten) van Steen**, Committee Chair, is currently Scientific Director of the Digital Society Institute of the University of Twente. His research concentrates on large-scale distributed computer systems. Before joining the University of Twente, Van Steen was employed at Vrije Universiteit Amsterdam (VUA), first as assistant and associated professor to be eventually promoted to full professor in 2002. He has been director of education at VUA and later head of the Computer Science department. Van Steen has served on many local, national, and international committees, more recently as member of the Science board of NWO, chair of the Research and Innovation group of the Dutch AI Coalition, and former chair of ICT-research Platform Netherlands.

**Prof. Dr. S. (Susanne) Boll** is Professor of Media Informatics and Multimedia Systems as Chair of Computer Science at the University of Oldenburg and Director of the OFFIS Institute for Information Technology in Oldenburg. Susanne Boll received her PhD with honors from the Vienna University of Technology, Austria, in 2001 and her diploma with honors in computer science from the Technical University of Darmstadt, Germany, in 1996. Susanne Boll's research interests are in multimedia and intelligent user interfaces. She has an excellent funding id and has been heading many international and national scientific research projects in the field of interactive multimedia and human machine interaction. Susanne is passionate on embedding her work into societal challenges and works in application domain of personal health, health care, automated driving and automated cyber-physical systems. As a leading scientist in the field, she became member of the acatech, the National Academy of Science and Engineering (500 members), ACM Distinguished Member (2019) and a Fellow of the German Informatics Society (2020). She is an elected member (Fachkollegiatin) of the

German Science Foundation (DFG) board of reviewers in Computer since 2016. In 2020 she also became spokesperson of this board.

**Prof. Dr. R. (Rita) Cucchiara** is full professor of Computer Engineering and Science within the Dipartimento di Ingegneria at the UNIMORE, Università di Modena e Reggio Emilia, Italy. She is Director of the Interdipartimental Center of Research in Ict for Enterprise Softech-ICT of the Modena Technopole co-funded by the Emilia Romagna High Technology Network, under EU FESR programs . She is Director of Master in “Visual computing and Multimedia Technology” of UNIMORE. She holds the Research Lab Imagleab, active in Computer Vision, Pattern Recognition and Multimedia within Dipartimento di Ingegneria “Enzo Ferrari”. Since 2016 Rita Cucchiara is President of the Italian Association of Pattern Recognition, Learning and Computer vision GIRPR, affiliated to IAPR, and is a member of the IAPR Governing Board member. Since 2015 Rita Cucchiara is an Advisory Board Member of the Computer Vision Foundation.

**Prof. Dr. E. (Elena) Demidova** is Professor of Computer Science and head of the Data Science and Intelligent Systems Group (DSIS) at the University of Bonn, Germany. In the past, she worked as a Research Group Leader at the L3S Research Center, Leibniz University of Hannover, Germany and as a Senior Research Fellow at the University of Southampton, UK. She received her PhD degree from the Leibniz University of Hannover in 2013 and her MSc degree in Information Engineering in 2006. Her research is in data analytics, artificial intelligence, machine learning, the web, and semantic web. Elena has been involved in the leading roles in several large-scale European and national projects, recently including the coordinator role of Cleopatra - a Marie Skłodowska-Curie PhD Network.

**Prof. Dr. C. (Christopher) Hankin**, joined Imperial College London in 1984 and was promoted to Professor of Computing Science in 1995. He served as Dean for Engineering (2000-2003), Pro Rector for Research (2004-2006) and Deputy Principal for Engineering (2006-2008). He was

Director and then Co-Director of the Institute for Security Science and Technology from 2010 until 2019. His research is in cyber security, data analytics and theoretical computer science. He leads multidisciplinary projects focused on providing better decision support to defend against cyber-attacks for both enterprise systems and industrial control systems. He has published about 130 publications including 3 textbooks and 7 edited volumes. He is Director of the UK Research Institute on Trustworthy Inter-connected Cyber-physical Systems (RITICS) which focuses on cyber security of critical infrastructure. He is immediate past chair of the Association for Computing Machinery (ACM) Europe Council. He serves on the ACM Publications Board, as Co-Chair of the Assessment and Search Committee, and chairs the ACM Europe Technology Policy Committee.

**J.J. (Jelmer) Koorn MSc.** studied a joint degree on Business Information Systems at the University of Amsterdam and the Vrije Universiteit Amsterdam. He is currently pursuing a PhD degree at the University of Utrecht in the field of Business Process Management with a specific focus on Process Mining. Next to his research work, since 2019 he is the chair of Prout, the PhD network and interest organisation of Utrecht. He is also a representative in the national PhD network (PNN) since 2019.

**Prof. Dr. J. (James) Larus** is a Professor and former Dean of the School of Computer and Communication Sciences (IC) at EPFL (École Polytechnique Fédérale de Lausanne) in Lausanne, Switzerland. Prior to joining IC in 2013, Larus was a researcher, manager, and director in Microsoft Research for over 16 years and an assistant and associate professor in the Computer Sciences Department at the University of Wisconsin, Madison. Larus published over 100 papers (with 9 best and most influential paper awards), received over 40 US patents. Larus received a National Science Foundation Young Investigator award in 1993 and became an ACM Fellow in 2006. Larus received his MS and PhD in Computer Science from the University of California, Berkeley in 1989, and an AB in Applied Mathematics from Harvard in 1980.

## APPENDIX B      SITE VISIT PROGRAMME

### DAY 0 – Wednesday November 10th, 2021

Time	Activity	Participants
17.30	Welcome of committee	Committee + Dean + delegate MT
18.30	Working diner: kick-off and preparation of interviews	Committee (private)
21.30	Closure	

### DAY 1 – Thursday November 11th, 2021

Time	Activity	Participants
8.30 – 9.00	Preparations	Committee (private)
9.00 - 9.30	Context site visit Executive Board <i>Lead assessors:</i> Prof. Dr. Ir. M.R. van Steen Entire committee	Rector Prof. T. van der Hagen (rector TU Delft)  Prof. L. van Vliet (dean EEMCS)
9.45 – 10.15	Management interview <i>Lead assessors:</i> Prof. Dr. Ir. M.R. van Steen Entire committee	- Prof. L. van Vliet (dean EEMCS) - Prof. A. Hanjalic (head INSY) - Prof. A. van Deursen (head ST)
10.30 - 11.00	Interview Management Team department of Software Technology  <i>Lead assessors:</i> Prof. Dr. Ir. M.R. van Steen	<i>Section Leaders ST</i>  - Prof. M. de Weerd - Prof. Dick Epema - Prof. Koen Langendoen - Prof. Eelco Visser

	Prof. Dr. C. Hankin Prof. Dr. J. Larus	- Prof. Arie van Deursen - Prof. Geert-Jan Houben
11.15 - 11.45	Interview Management Team department of Intelligent Systems  <i>Lead assessors:</i> Prof. Dr. S. Boll Prof. Dr. E. Demidova Prof. Dr. R. Cucchiara J.J. Koorn MSc	<i>Section Leaders INSY</i>  - Prof. E. Eisemann - Prof. G Smaragdakis - Prof. Catholijn M. Jonker - Prof. A. Hanjalic - Prof. M. Reinders
12.00 – 12.30	Interview Tenure trackers  <i>Lead assessors:</i> Prof. Dr. E. Demidova Prof. Dr. R. Cucchiara	- Elvin Isufi (INSY - MMC) - Catha Oertel (INSY - II) - Burcu Ozkan (ST - SE) - Jesper Cockx (ST - PL)
12.30 – 13.30	Lunch PhD's	- Alberto Ceria (INSY - MMC) - Ruben Wiersma (INSY - CGV) - Azqa Nadeem (INSY - CYS) - Ziqi Wang (INSY - PRB) - Koos van der Linden (ST - ALG) - Caroline Brandt (ST - SE) - Talia XU (ST - ENS) - Cas van der Rest (ST – PL)
13.30 – 14.30	[Lab Tour I] / Round Tour premises / demo's / pitches	- Vito Kortbeek (ST) (Embedded Systems Lab)  - Keyarash Ghazi (ST) (Embedded Systems Lab)
14.30 – 15.00	Interview PhD Council <i>Lead assessors:</i> J.J. Koorn MSc Prof. Dr. Ir. M.R. van Steen	- Chirag Raman (INSY - PRB) - Yeswanth Napoleon (INSY - PRB) - Willem de Muinck Keizer (EWI - DIAM)
15.15 – 16.15	[Lab Tour I] / Round Tour premises / demo's / pitches	- Frans Broz (INSY) (INSYGHT Lab) - Catherine Oertel (INSY) (INSYGHT)



		<ul style="list-style-type: none"> <li>- Ujwal Gadiraju (Crowd Computing)</li> <li>- Achilleas Psyllidis (Crowd Computing)</li> <li>- Jie Yang (Crowd Computing)</li> </ul>
16.15 – 17.00	Interview Future of Software Technology / Intelligent Systems (combined)  <i>Lead assessors:</i> Prof. Dr. Ir. M.R. van Steen Entire committee	<ul style="list-style-type: none"> <li>- Zeki Erkin (INSY - CYS)</li> <li>- Cynthia Liem (INSY - MMC)</li> <li>- Przemek Pawelczak (ST - ENS)</li> <li>- Ujwal Gadiraju (ST - WIS)</li> </ul>
17.00 - 18.00	Discussing and writing preliminary judgments	Committee (private)
18.00	Refreshing at hotel	Committee (private)
19.30	Working diner	Committee (private)
21.30	Closure	

## DAY 2- Friday November 12th, 2021

Time	Activity	Participants
8.30 - 9.00	Interview Tenured staff	<ul style="list-style-type: none"> <li>- Joana Goncalves (INSY - PRB)</li> <li>- Pradeep Murukhanniah (INSY - II)</li> <li>- Lydia Chen (ST - DS)</li> <li>- Neil Yorke Smith (ST - ALG)</li> </ul>
9.15 – 9.45	Interview Graduate School  <i>Lead assessors:</i> J.J. Koorn MSc Prof. Dr. Ir. M.R. van Steen	<ul style="list-style-type: none"> <li>- Prof. Dick Epema (director EEMCS graduate school)</li> <li>- Ada van Gulik (coordinator EEMCS graduate school)</li> </ul>
10.00 – 10.45	Interview regarding chosen cases (Tenure Track policy & Diversity)	<ul style="list-style-type: none"> <li>- prof. I. Lagendijk (head of career committee)</li> <li>- prof. O. Scharenborg (INSY -</li> </ul>

		MMC) - prof. A. Panichella (ST - SE) - dr. K. Reijenga (HR advisor)
11.00 – 11.30	Follow-up meeting with MT (extra interview)	- Prof. L. van Vliet (dean EEMCS) - Prof. A. Hanjalic (head INSY) - Prof. A. van Deursen (head ST)
11.30 – 12.15	Summarising findings and first conclusions	Committee (private)
12.15 – 12.45	Concluding meeting with management  <i>Lead assessors:</i> Prof. Dr. Ir. M.R. van Steen Entire committee	- Prof. L. van Vliet (dean EEMCS) - Prof. A. Hanjalic (head INSY) - Prof. A. van Deursen (head ST)
12.45 – 13.45	Discussing and writing preliminary judgments (including working lunch)	Committee (private)
13.45 – 14.15	Oral presentation on first impression by committee	Committee, Dean, entire CS staff, Mrs. Van Driel
14.15h	Closure	All invited

Between each interview, time is reserved for reflection by the committee. To improve readability this activity is omitted from the table.

## APPENDIX C      SEP-DATA ON RESEARCH STAFF

CS	2015		2016		2017		2018		2019		2020	
	#	FTE	#	FTE	#	FTE	#	FTE	#	FTE	#	FTE
Full professor	15	5.2	14	4.8	16	5.1	16	5.0	15	5.1	17	5.3
Associate professor	13	5.0	11	4.5	11	4.2	16	6.2	17	6.4	17	6.5
Assistant professor	27	10.5	26	10.0	28	11.1	29	11.3	28	11.1	33	13.1
Post-docs	37	26.7	32	22.9	31	22.8	34	25.4	39	28.8	45	33.0
PhD candidate (standard)	64		65		74		82		94		117	
PhD candidate (ext. scholarship)	35		29		34		34		35		36	
<b>Total research staff</b>	<b>189</b>	<b>47.4</b>	<b>178</b>	<b>42.2</b>	<b>195</b>	<b>43.2</b>	<b>211</b>	<b>47.9</b>	<b>229</b>	<b>51.4</b>	<b>266</b>	<b>58.0</b>
Support staff	8	6.0	8	5.8	8	5.8	7	5.1	8	6.0	10	6.7
Visiting fellows	25	0.0	25	0.0	28	0.0	31	0.0	21	0.0	20	0.0
<b>Total staff</b>	<b>222</b>	<b>53.4</b>	<b>211</b>	<b>48.1</b>	<b>231</b>	<b>49.0</b>	<b>249</b>	<b>53.1</b>	<b>259</b>	<b>57.4</b>	<b>295</b>	<b>64.6</b>

INSY	2015		2016		2017		2018		2019		2020	
	#	FTE	#	FTE	#	FTE	#	FTE	#	FTE	#	FTE
Full professor	6	2.2	6	2.2	8	2.5	8	2.5	8	2.4	8	2.3
Associate professor	7	2.8	6	2.5	5	1.9	8	2.9	8	2.8	8	3.0
Assistant professor	15	6.1	15	6.0	15	6.0	14	5.7	15	5.9	17	6.8
Post-docs	22	15.7	20	13.6	14	9.2	11	7.5	13	9.2	18	13.0
PhD candidate (standard)	38		37		40		40		48		59	
PhD candidate (ext. scholarship)	22		17		20		20		20		20	
<b>Total research staff</b>	<b>111</b>	<b>26.7</b>	<b>101</b>	<b>24.2</b>	<b>103</b>	<b>19.7</b>	<b>102</b>	<b>18.6</b>	<b>111</b>	<b>20.3</b>	<b>130</b>	<b>25.0</b>
Support staff	4	2.9	4	2.8	5	3.4	4	2.8	4	2.7	4	2.5
Visiting fellows	15	0.0	13	0.0	14	0.0	16	0.0	10	0.0	14	0.0
<b>Total staff</b>	<b>129.3</b>	<b>29.6</b>	<b>117.4</b>	<b>27.1</b>	<b>121.2</b>	<b>23.0</b>	<b>121.6</b>	<b>21.4</b>	<b>124.8</b>	<b>23.0</b>	<b>147.2</b>	<b>27.5</b>

ST	2015		2016		2017		2018		2019		2020	
	#	FTE	#	FTE	#	FTE	#	FTE	#	FTE	#	FTE
Full professor	9	3.0	8	2.7	8	2.6	8	2.5	8	2.7	9	3.0
Associate professor	6	2.2	5	2.0	6	2.3	8	3.3	9	3.6	9	3.5
Assistant professor	12	4.4	11	4.0	13	5.0	15	5.6	14	5.2	16	6.3
Post-docs	15	11.1	12	9.3	17	13.6	23	17.9	26	19.7	28	20.1
PhD candidate (standard)	26		29		34		41		46		58	
PhD candidate (ext. scholarship)	12		12		14		14		16		16	
<b>Total research staff</b>	<b>79</b>	<b>20.7</b>	<b>77</b>	<b>18.0</b>	<b>92</b>	<b>23.5</b>	<b>109</b>	<b>29.3</b>	<b>118</b>	<b>31.1</b>	<b>136</b>	<b>32.9</b>
Support staff	4	3.1	4	3.0	4	2.4	3	2.3	4	3.3	6	4.2
Visiting fellows	10	0.0	13	0.0	14	0.0	15	0.0	11	0.0	6	0.0
<b>Total staff</b>	<b>93.0</b>	<b>23.8</b>	<b>93.7</b>	<b>21.0</b>	<b>109.8</b>	<b>25.9</b>	<b>126.9</b>	<b>31.6</b>	<b>133.8</b>	<b>34.4</b>	<b>148.0</b>	<b>37.1</b>

## APPENDIX D SEP-DATA ON RESEARCH FUNDING

TOTAL	2015		2016		2017		2018		2019		2020	
	FTE	%	FTE	%	FTE	%	FTE	%	FTE	%	FTE	%
Direct funding <sup>1</sup>	63.0	52%	46.6	41%	56.5	46%	57.7	43%	63.4	42%	78.6	44%
Research funding <sup>2</sup>	15.3	13%	25.8	23%	30.9	25%	36.2	27%	33.4	22%	34.7	19%
Contract research <sup>3</sup>	43.9	36%	41.7	37%	36.6	30%	40.2	30%	52.9	35%	65.2	37%
<b>Total funding</b>	<b>122.2</b>		<b>114.0</b>		<b>124.0</b>		<b>134.2</b>		<b>149.6</b>		<b>178.5</b>	

*Relative research funding at level of the CS departments. The FTE values are research FTEs. The percentages give the relative research funding from the 1st, 2nd, and 3rd money tiers.*

TOTAL	2015		2016		2017		2018		2019		2020	
	FTE	%	FTE	%	FTE	%	FTE	%	FTE	%	FTE	%
Direct funding <sup>1</sup>	33.1	46%	26.2	40%	31.7	48%	28.8	44%	34.0	47%	42.0	47%
Research funding <sup>2</sup>	10.8	15%	13.3	20%	12.7	19%	14.7	23%	13.2	18%	16.5	19%
Contract research <sup>3</sup>	28.8	40%	26.5	40%	22.2	33%	21.4	33%	25.5	35%	30.0	34%
<b>Total funding</b>	<b>72.8</b>		<b>66.0</b>		<b>66.6</b>		<b>65.0</b>		<b>72.7</b>		<b>88.5</b>	

*Relative research funding at level of the INSY department. The FTE values are research FTEs. The percentages give the relative research funding from the 1st, 2nd, and 3rd money tiers.*

TOTAL	2015		2016		2017		2018		2019		2020	
	FTE	%	FTE	%	FTE	%	FTE	%	FTE	%	FTE	%
Direct funding <sup>1</sup>	29.8	60%	20.4	42%	24.8	43%	28.9	42%	29.4	38%	36.6	41%
Research funding <sup>2</sup>	4.5	9%	12.5	26%	18.2	32%	21.5	31%	20.1	26%	18.1	20%
Contract research <sup>3</sup>	15.1	31%	15.2	32%	14.4	25%	18.8	27%	27.4	36%	35.2	39%
<b>Total funding</b>	<b>49.4</b>		<b>48.1</b>		<b>57.4</b>		<b>69.2</b>		<b>76.9</b>		<b>89.9</b>	

*Relative research funding at level of the ST department. The FTE values are research FTEs. The percentages give the relative research funding from the 1st, 2nd, and 3rd money tiers.*

*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.*





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