

**RESEARCH REVIEW**

**Industrial Engineering & Innovation Sciences**

**2017-2022**

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# 1. Introduction

## 1.1 Terms of reference for the assessment

The quality assessment of research of Industrial Engineering & Innovation Sciences (IE&IS) of Eindhoven University of Technology is carried out in the context of the Strategy Evaluation Protocol 20221-2027 for Public Research Organisations by the Association of Universities in The Netherlands (VSNU), the Netherlands Organisation for Scientific Research (NWO), and the Royal Netherlands Academy of Arts and Sciences (KNAW).

The committee was asked to assess the research quality, the societal relevance, and the viability of the research conducted by IE&IS in the reference period 2017-2022 as well as its strategic targets and the extent to which it is equipped to achieve them.

The committee was also asked to incorporate four specific aspects: Open science, PhD policy and training, academic culture, and human resources policy.

This report describes findings, conclusions, and recommendations of this external assessment of the research of IE&IS. In sections 2.2 to 2.8, the department's view on the topics organization & strategy, research quality, societal relevance, viability, PhD policy, open science, and human resource management is described, followed by the assessment and comments of the committee.

## 1.2 The committee

The Board of Eindhoven University of Technology (TU/e) appointed the following members of the committee for the research review:

- Prof. Iris Vis (University of Groningen, chair)
- Prof. Hanne Andersen (University Copenhagen)
- Prof. Anna Bergek (Chalmers University of Technology, Gothenburg)
- Prof. Koenraad Debackere (KU Leuven)
- Prof. Geraldine Fitzpatrick (TU Wien)
- Dr. Jelle de Vries (Erasmus University Rotterdam)
- Nele Albers MSc (Delft University of Technology)

The Board of TU/e also appointed Dr. Ties Leermakers as the committee secretary. All members of the committee signed a declaration and disclosure form to ensure that the committee members made their judgements without bias, personal preference or personal interest, and that the judgment was made without undue influence from the institutes or stakeholders.

## 1.3 Procedures followed by the committee

Prior to the site visit, the committee reviewed detailed documentation comprising the self-assessment report research of IE&IS including appendices. Each committee member wrote a document containing first impressions and formulated an initial list of questions. During an online meeting the committee was informed on the SEP and the agenda for the visit. During that meeting, the committee also discussed the first impressions as well as the general set-up of the sessions of the visit.

The committee proceeded according to the Strategy Evaluation Protocol (SEP) 2021 - 2027. The assessment was based on the documentation provided by the institute and the interviews with their respective management, selections of senior and junior researchers, and PhD candidate representatives. The interviews took place on June 13 and 14, 2023 (see Appendix A).

The committee discussed its assessment of IE&IS during several sessions of the site visit. The committee chair had the coordinating role in the writing procedure. Based on the discussions and remarks of the committee members, the secretary wrote a first draft of the report that was sent to the chair for feedback. The revised document was sent to all members of the committee. They commented by email on the draft report. The draft version was then presented to IE&IS for factual corrections and comments. Subsequently, the text was finalized and presented to the Board of TU/e.

## 2. The assessment

### 2.1 Summary

The committee members assessed the research of the department of IE&IS of TU/e. They studied the documents provided by IE&IS and visited the department on June 13 and 14, 2023. During this visit, meetings with various groups within the department took place. The committee met with the departmental board and with very enthusiastic and talented researchers in all stages of an academic career. The committee also had a meeting with two partners of industry/society.

The committee appreciated each of these meetings and the open attitude of the attendees. It was an enormous help to the committee in getting a good and comprehensive picture of the department.

The committee is very positive on the overall management of IE&IS which facilitates and endorses cooperation and team science to be key characteristics of the department. In all meetings, the committee saw specific evidence of collegiality and a positive and collaboration-oriented atmosphere. The department is strongly in favour of multidisciplinary research and has made many steps to make this possible. The support organized by the department is very good to excellent. In particular, all researchers we met were very happy with the support offered by the Project Development Office. All in all, the committee has seen a strong collegial department that is future-proof and future-oriented.

The committee judges research and valorisation as very good. With the emphasis on multidisciplinary research in mind it is even excellent, in other words "excellent in context". The publication strategy is well thought out, gives room for multidisciplinary output, and helps junior staff in selecting output channels. The committee suggest to further discuss KPIs within the department to transition from product-oriented to more narrative-oriented and more team-oriented ones, to raise the bar in bibliometric KPIs given the emphasis on excellence and to further develop KPIs for valorisation/societal relevance as well as multi-disciplinary research.

The department is well prepared for the future with many contacts with societal partners on a regional, national, and European level. The research themes are relevant now and are expected to be relevant in the future. They are very well chosen and give ample room for cooperation with societal partners. The university is part of the Brainport ecosystem, with high-tech industrial partners in the neighbourhood. This gives IE&IS unique opportunities for collaboration. The discussions with the theme leaders provided more information on the way the themes are organized, and what procedures are in place to enable crossovers as well as evaluation of relevance and required changes to the focus areas if needed. Also, within TU/e there are opportunities for bidirectional, mutual collaboration and joint research between the technology departments and the IE&IS department. Those opportunities are recognized, developed, and will undoubtedly grow further in the future. They will contribute to the future-proof character of education and research activities in IE&IS.

Supervision of PhD students is very well organized. The recently revised PhD training & education plan entails a compulsory part (general academic skills) and a project dependent part. PhD students often have valorisation tasks, which they see as an advantage rather than a disadvantage.

As regards to open science and integrity, IE&IS is at the forefront of the developments in this field, both in terms of practical support offered by the department and the research being conducted on this topic within the department. With respect to this, we suggest the department to develop a vision on next steps, including how they could take a leading role within the TU/e and in The Netherlands on this topic.

The department has implemented a framework of criteria for tenure and promotion. The management of the department is aware of the new way of recognizing excellence in the Dutch academic world (reward and recognition). The committee recognises the practical steps taken to interpret and operationalise this strategy and suggests to further develop the performance framework in this context.

Overall, the committee was very impressed by the performance realized and concluded based on the visit that the report sometimes underplays what has been put in place by the department. The committee did not see any major points for criticism. There is a good base with very good performance and room for some improvement.

## 2.2 Organization and strategy

The department's vision is that they play a leading role in supporting industry, government, and society in their responsible adoption and effective implementation of Key Enabling Technologies (KET) to address grand societal challenges. Their mission is to integrate social sciences and humanities with engineering research. This is both challenging and ground-breaking, resulting in high-quality scientific output and in excellent educational programs, that create meaningful technology-based impact for the contemporary challenges of industry, government, and society.

For realizing that leadership role, IE&IS integrates its strong expertise in the social sciences and humanities with engineering research. In doing so, IE&IS takes a socio-technical systems perspective on the design of innovative technological solutions and attunes KETs to the real-life context of industry, government, and society. Disciplinary excellence is central to the mission and vision of IE&IS: it forms the basis for research-driven impact while also valuing contributions across disciplines. To generate real impact for industry and society IE&IS takes a systems approach and combines multiple perspectives in multidisciplinary projects.

The department is primarily organized along disciplinary lines, in seven groups: 1) Human Performance Management (HPM), 2) Human-Technology Interaction (HTI), 3) Information Systems (IS), 4) Innovation, Technology Entrepreneurship & Marketing (ITEM), 5) Operations, Planning, Accounting & Control (OPAC), 6) Philosophy & Ethics (P&E), and 7) Technology, Innovation and Society (TIS).

IE&IS has identified four departmental research themes where they can, on the one hand, capitalize most of their disciplinary expertise and, on the other hand, use and forge direct connections to the relevant stakeholder networks inside and outside academia. IE&IS believes that, within these themes, they can create the largest impact on grand societal challenges, leverage their expertise, and use the unique opportunities offered by the high-tech 'Brainport' area which surrounds the city of Eindhoven. These research themes are: 1) Humans and Technology (H&T), 2) Supply Chain Management (SCM), 3) Sustainability and Circularity (S&C), and 4) Value from Data-Driven Intelligence (VoDDI).

For more information about the department's budget and the number of researchers over the years 2017-2022 see Table 1 and 2 in appendix B.

### Assessment of the committee

Overall, the committee experienced a good base for performing excellent multidisciplinary research and noticed a very good performance with some room for further growth. The mission and the strategy to achieve this mission is very well thought out and is future-proof. The choice to aim for disciplinary excellence on the one hand, and generation of impact through multidisciplinary projects in a co-creational approach on the other hand is very well embedded in the department. We encourage the department to extend their current description in their strategy to highlight this co-creational approach and not just focus on the output itself. From all sessions it became clear that the department radiates multi-disciplinarity. Intensified bidirectional collaborations with the technology departments will further enhance this multidisciplinary strength. We encourage the department to elaborate more on this in their written vision and add also more qualitative KPIs to the evaluation framework. The KPIs formulated can mainly be seen as product focused. The committee also would like to encourage the department to work more with narratives to express quality on the various aspects of its research and valorisation activities.

The management of the department uses a mix of bottom-up and top-down approaches to formulate and realize the strategy. The committee notices that jointly making the strategy is an essential part of the strategy because the dialogue creates shared commitments. The research staff fully endorses the actions taken; the committee heard no complaints and received only constructive feedback. The management has created a multidisciplinary environment in which collaboration, collegiality, and enthusiasm are key words. In the last six years, investments have been made in resources and designing an excellent support organisation. For example, the department has well-equipped labs and support offered by the Project Development Office is very much appreciated by all the faculty ("they do magic"). So, the management has created an environment in which researchers can fully focus on their research.

The Dutch academic world is in a transition to a new form of “recognition and reward” of the academic staff. From the meetings we conclude that the management of the department sees personal development as important and considers to further develop the evaluation framework.

For more information about quality, societal relevance, viability, open science, PhD policy, and HR policy, see the respective paragraphs.

### 2.3 Research quality

Disciplinary excellence and recognition by academic peers is the cornerstone of the mission of IE&IS. The number of scientific journal articles increased from 301 in 2017 to 370 in 2022 (see Table 3 in appendix B for more details). IE&IS developed an explicit publication strategy, also focusing on Open Science. In this publication strategy several target journals have been defined. The relative number of publications in these target journals has steadily increased over the past six years. Almost 60% of the work is published in outlets of high quality by the standards of their publication strategy. Over the past six years, the faculty have acted as (associate) editor, editor-in-chief or guest editor for more than 50 journals and for eight special issues. The number of PhD dissertations steadily increased during the assessment period.

The mean FWC index (Scival) of the full professors is 2.00 (median 1.48), of associate professors 1.97 (median 1.22), and of assistant professors 1.87 (median 1.22), indicating that their publications have been cited more than expected in their domains (a FWC index of 1.97 means that the publications have been cited 97% more than the mean in these domains).

More than 10 researchers received scientific awards for their work, and 10 researchers received a personal research grant or another grant for which scientific excellence is the main criterium. The faculty presented more than 20 keynotes and lectures during 2017-2022.

#### Assessment of the committee

The committee judges the research quality as very good. In the context of multidisciplinary research, the committee judges the research as excellent. In particular, the committee commends the department for how they are navigating the challenges of multidisciplinary research in still encouraging disciplinary excellence while also contributing across disciplines. There is an impressive record of editorial tasks. Grants and several prizes and awards demonstrate a strong standing in the field.

A clear publication strategy has been formulated in the past years. The publication strategy gives ample room for the variety of academic staff within the department to excel in their own discipline and to define the venues of most relevance to their research. The committee encourages the department to raise the bar in the formulation of the bibliometric KPIs (i.e., share of publications in top 10% and 10-25% journals) to match the ambition on performing excellent disciplinary research. The committee notices the strength of the department in multidisciplinary research, its importance for the researchers as well as the opportunities provided to the researchers to perform multidisciplinary research. The committee wonders if some of the KPIs defined should not be altered to express more strongly the focus on multi-disciplinary research and how to define quality metrics for team science vs an individual focus. In that respect we advise to think of more qualitative KPIs illustrating the co-creation aspect in multidisciplinary research and societal relevance. The committee also advises to reconsider the terminology of target and non-target journals given the ambition of the department to give room to individual career paths. In this regard, a broader view on target journals, which accounts for both scientific excellence and broader relevance, might be more in line with the department's focus on multidisciplinary and societally relevant research.

### 2.4 Societal relevance

IE&IS wants to generate impact on relevant societal, governmental, and industrial challenges through multidisciplinary collaborations. Therefore, the department formulated a valorisation strategy. To realize more impact of their research in the implementation of Key Enabling Technologies, IE&IS stimulated multidisciplinary collaborations not only within, but also outside the department. Four departmental research themes have been defined to coordinate valorisation efforts across the disciplinary research groups.

The main achievements, relevant to society are:

- The launch of large-scale projects, such as cVPP, and ECDT, with and for societal target groups;
- Collaborative research on societal problems with industry partners such as ASML, MSD Health, governmental bodies and NGOs; (132 second tier and third tier funded research projects, 63 co-funded by industry);
- Leadership in valorisation communities such as the European Supply Chain Forum (ESCF) and the Centre for Humans & Technology (CH&T);
- 94 publications in Top 5% Altmetric score.

### Assessment of the committee

Based on the results reported in the report, the committee finds the achievements on societal relevance very impressive. The committee considers the choice of the departmental research themes very well thought out; they give direction to the research, they are defined broad enough to be viable for the longer term, and they guarantee the academic freedom of the staff. These themes provide many opportunities and recognize important fields. The departmental themes are closely connected to the research institutes of the university, which gives much room for cooperation with the other departments of the university. We encourage the university to stimulate such collaboration in a truly bidirectional manner. IE&IS can benefit from the research done in the technological TU/e departments, while the technological TU/e departments may benefit equally from the research and valorisation activities done in IE&IS.

The Brainport eco system is very important for the department. It provides many opportunities for cooperation on a regional level. IE&IS is aware of that, but also wants to spread the research and valorisation opportunities to a national and European level.

In working together with societal groups, mutual trust is very important. The committee has observed that IE&IS paid much attention to this. This resulted in several excellent examples of valorisation, and in many 3<sup>rd</sup> tier funded projects. The valorisation communities are very supportive in this endeavour, also in finding opportunities for acquiring European funds.

The committee suggests to further deepen the strategy on valorisation/impact from projects by developing an overarching vision on the full spectrum from research to valorisation, to emphasise the co-creation aspect and reflect the very good work done so far. For example, what is the potential for more ecosystem activity and embeddedness and how to further increase impact? How may this stimulate the research activities of the department in a structural manner? And how can the resourcing for this work be supported?

The committee has the feeling that the KPIs are mainly product focused. Based on this observation, the committee suggests to further discuss the formulation of KPIs for valorisation/impact in the department and how this can be translated to specific (qualitative) performance measurement of individual researchers that recognise diverse contributions.

It looked as if many projects started with person-to-person contacts. Steps are made to institutionalize this, so there is room for development and growth.

## 2.5 Viability

According to IE&IS several internal actions to support the faculty are now in place (the Project Development Office; the research themes; the HR policy to safeguard a healthy research-teaching balance). IE&IS will build further on these in the coming years. The department will also retain the publication strategy and will keep investing in their valorisation strategy.

IE&IS wants to increase research funding and wants to diversify the project portfolio, while retaining clear focus points. They also want more often to play an initiating and leading role in large-scale projects that contribute directly to realizing the research vision. These projects should build on their existing research strengths, successful multidisciplinary collaborations, and their unique position in various valorisation circles, including the expanding high-tech industry in the Brainport region. The trends that the department expects to gain interest in the coming years are Smart Industry, Sustainable Supply Chains, and Preventive Health. Anticipating the abovementioned new trends, IE&IS is currently hiring junior faculty. These hires will also

allow IE&IS to safeguard the balance between research and teaching.

A distinctive strength of the department is their research-driven approach to integrity issues, which has led to several successful efforts at improving research practices. This will remain high on the agenda in the coming years.

### **Assessment of the committee**

IE&IS is well prepared for the future. The plans are realistic, the themes are viable, and all support processes are in place. The department is aware of the threats and has taken the right actions to tackle these. One of the challenges is attracting and retaining talent. IE&IS has introduced a mentorship program to support early career researchers. The early career researchers indicate that this is very helpful, for example, in finding and developing their own research profile. Some suggestions are done during the meetings to improve the onboarding, by, for example, streamlining all information available and helping to understand the differences with other academic environments. The mentorship program is considered a great asset in retaining the academic staff.

Another challenge is resources. The budget seems to show some financial clouds. From the meetings it became clear that the budget of the department could become a problem in the future. The committee considers the position of the department as unique for multidisciplinary research and for connecting engineering research to social sciences and humanities. IE&IS can act as a critical bridge to this end. Except for the commitment and performance of the team and collaboration with the internal and external environment, ultimately, the viability of the strategy depends on the resources available. Given the growth path and ambitions of the department the latter will be increasingly relevant.

The new language requirements in education that potentially will be imposed by the Dutch government could enlarge the problem of attracting and retaining talent. The departmental board is aware of this and recognizes the challenges, also in the context of Brainport where people operate in an international environment.

### **2.6 PhD policy**

Several procedures are in place to safeguard quality and progress in PhD trajectories. PhD candidates are recruited by a committee of researchers involved in and independent from the dissertation project. Once hired, PhD candidates are supervised by at least two faculty members. In the first months of their project, they write an education and supervision plan, which is assessed internally for feasibility.

To guarantee a high-quality training program and a dedicated research network for the PhD candidates, the department takes crucial responsibility in the Beta Research School for Operations Management & Logistics.

These strategic processes on PhD supervision led in the last six years to a length and success rate of PhD trajectories as summarized in Table 4 in appendix B.

### **Comments of the committee**

Supervision of PhD students is very well organized. Each student has a training and education plan, which is the basis for the activities of the PhD student. The education plan provides several courses that are compulsory and that prepare the student for future tasks.

The PhD students mentioned that they are very satisfied with the support provided by the department. Meetings with supervisors are scheduled on a regular basis, and if necessary, they can contact them more often. The time they spend on valorisation is not considered as a problem. They mentioned in fact that it helped them in defining their own research plans.

Topics discussed within the yearly assessments are research, education, and personal development. Typically, there are no surprising developments during the meeting. Most PhD students already know what to expect. There are regular talks on potential career paths after obtaining a PhD, and supervisors help the students in thinking about a future career, inside and outside academia.

From the statistics provided it is seen that the length of the PhD projects is still too long. The department has acknowledged it and has taken measures to shorten the project length.



## 2.7 Open science

The TU/e repository supports Green Open Access for any publication that is not featured in a Gold Open Access journal, facilitating easy and free dissemination of our research findings. IE&IS pays increased attention to transparency, data sharing, and research integrity. To this end, researchers are expected to adopt high ethical and quality standards and encouraged to continuously improve their research practices. A group of researchers of the department joined forces to conduct research on good science practice. They contribute nationally and internationally to the development and implementation of better ethical and quality standards and procedures in science.

### Comments of the committee

The department is at the forefront of the developments in open science with the availability of and accessibility to a lot of rich in-house expertise. The departmental and university-wide support is very good. The committee strongly encourages the department to make this being at the open science forefront more explicitly part of the own ambitions of IE&IS. The committee suggests, next to the ambitions already formulated, as next steps to continuously define even sharper ambitions and metrics for open science as well as to extend the infrastructure in place.

## 2.8 Working environment and personnel policies

### 2.8.1 Academic culture

IE&IS encourages the faculty to co-supervise PhD candidates, and to publish together, and strongly believes that people flourish through teamwork, that they can do high-quality and impactful research, and in this way build a stronger CV. Both mono- and multidisciplinary collaborative projects offer abundant opportunities for researchers to contribute from their disciplinary expertise and to develop their own profile.

The mentorship program reflects this academic culture, and enables tenure-trackers to join a research environment in which research ideas and projects are openly shared and discussed in order to improve quality, and to explore and establish collaboration. Senior faculty support new faculty in all aspects that are important for their career towards Associate or Full Professor.

The department's diversity in terms of seniority, gender, culture, and discipline facilitates an open, inclusive and pluriform climate. There is ample room for discussion and reflection on all aspects of the academic culture. IE&IS considers it crucial to secure a healthier balance between research and education tasks.

### 2.8.2 Human resources policy

IE&IS revised its HR policies for recruitment, mentorship, and promotion, including increased attention for diversity and inclusiveness. Tenure-trackers are provided with a framework of criteria for tenure and promotion to the various levels of an academic career. This framework defines required performance levels regarding the task categories (education, research, valorisation, and management), and considers professional, interpersonal relationships and academic citizenship, and ensures that candidates are not assessed on a narrow definition of scientific excellence, but on a broad mix of qualities.

IE&IS has set up a mentorship program; tenure trackers are supported by a second senior scientific faculty other than their supervisor or group chair. The department actively strives for diversity of gender and cultural background, and for an inclusive, collaborative, and multi-perspective academic culture. IE&IS fosters diversity by recruiting all research positions internationally, by using English as the default working language in documents and meetings, by having selection and promotion committees that are well balanced in terms of gender and culture, and by actively scouting for female employees.

### Comments of the committee

The committee got an excellent impression of an open academic environment at IE&IS in which collaboration, collegiality and team science are key elements. The research staff has an intrinsic motivation to collaborate in research and is very willing to help each other. This is illustrated in example comments

heard from all groups: “[collaboration] is very much our way of working” and “we don’t leave people to their own devices”, “we try to help each other”.

The framework of criteria for tenure and promotion is clear. The committee sees opportunities to further develop this framework by linking it to the recent developments in recognition and reward. The mentorship program is an asset in helping early career researchers to find their way in academia. Potentially this program could be broadened to also include PhD candidates and post-doctoral researchers.

Support for parental responsibilities and support in general for tenure track people was greatly appreciated, and the department could consider how to extend such support also for post-doctoral researchers and for PhD students (e.g., managing parental responsibilities while also writing up thesis work).

## 2.9 Conclusions and recommendations

### 2.9.1 Conclusions

- Overall, the management of IE&IS has perfectly facilitated the creation of a department, conducting excellent research and teaching, in which cooperation, collegiality and team science are key elements and that is future proof.
- The department has a unique position in multidisciplinary research by connecting social sciences and humanities with engineering research and has made many steps to make this possible.
- The support organized by the department is very good to excellent.
- Research quality is evaluated as very good and within the context of multi-disciplinary research as excellent. The publication strategy is well thought out and helps staff in selecting output channels.
- The results in valorisation activities and realising societal relevance are particularly impressive.
- The department is well prepared for the future with many contacts with societal partners on a regional, national, and European level. The research themes are relevant now and are expected to still be relevant in the future. They are very well chosen and give ample room for cooperation with societal partners and researchers at other departments within the TUE.
- Supervision of PhD students is very well organized. The education offered to the students is partly compulsory (general academic skills) and partly project dependent. PhD students have valorisation tasks, but they see this as an advantage rather than a disadvantage.
- The department has implemented a framework of criteria for tenure and promotion and discusses how to extend this to meet the new way of recognizing excellence in the Dutch academic world (reward and recognition).
- As regards to open science and integrity, IE&IS is at the forefront of the developments in this field.

### 2.9.2 Recommendations

- The committee encourages to raise the bar in to the formulation of bibliometric KPIs to match the ambition in disciplinary research excellence. The committee considers the position of the department as unique for multidisciplinary research and connecting engineering research to social sciences and humanities. The committee encourages the department to make the relationships with Key enabling and emerging technologies even more explicit and integrated in the research portfolio. Within TU/e there are opportunities for bidirectional, mutual collaboration and joint research between the technology departments and the IE&IS department. Those opportunities are recognized, developed, and will undoubtedly grow further in the future. They will contribute to the future proof character of education and research activities in IE&IS.
- The committee suggests to further discuss KPIs within the department. One opportunity would be to discuss how the step from product-oriented to more narrative-oriented KPIs, and to more team-oriented KPIs, can be made. Furthermore, it seems that there is room to further develop KPIs for valorisation/societal relevance as well as multi-disciplinary research.
- We encourage the department to deepen its strategy on valorisation and link it further to its research strategy and to the opportunities the Brainport ecosystem as well as other ecosystems provide.
- With respect to open science, the committee sees ample opportunity for the department to take a leading role in The Netherlands and internationally. Being at the forefront could be made more explicit in the ambitions of IE&IS.

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- From the meetings it becomes clear that the budget of the department could become a problem in the future. Ultimately, the viability of the strategy and the opportunity of further growth depend on the resources available.

## Appendix A - Programme of the visit

### Day 1: 13 June

11.30-11.45	Welcome
11.45-12.15	Purpose research review (committee)
12.15-13.00	Lunch
13.00-13.45	Campus tour & demo's
13.45-14.00	Short break
14.00-14.30	First impression based on self-evaluation report (committee)
14.30-15.15	Meeting with departmental board
15.15-15.30	Reflection committee
15.30-16.15	Meeting selection of Professors and Associate Professors
16.15-17.00	Reflection committee & short break
17.00-18.00	Meeting leaders research themes
18.00-18.15	Reflection committee & short break
18.15-19.00	Meeting with partners from society & industry
19.00-??	Dinner & reflection day 1 & preparation day 2

### Day 2: 14 June

09.00-09.30	Committee meeting
09.30-10.15	Meeting early-career researchers
10.15-10.30	Reflection committee & short break
10.30-11.15	Meeting PhD students & postdocs
11.15-12.00	Meeting departmental board - discussion of additional questions and opportunity for peer advice
12.00-13.30	Reflection & time for additional meetings & formulating feedback
13.30-14.00	Feedback of the recommendations to the departmental board & anyone interested & closing

## Appendix B- Quantitative data

Table 1: Budget in M€ and %

	2017		2018		2019		2020		2021		2022	
<i>Funding</i>	M€	%	M€	%	M€	%	M€	%	M€	%	M€	%
Direct funding	17.141	69	17.298	67	18.739	69	18.167	68	18.853	66	20.122	70
Research grants	1.321	5	1.521	6	1.599	6	2.007	8	3.065	11	2.564	9
Contract research	3.627	15	4.012	16	4.697	17	3.921	15	4.578	16	4.888	16
Other	2.681	11	2.920	11	2.098	8	2.302	9	2.275	8	1.739	6
<b>Total funding</b>	<b>24.770</b>		<b>25.751</b>		<b>27.133</b>		<b>26.397</b>		<b>28.771</b>		<b>28.913</b>	
<i>Expenditure</i>												
Personnel costs	21.132	90	22.844	89	24.470	90	24.924	93	27.236	94	27.828	91
Other costs	2.271	10	2.942	11	2.774	10	2.000	7	1.670	6	2.618	9
<b>Total expenditure</b>	<b>23.403</b>		<b>25.786</b>		<b>27.244</b>		<b>26.924</b>		<b>28.906</b>		<b>30.446</b>	
<b>Results</b>	<b>1.367</b>		<b>-0.035</b>		<b>-0.111</b>		<b>-0.527</b>		<b>-0.135</b>		<b>-1.533</b>	

Table 2: Research staff in # and fte

	2011		2018		2019		2020		2021		2022	
	# <sup>1</sup>	Fte <sup>2</sup>	#	fte	#	fte	#	fte	#	fte	#	Fte
Full professor <sup>3</sup>	28	9.13	28	9.46	28	9.39	29	9.6	26	9.63	25	9.24
Associate professor <sup>4</sup>	21	7.19	23	7.93	28	8.67	28	9.33	31	11.60	28	10.59
Assistant professor <sup>5</sup>	76	28.3	69	24.00	76	26.02	77	26.50	68	24.63	67	25.97
Postdocs	20	9.33	25	12.02	30	15.40	29	13.86	24	13.36	19	11.15
Support staff <sup>6</sup>	4	2.03	11	4.65	11	7.03	12	7.87	7	4.99	3	1.97
<b>Total research staff</b>	<b>149</b>	<b>53.51</b>	<b>156</b>	<b>58.06</b>	<b>173</b>	<b>66.51</b>	<b>175</b>	<b>67.16</b>	<b>156</b>	<b>64.21</b>	<b>141</b>	<b>58.92</b>
Phd candidates <sup>7</sup>	101		106		110		124		121		122	

<sup>1</sup> Number of scientific staff on payroll; staff members changing positions during calendar year

count in both categories.

<sup>2</sup> Research FTE in Man-Year Equivalent (mye), where research effort is a percentage of the appointment. Standard research ratio is 40% for Professors, Associate Professors and Assistant Professors, 80% for postdocs and 100% for researchers. For some staff members, the ratio differs from the standard. Staff members changing positions during the calendar year are included in the respective categories based on contract duration, which affects the actual research capacity per category compared to the reported number of researchers.

<sup>3</sup> Full Professors; tenured and non-tenured staff.

<sup>4</sup> Associate Professors; tenured and non-tenured staff.

<sup>5</sup> Assistant Professors; tenured and non-tenured staff.

<sup>6</sup> Support staff (Researcher)

<sup>7</sup> Standard PhD candidates (employed) and contract PhD candidates (externally or internally funded paid by IE&IS) and PhD candidates on scholarship.

Table 3: Publications in line with publication strategy – target versus non target scientific output

Type	2017	2018	2019	2020	2021	2022	Total
Scientific journal articles in journals with AIS - top 10%	22	37	23	43	46	32	203
Scientific journal articles in journals with AIS - 11 t/m 25%	58	68	50	60	70	89	395
Scientific journal articles in target journals with AIS Q2- Q4	25	10	18	16	23	25	117
Scientific articles in target proceedings (paper) and chapter in books target publishers	10	14	14	13	17	14	82
<b>Subtotal target output</b>	<b>115</b>	<b>129</b>	<b>105</b>	<b>132</b>	<b>156</b>	<b>160</b>	<b>797</b>
Scientific journal articles with AIS Q2, Q3, Q4 excluding target articles	60	72	67	82	93	76	450
Scientific journal articles in WoS ESCI	7	13	15	18	15	17	85
Scientific journal articles in journals not included in WoS	12	20	14	27	31	35	139
Number of scientific articles (papers) in proceedings and chapters in books (not target proceedings)	107	130	137	113	111	82	680
<b>Subtotal non target scientific output</b>	<b>186</b>	<b>235</b>	<b>233</b>	<b>240</b>	<b>250</b>	<b>210</b>	<b>1354</b>
<b>Total</b>	<b>301</b>	<b>364</b>	<b>338</b>	<b>372</b>	<b>406</b>	<b>370</b>	<b>2151</b>

Table 4: Success rates PhD candidates IE&IS influx cohort 2014-2018

Enrollment				Cumulative success rates											
Starting year	M	F	Total	Grad. in yr 4 or earlier		Grad. in yr 5 or earlier		Grad. in yr 6 or earlier		Grad. in yr 7 or earlier		Not yet finished		Discontinued	
				#	%	#	%	#	%	#	%	#	%	#	%
2014	15	11	26	2	8%	17	65%	21	81%	21	81%	0	0%	5	19%
2015	13	7	20	1	5%	8	40%	13	65%	14	70%	0	0%	6	30%
2016	12	9	21	1	5%	10	48%	14	67%	16	67%	3	14%	2	10%
2017	14	15	29	2	7%	11	38%	16	55%	10	34%	3	10%		
2018	7	13	20	4	20%	7	35%					10	50%	3	15%
<b>Total</b>	<b>61</b>	<b>55</b>	<b>116</b>	<b>10</b>	<b>9%</b>	<b>53</b>	<b>46%</b>	<b>71</b>	<b>61%</b>	<b>74</b>	<b>64%</b>	<b>23</b>	<b>20%</b>	<b>19</b>	<b>16%</b>

Notes

- Numbers in the “Grad....” columns are cumulative numbers. In other words, students that graduated in 4 years are also included in the column of number of students that graduated in 5 years or more.
- All PhD candidates conduct research with the primary aim/obligation of graduating, based on a 0.8-1.0 FTE contract. This only includes PhD candidates with employee status and contract, and PhD candidates without employee status, but receiving external funding or a university scholarship.
- One PhD candidate in the 2017 and two in the 2018 cohort continued their PhD research outside the department IE&IS. These PhD candidates are not included in the table.
- Two PhD candidates (one in the 2017 cohort and one in the 2018 cohort) combined their PhD trajectory with an appointment of 25% for education, so they have a five-year instead of a four-year PhD trajectory. The figures have not been corrected for this.
- Some PhD candidates use maternity and care leave. The figures have not been corrected for this.