Expert report, panel 5

KTH's Research Assessment Exercise (RAE) 2021

Panel chair:
Professor Bart De Moor

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Introduction

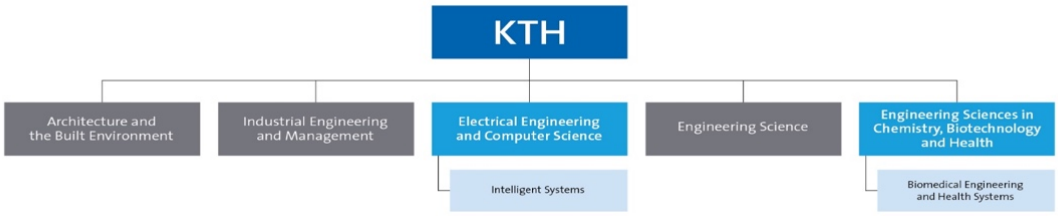
This expert panel report is part of the Research Assessment Exercise (RAE) 2021 at KTH Royal Institute of Technology and started from the self-evaluation report of the two departments involved, the Department of Intelligent Systems, and the Department of Biomedical Engineering and Health Systems.

Expert panellists:

- Prof. Dr. Ir. Bart De Moor, full professor Department Electrical Engineering, KU Leuven, Belgium, Chair of panel 5
- Prof. Dr. Aylin Yener, Ohio State University, US
- Prof. Dr. Athina Petropulu, Rutgers, State University of New Jersey, US
- Prof.dr.ir R.H.M. Goossens, Full professor Physical Ergonomics | Department of Human-Centered Design | Faculty of Industrial Design Engineering | Delft University of Technology, The Netherlands; Program Director Convergence Health & Technology, Delft University of Technology, Erasmus Medical Center and Erasmus University Rotterdam
- Prof. Dr. P. John Clarkson, Professor of Engineering Design, University of Cambridge, United Kingdom; Professor of Healthcare Systems, Delft University of Technology, The Netherlands
- Prof. Dr. Ir. Jos Vander Sloten, Department Mechanical Engineering, KU Leuven, Belgium
- Prof. Dr. Carlos Canudas De Wit, GIPSA-lab, Grenoble, France
- Prof. Dr.-Ing. Tanja Schultz, University of Bremen
- Prof. Dr. Lina Sarro, TU Delft, the Netherlands, was excused for personal reasons.

Panel 5

Coordinator: Prof. Wouter van der Wijngaart, KTH
Vice-coordinators: Prof. Sebastiaan Meijer and Prof. Mikael Skoglund, KTH



Part A: Summary of the whole panel

This panel is highly appreciative for the overall preparation of the assessment process, as evidenced by numerous a priori briefing sessions and presentations, the commitment of the panel (vice-) coordinators[1], and the global presentation by KTH's President surveying the international positioning of KTH, the 4 policy pillars (Sustainability, Equality, Digitalisation, Internationalisation), the organisational structure and its (international) strategic partnerships and networks in which it participates. In addition, the presentation on 'Quality in research at KTH' provided the panel with the necessary background information on the quality assurance cycle, and the overall funding landscape in Sweden. The availability of several movies on research centres, labs and infrastructure was very instructive. All this policy information was absorbed by the panel as necessary background in which the policy plans of the departments must be positioned, with an emphasis on assessing the quality of research at KTH and formulate adequate visions and strategies to consolidate and/or improve it, in a six-year cycle of monitoring and periodic review. In addition to the presentations, we were also provided with short presentations about WASP, Digital Futures, Strategic Partnerships with the Region Stockholm, Campus Flemingsberg, MedTechLabs, AIMES (Centre for the Advancement of Integrated Medical and Engineering Sciences) and the KTH Tech Transfer Office.

Starting from the self-assessment report, which was of high quality, the panel deployed a bottom-up methodology, where we started from hearings and interviews at the division level, up to the department level, to end up, inductively, with global recommendations at the KTH Institutional Level (so exactly opposite to the 'top-down' structure of this report).

Of course, our recommendations are often based on a rather subjective interpretation of what the panel heard, saw and read, and can also miss nuances here and there. We sincerely hope that the stakeholders at the different levels of KTH understand this relative uncertainty in our recommendations, all of which are meant to be constructive. For sure, the panel is open for further interactions and suggestions.

A.1. Strengths, weaknesses, and recommendations

Among the strengths, which are elaborated on in detail in part B.1. (Intelligent Systems) and B.2. (Biomedical Engineering and Health Systems), we count:

- Excellence and impact of research in Intelligent Systems.
- The identification of growth trajectories towards excellence in Biomedical Engineering and Health Systems.
- Research topics and themes that are 'hot' in current day society.
- Excellent leadership with extremely well motivated and committed researchers.

As for the weaknesses/challenges, we identify (between brackets we refer to the recommendation Sections):

- Issues with gender and diversity (see under Section A.6.3).
- Issues with hiring (see Section A.6.4).
- Opportunities for more intensive collaboration (see Section A.4.).
- The need to identify future leadership (see Section B.1.1.1. and B.1.1.5.e.).
- Potential for more activities with respect to Outreach (see e.g., B.1.1.5.f.).
- Sometimes unbalance between teaching load and research (see Section B.2.1.1.).

[1] The commitment of prof. dr. Wouter van den Wijngaart as the panel 5 coordinator, and of vice-coordinators professors Mikael Skoglund and Sebastiaan Meijer was deeply appreciated by the panel.

A.2. Feedback on the formulated visions and strategies

The self-assessment report delivers an impressive account of all research and valorisation activities of the two departments. The strengths of both are very well described, in realistic terms. In addition, the self-reflection also identified weaknesses and challenges, for both Departments, with appropriately defined measures to cope with them. So as such the panel can agree with the analysis made and delivered, but in the panel, we have identified additional points of attention, for which we also formulate additional, and sometimes stronger recommendations than the ones elaborated on in the self-assessment report. We refer to the appropriate Sections in this report for more detail.

A.3. Ideas and recommendations for essential steps

Common to both departments seems to be the lack of, and therefore the need for more long-term and strategic thinking. Indeed, some divisions reported that the self-assessment exercise was the first occasion at which they all did a collective strategic thinking exercise. Mechanisms to improve this are suggested in the appropriate Sections of this report (e.g., in Section B.1.1.5.b, Section B.2.1.5.).

This strategic thinking is also mandatory to avoid that divisions and departments are exclusively guided by external forces and funding (such as WASP, Digital Future,…), and in the meantime would neglect strategic thinking which supersedes the more down-to-the-earth and shorter term objectives of the industrial stakeholders. This also requires a serious thought on an adequate equilibrium between 'fundamental' research, and strategic basic/applied research, and will also impact the description of the profiles of future faculty to be recruited.

In addition, the panel thinks that a more open spirit for more research collaboration and interaction between divisions, departments, within and outside KTH, would be beneficial, whereby others can benefit from the excellent current leadership in the division and departments.

A.4. Potential links and synergies

The opportunities for collaboration with internal and external partners for both the departments assessed, Intelligent Systems and Biomedical Engineering and Health Systems are manyfold. Yet, it was a bit surprising for the panel to learn that:

- There is still ample room for intensified research collaboration between the divisions in each department. Currently, these opportunities are far from being exhausted.

- It was only at the end, during the final debriefing of all panels before the KTH Board, that for this panel it became clear that there are many opportunities for more interactions between the departments than were reported on in the self-assessment report and in the interviews and interactions. As a matter of fact, this seems one of the issues where KTH could improve, considering that many of the societal themes, like health, sustainability, digitalisation, etc., require interdisciplinary approaches, and research topics like artificial intelligence and intelligent systems are transversal.

- As the demand for themes like 'Artificial Intelligence' and 'Cyber Security' is ubiquitous, there are still largely unexplored areas for collaboration between the department of Intelligent Systems, and other departments and divisions of KTH, as well as ones external to KTH (e.g., Digital Humanities in collaboration with Stockholm University, all developments in the life science and e-health, etc.). In the reports received, there was almost no evidence that such opportunities would/could be identified.

- Similar challenges and opportunities are there for the Department of Biomedical Engineering and Health Systems: some of the clusters and divisions there seem to operate quite isolated

from more massive research activities (e.g., the division of structural biology with respect to Life Science initiatives in KTH and elsewhere (e.g., also Wallenberg induced)).

- This panel inquired several times during the interview about the existence of the transversal and translational platforms and research centres: they seem to be there (as evidenced in the President's power-point address, which enumerates 6 platforms: energy, materials, transport, life science, industrial transformation, digitalization), but they are not very active, or the departments we assessed, are not very much involved in these. To be more precise, it seems that the departments are very active, but that the depth of the collaboration that should be catalysed by these platforms, is rather limited. Their impact seems to be limited to collecting and spreading information. This represents some missed opportunity, and action should be taken to remedy this deficiency.

- Another example, not induced by weaknesses, but by strengths, might be the following: Consider two of the centres that were presented to the panel: *MedTechLabs*: A research centre with partners KTH, Karolinska Institute and Region Stockholm with the aim to develop diagnostics and better treatments for our most common diseases. Especially the connection with both the region and a prominent hospital offers unique valorisation opportunities. *Aimes Centre for the Advancement of Integrated Medical and Engineering Sciences,* which mission is to offer an academic research environment that promotes interdisciplinary research and education alongside innovation and entrepreneurship.

  The activities in these centres could be combined under the umbrella of KTH Innovation, in which case a very strong interdisciplinary pipeline to connect research to entrepreneurship would result. The visibility of the potential services to internal and external stakeholders would increase and also 'valorisation' processes would speed up. Indeed, these centres can exchange best practises and make use of each other's networks. Depending on their readiness levels the projects can be passed on to the other centre. For the research staff there will be a one stop shop for valorisation support. It can be extended into an ecosystem of integrated facilities that stimulate interaction and innovation, including (i) offices where people can meet and interact, (ii) unique research labs and facilities, (iii) testing and research facilities embedded in the clinical context and (iv) shared data infrastructure that makes clinical and research data readily accessible and reusable for all partners for research and innovation purposes.

A.5. Recommendations for strengthening the departments and their future potential

Most of the recommendations formulated under Section A.6. obviously apply to the departments and divisions. Indeed, the recommendations from A.6 were built bottom-up from the findings we observed in the divisions and departments that we assessed. So, we are not going to repeat them here, but have the following additional recommendations:

- Install instruments and mechanisms for longer term strategic thinking, including the identification of opportunities for more interaction and collaboration within the department and with third parties.

- Install tools and (administrative) support for linking up the strategic top-down themes as proposed by 'central' KTH, and the policies of divisions and departments. Try to be a role model in these.

- Identify and train future leaders for the division and the department, and successors that can also play a leading role in initiatives such as WASP, Digital Future and the like.

- Increase efforts and initiatives with respect to science and technology outreach activities.

A.6. Recommendations applicable to the whole of KTH

A.6.1. Necessity of better diffusion of top-down policy plans

There seems to be a big gap/divide between the well-intended 'top-down' strategic plans on sustainability, diversity, outreach, internationalisation (in many cases lead by a vice-rector) on the one hand, and their deployment in the field, at the level of departments and divisions, on the other hand. When asked about what the department/division could mean or represent in these top-down plans, for sure answers were provided, but nevertheless the panel notices a lack of 'bottom-up buy-in' and 'added value' with respect to these plans. KTH should carefully envisage deploying additional instruments, communication, people, etc… to make these strategic plans successful, and may also want to reflect on several layers of strategic thinking (individual, organisational, facilities and environmental strategies, see footnote [2]). While there has been some analysis of the above issues, and there is good will at the university level to remedy the problem, there is a disconnect at some point and the discussions/policies do not get down to the departments. The central administration should find ways to engage departments and students to the development, implementation, and evaluation of policies.

A.6.2. More de-centralization of the administrative support

Quite some interaction time with faculty members was devoted to the decision and subsequent implementation of KTH for centralizing most of the administrative, financial, etc. services. Although for sure this decision must have been based on well over-thought arguments, its reception and deployment at the level of the professors and divisions, is hardly supported[3]. One suggestion might be to relax some of the stringent and rigid regulations (be it on personnel and financial autonomy), towards more de-centralization, especially in those department that could financially and budget-wise afford it[4].

A.6.3. Diversity

The composition of the faculty does not represent society. The number of female faculty is very low, hinting to a fundamental problem. This lack of diversity translates to missed opportunities for KTH to tap into a vast talent pool of students and faculty. This panel advocates:

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[2] The thought of strategy does not always land well with academics and is often thought to be counter to academic freedom. However, strategy defined from the bottom up with agreed ambition for the future, is essential in delivering and sustaining research leadership.
There is a place for ***individual* strategy**, where faculty and researchers determine their preferred areas of research. A collection of individual strategies, often known as a *bottom-up* strategy is typically advocated for leading academic institutions where the brightest minds are recruited and left to develop and deliver their own areas of excellent with considerable freedom. There is equally a place for ***organisational* strategy**, where research groups, divisions, departments, or schools determine their collective long-term goals and directions of travel. This need not be imposed *top-down* and is often best developed corporately and appropriately moderated to reduce local bias and blinkered thinking. At its best *organisational* strategy supports collective goals and ensures the introduction of new areas, refocusses and sustains areas of long-term importance and excellence, facilitates closure of old topics, and above all else preserves *individual* strategy. Organisational strategy also drives faculty development at all levels, from hiring, through career development to promotion, both in rank and role. It contributes to the creation of a positive cultural environment. It is shared with the local and wider organisation, and key supporters and collaborators to ensure uniformity of action and direction.
There is also a place for a ***facilities* strategy**, where divisions, departments, schools, and universities look to their current and future buildings, equipment and supporting resources required to deliver research, teaching and impact. It contributes to the creation of a positive physical environment. Policies to develop shared, resilient facilities are particularly useful. Finally, there is a place for ***environmental* strategy**, a guiding principle to remind all faculty and researchers of the importance so SDGs and other societal drivers. This should be presented not only in principle, but also as repeated and practical reminders as to how this can drive, at some level, all areas of research, teaching and practice. The overall success of any group, division, department, school or university depends on the alignment of all these elements of strategy, effective at the particular level of interest. Their creation and continued development must therefore be informed by a combination of bottom-up views combined with visionary, purpose-driven leadership, and experienced and informed top-down views at every level.

[3] Some leading professors complained about the lack of direct secretarial support, which is, considering the large budgets and number of people in some of these departments and divisions, hard to belief.

[4] There are many examples of oscillations between centralizing and decentralizing initiatives in academic institutions and companies or industries. Yet, the general feeling is that both are necessary in an adequate and well-thought manner, which basically correlates with the vision on the several layers of strategy, as elaborated on in footnote 2.

- Re-evaluate your hiring practices and change the composition of your faculty search committees. Re-evaluate your metrics; there is no unique way to quantify excellence. Allow for departmental division members to have a say in the hiring process.

- Reach out to your female PhD students. There are several opportunities to educate them on how exciting an academic career can be and prepare them on how to pursue academic positions (check www.ieeeprogress.org). Bring them in touch with a network of students interested in academia. Give them the opportunity to teach and co-supervise students during their PhD study.

  We also refer to Section B.1.1.5.d. for more details.

A.6.4. Hiring and recruiting

The panel has understood that the faculty hiring process needs to be reconsidered and thinks that it might be to the benefit of both the receiving division and the candidates to rethink the hiring process by addressing the following challenges: (1) denomination of a professorship, (2) inclusion of division's representatives into the decision process, (3) duration of the overall hiring process. With regards to (1) and (2) denomination and decision of new professorships: to further extend KTH's excellent reputation and leadership in the world, the scientific strengths shall be strengthened, e.g., by hiring high potentials who match the divisions' scientific profile and strengthen them in a meaningful way. To identify those scientific areas of strength and need, the consultation of divisions' representatives is of utmost importance. Ideally, strategically important future-oriented and sensible delimited denominations are negotiated and jointly agreed upon. Since professors of the receiving divisions know their field best, it makes sense to include them into the advertising, recruitment, and the decision process, this may also facilitate the targeted search for female candidates in the community. The panel is also aware of the potential for Conflicts of Interest. So, if a person from the division is among the candidates, the representatives may leave the room during the discussion of that candidate and abstain from voting, in all other cases the representatives shall have a vote. With respect to (3), given the general shortage of high potentials in the field of technologies and the strong competition with big players paying big money, the time between application and job start must be as short as possible, otherwise the best candidates will be hired by the early birds.

We also refer to Section B.1.1.5.d. for more details.

A.6.5. Valorisation and technology transfer

There are very strong initiatives in valorisation that can be combined into a more coherent and even stronger proposition for fast track to innovations in most disciplines, but according to this panel opportunities are abundant, especially in healthcare. KTH Innovation offers early-stage tech innovation support for KTH researchers, students & employees. It has an internationally recognized innovation support process and has a Business Development Support Office that offers support in tech, market, IP, team, funding, pitch and more. The open-source Innovation Readiness Level model where everyone who uses the model can get access to the latest updates, share experiences, and spread best practices, is remarkable. The tool gives more insights than the commonly used Technology Readiness Levels. Yet the panel finds that there is more potential for valorisation.

Part B.1. Report for department Intelligent Systems

The panel has appreciated very much the careful preparation of the self-assessment report of the department of Intelligent Systems, which was extremely informative and sufficiently detailed to have a realistic view of the status of the department. We would like to thank all members of the department who contributed to this thoroughly. The department comprises 5 divisions, has about 300 employees and a global annual turnover of about 310 MSEK. It maintains the strong vision that research excellence is mandatory for teaching, research, and societally oriented activities of a university, and for sure lives up to this standard and expectations it brings along. The department is organised in a kind of matrix structure, with teaching being coordinated by the department, and the research strategies and activities 'independently' by the divisions. The 5 divisions are: Decision and Control Systems (DCS), Information Science and Engineering (ISE), Micro- and nano-systems (MST), Robotics, Perception and Learning (RPL), Speech, Music and Hearing (SMH).

B.1.1. Major findings Department Intelligent Systems

B.1.1.1. Strengths and weaknesses of the department

As for the strengths, the panel is unanimous about the extremely excellent performance in research activities, with 'shining' and 'leading stars' in all divisions, with respect to all thinkable key performance indicators for research, about the impressive line-up and interaction with Swedish industry, about the impressiveness of the amount of funding, as witnessed by WASP and Digital Futures, the leaders and instigators of which belong to this department, about the impressive international research network and impact.

As for the weaknesses, and hence points for improvement, the panel noticed:

A huge challenge with respect to diversity: The department research is in very good shape technically, in terms of quality of faculty, external funding, and timeliness of topics. However, the number of female faculty is strikingly low, hinting to a fundamental problem. This lack of diversity translates to missed opportunities for KTH-IS to tap into a wider talent pool. The challenges our world is facing, and which we engineers are called to solve are multifaceted and require diverse perspectives and experiences. While at KTH there have been discussions and deep analysis of the above issues, the lack of diversity has persisted. Faculty mentioned that while there is will at the university level to correct the problem, there is a disconnect at some point and the discussions/policies do not get down to the departments.

Challenges related to the hiring processes: The expert panel understood that the faculty hiring process leaves room for improvement, in particular the panel thinks that it might be to the benefit of both the receiving division and the candidates to rethink the hiring process by addressing the following challenges: (1) denomination of a professorship, (2) inclusion of division's representatives into the decision process, (3) duration of the overall hiring process.

A challenge for long-term thinking and vision. The IS department consists of five divisions that have recently been merged under the department's umbrella. Historically, they come from the former EE and CS departments, so they are diverse in expertise, and in research methodology. Each division has considerable intellectual strength and a world-class reputation in its research area. Some of the research areas, for example Decision and Control Systems and Robotics, Perception and Learning have some overlap in their research vision though their approaches may differ. Similarly, Information Science and Engineering has significant effort in teaching. The panel recognizes the strengths of each

division and would like to suggest that further cooperation in research vision (not necessarily the domain expertise or flavour of research, which the panel recognizes are unique to each division) could further elevate the department in the world stage.

Several department and division leaders admitted that the RAE was the first time they did some strategic thinking together in a systematized manner. This is quite surprising for a successful department of this size. The panel was of course also not insensitive to the impressive amount of funding (WASP, Digital Futures…) but at the same time, expressed some concern about the 'academic' long term vision and positioning. Indeed, these massive funding seem to be induced by relatively short term needs of the Swedish industry, and of course offer an opportunity, but there might be a need to also do strategic thinking on a higher 'meta-level', which looks further than the objectives as formulated by industry. Another symptom of this 'luxury position', might be the relative shortage of Advanced ERC grants, which throughout Europe and the world, are top achievements in (fundamental) research.

A challenge and resulting opportunities for collaboration between divisions: The creation of the Department Intelligent Systems is relative recent (two year back from this evaluation). The department is composed of several divisions, each one having their own landscape, scientific homeland, community, and way to operate. Each division has enough critical mass to operate by their own. Our perception is that the actual division separation is a convenient heritage from previous organization, and all of them excel in their own scientific field. Therefore, there is no necessity to change/modify the perimeter of division, nor the topics treated by each division. Nevertheless, at this early stage of the department formation, the full value of the department is mainly due to the sum of all individual division outputs. In the oral interviews however, it appeared that there are several ongoing interactions between the divisions, and its number seems increasing (this was not much detailed in the self-evaluation report), also catalysed by WASP and Digital Futures, even with many research groups inside and outside KTH. The panel considers that even more further synergies can be reached.

A concern about the future continuity in leadership: The department is co-founder of and participates in several of the largest research programs in Sweden, the Wallenberg AI, Autonomous Systems and Software Program (WASP), the SciLifeLab and Wallenberg National Program for Data-Driven Life Science (DDLS), which is now launching a joint call with the goal of solving ground-breaking research questions across disciplines, and also the Digital Futures initiative. On the positive side this turns out to be an incentive for hiring new staff members. However, also several other aspects need to be considered:

- In these programs, the research agenda is defined by others, the department has to follow that external agenda instead of defining future ambitions of the research program with cross cutting research that lead to new frontiers in knowledge.

- The loss of sense of urgency for external competitive funding (e.g., ERC) because both are long term programs and financial security is also secured for longer term, but that also means that new financial resources should already be explored in an early stage to continue the employment of staff that was hired.

- In addition, there do not seem to exist plans for educating and training new leaders of the calibre of Karl Johansson and Bo Wahlberg, who are instrumental in Digital Futures and WASP.

B.1.1.2. Relevant and forward-looking objectives

The fact that for the first time the department performed a global strategic exercise, as induced by this RAE, was beneficial to the young faculty members in sharpening their leadership competences, and for sure strengthened the cross-links between divisions.

B.1.1.3. International community engagement

Because of its impressive research excellence, the international impact of IS is a no-brainer. All divisions in this department are fully international in all possible academic respects, apart maybe from the composition of the faculty itself, which is mainly Swedish.

B.1.1.4. Future potential of the department

As the department covers all possible current day 'hot topics' (communication, cyber security, control, artificial intelligence, etc.), there is a 'natural' potential for further strategic development of all the divisions on their own, and the department as a whole, provided the recommendations made elsewhere in this report, are taken up seriously.

B.1.1.5. Recommendations

B.1.1.5.a. Recommendations w.r.t. hiring:

We refer to the general recommendations in Section A.6.4 (Hiring and recruiting) of this Panel's report, which obviously also apply to the specific Department here.

B.1.1.5.b. Recommendations w.r.t. strategic plan and long-term vision:

Annual retreats: These could be two-day retreats where the entire department's faculty can get together (potentially off-site) towards constructing a unified research vision for the future (for example two to five year into the future). The panel feels the collective technical strength of this department can address societal grand challenges under a unified vision. This exercise would encourage the faculty to brainstorm together to define that vision. This would also likely result in an easier preparation for the next RAE where research milestones of the divisions would contribute to this grand vision. The panel does appreciate the key role the IS department faculty is playing in the WASP and Digital Futures initiatives and feels that a clear department-wide vision would further strengthen the impact of IS in these initiatives.

Joint bi-weekly or monthly seminars: While the previous recommendation is strictly for faculty members, a better integration of research topics can be facilitated also by departmental seminars given by researchers (including PhD students and postdocs), followed by break outs of researchers working in similar topics (possibly with different approaches).

Interdisciplinary seed projects: The department could further encourage cross division collaborations by awarding seed grants (with support from KTH) to junior faculty. For example, these seed grants may have eligibility criteria such as two junior faculty from two different divisions. The performance metric could be whether this effort translates to an external grant opportunity, and/or joint research output.

B.1.1.5.c. Recommendations with respect to strengthening inter-division collaboration

One possibility for fostering the department visibility and outputs could be that the department provides and formalizes some new instruments for collaboration across divisions. Below are some examples of such instruments that the board recommend implementing: Open specific scholarships for division cross-collaboration in topics involving at least two divisions: master, PhD, Post-docs; Study the possibility to merge or to create common research platforms, testbeds, study-cases across divisions; Define rewards mechanisms to encourage joint-proposals to industry, EU, WASP, etc projects with two or more division. Specific seminar/discussions/workshops touching research topics common to divisions (Cybersecurity, robotics, ITS, etc.). Improve periodic communication of the own Department as a whole, but also communication across division.

Of course, the panel is aware that all these improvements may be possible if the department could get the suitable management support. The actual central administration strategy, and the rate of the

overheads, seems not be enough to suitable reply to the growing strategy of this excellent department. A local administrative support at the Divisions level should be improved.

B.1.1.5.d. Recommendations with respect to diversity:

We also refer to Section A.6.3.

Faculty Search Committees:

- Re-evaluate hiring practices and change the composition of your faculty search committees. Train those faculty on how to avoid bias when reviewing applications (there is a lot of literature on this topic). Include diversity faculty in your search committees. Re-evaluate hiring metrics; there is a plurality of ways to quantify excellence.

- Generate diverse applicants: Invest efforts in widening the pipeline of students interested in academic careers. Proactively look for promising diversity graduate students in other schools or at KTH and cultivate them to become competitive faculty candidates. Also reach out to your undergraduate diversity students and get them excited about academia. Get them involved in research and teaching of courses.

- Find ways to convey to those students that being a professor is the most rewarding profession in the world with a huge impact to society (we address society's grand challenges and educate/shape tomorrow's academic leaders and entrepreneurs).

- There are several opportunities designed to educate students on how exciting an academic career is, and prepare them to pursue academic positions (check www.ieeeprogress.org). Bring them in touch with a network of students interested in academia. Give them the opportunity to teach and co-supervise students during their PhD study.

- Establish a mentoring program ensuring that faculty will take the necessary steps to develop stellar careers and also get help/advice on personal life matters. Mentoring is necessary given that a large percentage of the faculty are international and not familiar with the language and ways for conducting business in Sweden. Advertise the mentoring plan to your students and faculty candidates so that they see that they will not be left to fight all alone. Provide a list of collaborative opportunities to your faculty candidates.

- Create opportunities for two-body careers at KTH or affiliated sites.

Create an environment that supports diversity:

- Diversity is widely considered a pillar of innovation. Diversity does not threaten quality. Educate your current faculty and students on the importance of diversity so that they appreciate it and partner in efforts to improve diversity.

- Maintain a comfortable environment for diversity faculty and students. With the influx of international students, some from countries that suppress women and non-binary people, you are a risk of importing an environment that is hostile to diversity. Train those students on the values of the university and ensure they abide by those values.

- Find out from your female alumni what turned them off from pursuing an academic career and try to address the issues[5].

- Work with upper administration on improving diversity: The upper administration should find ways to engage departments and students to the development, implementation, and evaluation of policies.

B.1.1.5.e. Recommendations with respect to continuity

- Find a better balance between external agenda setting of research because of large programs and own defined (and maybe high risk) research that lead to new frontiers of knowledge.

- Start early with planning new funding opportunities of large programs.

- Educate and train new potential visionary leaders as potential successors for the current ones.

- There is no formal young faculty mentoring program that will ensure faculty take the necessary steps to develop stellar careers and also get help/advice on personal life matters. Mentoring is necessary given that a large percentage of the faculty are interactional and are not familiar with the language and ways for conducting business in Sweden. Develop a faculty mentoring plan.

- There is no formal student training program to ensure that all students are aware of the values of the school. This is especially important when you have a lot of international students, who are not necessarily supportive of women and non-binary people and bring their country's biases to KTH. Develop a student training program.

B.1.1.5.f. Outreach

There is no structure for outreach that would inform the public on the exciting research conducted in IS and attract students. This would be a good opportunity to attract female students. With some exceptions, faculty appear to think that societal impact of their research is not their concern because they must prioritize their time.

However, going forward, researchers need to worry about the readiness of the public to accept their innovations. They need to educate the public for the importance of their research. Otherwise, as technology advances at a fast pace, a large segment of the populations gets disenfranchised, becomes hostile towards progress and susceptible to conspiracy theories. We have clearly seen such effects in the US and other countries when it came to the acceptance of the covid-19 vaccines.

B.1.2. Specific issues Department Intelligent Systems

The panel has opted to use this section to provide feedback based on the interactions/interviews with the individual divisions. Not all topics were treated in all sessions, nor were the questions necessarily the same. This explains why for some divisions for some issues, no comments are given. The comments provided here basically contain information or clarification in addition to the self-assessment report, based on the notes of the individual panel members. In addition, we do not repeat the more general recommendations that we make elsewhere in this report, and which are basically common to both

[5] In the fruitful discussion with Alumni, most of which were successful women in leading Swedish high-tech companies, in turned out that these former PhDs/postdocs found an industrial career much more attractive, due to its predictability, and more assurance for an equilibrated work-life balance. Some of the interviewees referred to their female promotor as a role model, which they admired very much, but which also led them to the conclusion that they did not want to lead such a stressful life with performance pressure and uncertainty in all academic dimensions.

departments and their divisions that were assessed by this panel. We treat the divisions in the order DCS, ISE, MST, RPL, TMH.

B.1.2.1. Research profile and quality

B.1.2.1.a. Central research questions and themes, and main research activities

The department consist of five divisions:

1. **DCS** research focuses on system identification, control, machine learning (ML) and optimization of dynamical systems, with applications in autonomous systems, networked systems, process control, robotics, and cyber-physical security. Its activity is well organized and perfectly well structured along 6 main topics: NCS, CPS, ITS, Multi-Agent Robots, Identification and AI/ML. Focus areas are cutting edge. Automation and Control are among the big strengths of KTH in terms of worldwide ranking (#19, Shanghai)[6]. DCS faculty publishes in high impact journals and conferences and has substantial external funding. DCS faculty are world class as evidenced by bibliometric statistics and play leading roles in interdisciplinary university initiatives, such as WASP and Digital Future. All of them are well connected with local industry. Only one of the 13 faculty is female (assistant professor).

2. **ISE** research focuses on digital communication and networking, signal processing and data sensing/analysis, machine learning, multimedia processing, and the utilization of stored and real-time data for information extraction and predictions. All areas are cutting edge. ISE faculty are world class researchers as evidenced by bibliometric statistics. They publish in top journals and are leaders in their technical societies. There is not a single female faculty.

3. **MST** research focuses on Microsystems (MEMS) and Nanoengineering (NEMS) and their applications in the fields of medicine, life sciences, information, and communication technology (ICT), security, transport, biodiversity, and aerospace are cutting edge. Noteworthy are the Young and enthusiastic faculty. Faculty pursue top publication venues like Nature and Science. There is a strong technology commercialization and participations in large collaborators network. There is 1 female faculty member.

4. **RPL** research focuses on robotics, computer vision and ML systems that provide advanced service in industry, for search and rescue operations, in medical applications or as assistants to elderly. Focus areas have important societal impact. The strength of the RPL is that they connect theory and practise; theory feeds practise and practise feeds theory. This cycle pushes the research agenda and projects of the team. RPL has a very refreshing bottom-up strategy for the team, keeping all their staff members and their talents central in their governance. Young and enthusiastic faculty. Good external funding. Focus on Entrepreneurship and industry contacts. Faculty development programs and workshop on supervision of PhD students. Focus on pedagogics. Faculty involved with WASP and Digital Futures. Perhaps DLS and RPL would be all in one group, so that there is better interaction with theory and applied research in autonomous systems, ML, etc. There are two women full professor, and three women associate professors, out of 13 faculty members.

5. **TMH**'s research questions and themes: Speech and Language Technologies, Human Speech and Communication, Conversational Systems, Social Robotics, Voice Science and Technical Vocology, Music Informatics and Auditory Perception. Main research activities: TMH aims at an understanding of how humans communicate through speech, music, and gestures. Rooted in an engineering modelling approach, TMH develops multimodal human-computer interaction systems in which speech, music and gestures are used to create human-like

[6] Within Sweden, DCS might have overtaken the historical leadership in these areas from Lund and Linköping University.

communication. The research is interdisciplinary, and based on data collection, analysis, and generation of human communicative behaviour. Central methods range from speech and language technology, ML, computer animation and robotics, and are combined with knowledge from linguistics, phonetics, cognition, and experimental psychology. *No reported female faculty.*

B.1.2.1.b. Contributions to the advancement of state of the art within the research fields of the department

DCS: In all topics mentioned before, the DCS division succeeded to produce ground-breaking results with many success stories. In particular in NCS, the staff members have been pioneering in defying challenges, addressing new control problems, and starting international forums and conferences promoting the NCS domain. In the area of Intelligent transport systems, the strong links and longstanding collaboration with Swedish truck builder is exceptional at many levels; it educated many PhD students that integrated the companies, it generated an impressive number of results that were transfer in production, and it brought a great deal of visibility for the division and the whole institution. The joint Integrated Transport Research Lab ITRL, and the Smart mobility lab, are excellent initiatives. The CPS security is another example of novel and important topics lead by the DCS, which participated in the foundation of the Centre for Resilient Critical Infrastructures. DCS is the main contributor in Sweden to top conferences in machine learning, e.g., NeurIPS and ICML. This is due to a major research investment in the theory of machine learning and in particular optimization and reinforcement learning.

ISE advances the state of the art in communications, coding and information theory, foundations of machine learning, security, and privacy. The research done in this group is skewed towards theoretical contributions, although meaningful collaborations both with industry, e.g., wireless communications industry and application domains, e.g., life sciences, in particular biology, are being carried out as well.

MST: Both in fundamental and in applied research, MST has succeeded in making significant contributions (see e.g., p.26 of the self-assessment report).

RPL: Contributions range from new theories to changes in practice, across a wide range of application areas determined by the 13 faculty. Specific contributions range from leading academic articles which attract significant numbers of citations, to real-world applications developed in collaboration with academic, clinical and industry partners across healthcare, transport, and robotics. RPL has high quality publications in all of their research domains and a large share (20.4%) in top 10% publications. Next to that the team also believes in other than – classical journals – ways of knowledge distribution. The track record of grants is very strong. They are involved in EU projects as well as national grants and individual grants in EU (ERC (Consolidator and Advanced Grants)).

TMH contributes to advancements in several research areas, including (1) spontaneous conversational speech synthesis, (2) modelling multimodal, multiparty interaction, (3) development of spoken dialogue frameworks, (4) social robotics, e.g., development of the Furhat robot, (5) generative models of human motion, (6) research infrastructures for speech-centric research, (7) development of scientific clinical instrumentation for voice analysis, (8) critical perspectives on the ethics of AI applied to music, and (9) modelling the music perception. TMH is highly visible and heavily engaged in national and international research collaborations within academia, companies, and research environments, including but not limited to top universities (CMU, Columbia) and major players in the US (MS, Amazon, Disney), in Japan (NII, Honda, Toyota), and the who-is-who in the field in Europe (e.g., EPFL, IDIAP, CNRS, INESC-ID, DFKI, IMB, Daimler, many other top universities all over Europe).

B.1.2.1.c. Quality and quantity of contributions to the body of scientific knowledge, engagement in national and international research collaboration within academia and its outcomes

DCS: The research production for the DCS division is impressive in both quality and quantity. DCS is clearly one of the leading groups in control, as indicated by consistently high ranking for: i) KTH in Automation and Control in Shanghai Ranking's Global Ranking of Academic Subjects (2017-2018-2019 ranked 12-15-19), and ii) 6th largest contributor to the leading journals Automatica and IEEE-TAC. The division is strongly involved in WASP and Digital Futures programs (members of the division have leading positions in both programs). Those initiatives are clearly very much welcomed, and clearly, they leverage substantially the quality of the whole research and visibility of the division. Finally, DCS has excellent participation to EU programs including several ERC, VR, and KAW.

ISE: The quality and quantity of contributions from ISE is outstanding. Majority of the division faculty are well-known and recognized leaders in the communications, signal processing and information theory. The group has published 110 journal and 160 conference papers (fractionalized per author) in 2013-2019. Given the theory-oriented nature of the research, this productivity level is high. 20 journal papers published in 2013-2019 have over 100 citations. This number also is excellent, but there could be room for improvement.

The MST division has a successful track record of publications in very highly ranked journals. As an example, since 2018 there are eight publications in journals with an IF of more than 20. This is a deliberate strategy, supported by the overarching KTH vision. The division supports their researchers by inviting e.g., editors from these top-ranked journal to speak for the division members. This is just one element of creating a positive or upward spiral, where international exposure and reputation creates new opportunities for research projects and collaborations and attracts top researchers to their labs. Conversely, faculty members from MST spend research visits or internships in befriended labs e.g., in MIT or Harvard.

RPL has an active and successful publication strategy driven by research enabled by a range of funded national and EU projects. There is a very reasonable interplay between the quality of key publications and the quantity of publications produced, to ensure timely communication of research findings and to satisfy the needs and expectations of all research stakeholders from faculty to PhD students. The Division is actively engaged in the WASP programme, has several significant international collaborations, and is actively engaged with industry and the public sector. RPL's staff is present in many national and international boards and networks (for example they have participated in the European AI network ELLIS to influence the AI agenda in Europe) and has collaborations with many high-profile institutions (MIT, Stanford, Oxford). RPL organised IEEE ICRA, the world's largest robotics conference, in Stockholm 2016.

TMH aim to publish at the most prominent venues in the fields. Traditionally they published in journals of speech technology and music informatics but lately have broadened into multimodal interaction and social robotics, e.g., publications at ICMI (major outlet in multimodal interaction) has gone from 0 to 14 in the last 10 years, and publications in robotic conferences (HRI, ICRA, IROS, ICSR and Ro-MAN) have increased from 5 to 20. Since 2012 TMH published over 400 papers, including most prestigious Journals and conferences in their field, several paper awards, and nominations, and with a journal-to-conference paper ratio of 1:2, some of which receiving very high citation numbers.

B.1.2.1.d. Follow-up from previous evaluations

DCS adapted to new venues in optimization and learning, strengthened their impact and engagement with industry and society since the previous RAE. The "espirit de corps" mentioned in the previous RAE evaluation has been preserved and strengthened.

MST: As a follow up from the previous evaluation, MST has reinforced its focus on the nanoscale phenomena, which has resulted in an excellent scientific output. Collaboration with industry is intensive, and the division can even be selective in which collaborations are a priority.

RPL has been active in following up on previous evaluations, with a critical faculty hire to assist in research integration and with engagement in the WASP programme to provide funding stability for core research activities. Challenges related to the slow KTH hiring process have not been fully resolved, but there has been real success in encouraging cross-divisional research using Small Visionary Projects. The previous evaluation was before the merger of three groups, and the merger has been a success, because it made the groups work together on projects instead of competing. As a result, the WASP project is now a major funding source for RPL because within KTH they fit right in the middle or both Autonomous Systems and AI, i.e., two of the biggest areas in WASP.

TMH got three main suggestions from RAE 2012, which they all addressed i.e. (1) to encourage a climate of intellectual integration of the different groups: TMH increased collaboration with RPL and is in the process of building the KTH Interaction and Robotics Lab, (2) to handle the risk of discouraging long-term and high-risk initiatives resulting from the dependency on external funding: THM widened their base of funding agencies and increased the number of projects with longer duration (4-5 years), and (3) to work on the issue that hiring new faculty takes too long: TMH employed four very good postdocs who were encouraged to apply to faculty positions, two of them applied, one got in, the other successfully applied for project funding.

B.1.2.2. Viability and research environment

B.1.2.2.a. Internal and external funding; current status and strategies for the future

IS increased its research income in 2020 significantly compared to 2012 and 2016. Their funding comprises mainly governmental and research grants (including national, EU, private and state foundations, prestigious grants such as three ERC Advanced Grants, 3 Consolidator Grants, and 2 Starting Grants). In total, IS has a revenue of over 307MSEK for 2020, with 5 divisions corresponding to 60MSEK on average.

DCS has a large and well balanced research portfolio, with many external highly competitive grants from ERC, KAW, VR, SSF, Vinnova, WASP,....

ISE is well funded with over 45+ MSEK per year, a significant part (25M) comes from external funding. As the division's research scope provides key ingredients for WASP and Digital Futures, it is also well funded by these initiatives. The group also has a self-imposed culture of going after-highly competitive funding.

MST: Most of the research in MST occurs within large European consortia or through national framework grants involving both academic and industrial partners. The division is or has been active in 16 EU projects and three Marie Curie-Sklodowska ITN networks. There is collaboration with over 50 academic institutes and research-intensive companies.

RPL secures base funding, other government funding and national and European research and innovation grants across a wide front. There is a significant contribution from the WASP programme. Future strategies for funding seek to encourage diversity of sources to complement medium-term stability afforded by WASP. We advise the team to see 'strategy' more as 'what is needed for something that we wish to do in the future' instead of 'something that is imposed on the team top down'. Because the research at RPL is largely funded by external grants attention should be paid to continuation on the longer term. They are supportive for faculty to apply for funding and do their best to co-fund projects that faculty obtains.

TMH's budget is 45MSEK for 2021. The goal for the future is (1) to obtain sustainable growth of external research grants and (2) to secure an increasing fraction of the internal base funding available at EECS and KTH. Due to the growing interest in THM's research topics, there is a reasonable hope to increased funding opportunities. However, the IS/THM team have a (justified) concern that widespread, high overhead, lack of gender balance in the IS faculty, and lack of influence on funding agencies' research agenda may reduce impact and/or competitiveness. TMH/IS strategies for the future: encourage, support, set clear expectations and incentivize the individual researchers to (i) excel in the KPIs set by EECS and KTH for distributing the internal research funding; and (ii) obtain sustained success in acquiring external research funding. Important components of this strategy are: when hiring evaluate track-record and experience in grant writing, and ability to adapt to changing needs; diversify funding sources and research areas; mutual support, and secure prestigious research grants.

B.1.2.2.b. Academic culture

The academic culture in all divisions is excellent, collaborative and simultaneously one that values individual faculty's scholarly strengths. The spread of related disciplines, coupled with a bottom-up research strategy, leads to a healthy academic culture. The common desire to deliver excellent research and impact to practice is evident within a flat management structure. There is a common perspective to go for excellent research with international impact: be visible, take responsibility, and provide academic service to research community, collaborative, dynamic, open and welcoming research environment with an active exchange of ideas and continued renewal.

B.1.2.2.c. Current faculty situation and composition of the research team(s)

Even though some PIs mentor a lot of PhD students, all advisors seem to manage their team in an excellent manner, with healthy compositions in terms of PhD, postdocs, professors, etc. Main issue here is diversity and gender, to which we have commented extensively elsewhere in this report.

B.1.2.2.d. Recruitment strategies

Overall, IS has only 10% female faculty. A central plan of action was formulated with 20 specific recommendations for improvement. IS activity plan adopted four and was able to grow the ratio of women from 10 to 20% but so far on the level of postdoc and PhD students. The Department is well aware of the poor gender balance and considers this a main weakness.

There was a general complaint about the long duration of the recruitment process, which we elaborate on extensively in Part A of this report.

B.1.2.2.e. Infrastructure and facilities

DCS: The Smart Mobility Lab is an important part of the strategy in both teaching and research. It bridges fundamental theoretical research to applications in collaborative robotics, transport, and autonomous vehicles.

RPL is well served by a robots lab, a drone lab, a social robots lab and an in-house GPU server. There is a need to ensure continuity of support for these facilities, funded by external research projects.

MST is the largest academic group in micro and nanosystems in Sweden, relying heavily on state of the art equipment to support the research. There is a combination of shared facilities and division-owned equipment, with the equal challenge to guarantee maintenance and regular upgrading of the equipment. Although internal and external users pay fees for usage, both maintenance and upgrades remain a constant challenge.

TMH is in the middle of building up the Interaction and Robotics Labs (IRL) – the lab will serve as hub for integration and exploitation, where research results from different projects can be combined, matured and maintained as showcases used for demos, education and user studies.

B.1.2.3. Strategies and organisation

B.1.2.3.a. Goals for development 5–10 years ahead

The Department has formulated four ambitious goals:

1. Internationally leading research
2. Impactful interaction with industry and society
3. Breath through engagement
4. Gender balance over the next 10 years

All divisions comply with these objectives.

B.1.2.3.b. Congruence with university-level goals

It is the panel's impression that the plans and intentions of all divisions in the department of Intelligent Systems comply with the KTH's set central goals. However, there seems to be a general challenge within KTH to bridge the gap between top-down plans (diversity, etc…) and bottom-up possibilities. We refer to our general recommendations above for more elaboration.

B.1.2.3.c. Leadership structure and collegial structure

DCS: The division has some strong and visionary leaders, who have high impact in their division, inside and outside KTH.

ISE houses leaders in communications, signal processing and information theory. The group is highly collaborative which suggests a collegial culture.

RPL's leadership is characterised by a light-touch approach, more enabling than controlling. This reflects the bottom-up approach to research strategy and is effective within the context of a positive and collegial research and teaching culture. Within this flat structure it is hard to identify the Division's vision for the future, beyond that being the result of the good work of the individual players. Very positive is the way that they implemented a tight feedback loop between the PhD's and the management and that each PhD student is assigned two mentors among faculty and postdocs. The mentors are not supervisors but provide an outside perspective. A statement in the report is 'We aim for the highest impact venues, but always keep the doctoral student in mind'.

In **TMH**, there is typical consensus among faculty, with regular meetings, very open, transparent and welcoming environment, bottom-up, early-career feel very comfortable, very positive feedback on support and advice

Despite the broadness of scope within **MST**, both in terms of focus on fundamental and applied research, and in terms of the topics themselves, the division manages to realize a coherent and forward-looking leadership. This is facilitated by weekly division member meetings that stimulate interaction and internal collaboration.

B.1.2.3.d. Strategies for achieving high quality

DCS's strategy for achieving high quality in research relies on the excellence of its staff and the quality of the PhD and post-doc recruitment. Excellence is also leveraged by the recruitment of staff members at international level and participation to many international projects. The whole staff has great vision for leading scientific topics and treating important applications domains. Besides, post-docs students benefit of a great deal of freedom to treat/select research topics. This policy is well aligned with the whole department bottom--up strategy and contributed greatly to the high-quality of their results. Finally, the internal communication, the good relation between staff and student, and the quality working conditions also contribute considerably to improve the research outputs of the division.

ISE's members value foundational research excellence above all. Retaining this culture of high standards and focusing on information systems from foundational approaches will already go a long way towards achieving excellence. The group could also seek inclusive excellence at the faculty level with respect to gender diversity.

RPL's culture naturally leads to the achievement of research quality, both in terms of the excellence in research and the recruitment of the best PhD candidates. There is also a balanced view of the value of independence in research alongside the benefit of external service in academic and agenda-setting roles. Success is also measured and driven by monitoring funding successes and impact achieved. RPL has implemented a few processes to monitor quality that align with their bottom-up strategy.

TMH nurtures its early-career people to strive for excellence, but there is no general research vision across the group. Very focussed on a bottom-up research approach. No concerns regarding coherence, this is expected to happen by encouraging cooperation among PhDs and Postdocs. Focus on very open, welcoming, and family-like research environment with regular meetings for exchange.

Because of its international standard, **MST** can be selective in engaging in projects and collaborations and hence go for the highest quality opportunities. Their international standard is supported by a strategy to publish in high impact journals. The division supports its researchers by inviting e.g., editors from these top-ranked journal to speak for the division members. This is just one element of creating a positive or upward spiral, where international exposure and reputation creates new opportunities for research projects and collaborations and attracts top researchers to their labs.

B.1.2.4. Interaction between research and teaching

There seems to be no problem at all with this interaction within the department, on the contrary. Teaching is dominated by master level courses, which match well to the research interests of faculty. While some of these courses are very large, requiring creative approaches to examination and evaluation, they reflect topics of particular interest and/or importance in the field which are synergistic with current research projects. There is potential to engage in more bachelor level teaching to expose students earlier in their studies to the increasingly important subjects that are at the core of the Division's research. There is also potential to work with industry partners in the educational process. The courses offered to PhD students (60 ECTS) seem well organized and announcement (central KTH website), with 15 credits reserved for mandatory courses and the others to be chosen at will.

B.1.2.5. Impact and engagement in society

B.1.2.5.a. Relevance, scale, and impact of the department's current engagement with society and industry

All the divisions deliver significant impact across a wide range of application areas through their collaboration partners. In addition, they have a strong track-record of commercial spin-offs and of the delivery of trained researchers and graduates into industry and society. Because of the strong connection between theory and practise, there are many industrial partnerships as with scientific

institutions. This makes it possible to participate in as well industrial projects as national and international (EU) research programs.

B.1.2.5.b. Research dissemination beyond academia

Considering the 'hot' topics of research in this Department (Communication, Security, Intelligence, AI, Control, etc…), there are many opportunities. However, there is likely a need to provide increased support to faculty and students to exploit a wider range of communication and outreach channels and to monitor the effectiveness of their use. Also, professors are limited to 168 hours in a week (without sleeping).

B.1.2.5.c. Relation to sustainability and the UN's Sustainable Development Goals

Considering the research fields of this Department, there is a huge correlation with the SDGs.

There is also relevance to industry, innovation, and infrastructure. Amongst other contributions, an important and visible contributions is the publication "The role of AI in achieving the Sustainable Development Goals", Nature Communications 11, 233 (2020), co-authored by faculty from RPL, showing the positive and negative impact of AI on the various SDGs. Although it is published very recently it is already cited over 300 times in Google Scholar.

B.1.2.5.d. Plans and structure for increased impact

All divisions subscribe to the aspiration of the wider Department to develop approaches to impact and the measurement of impact. A comprehensive strategy and plan for increasing impact is described. However, it is important that efforts in this area are aligned across all levels of the Division, Department and School, and are embedded in a new academic culture that drives and rewards impact alongside the more traditional research and teaching expectations and measures. Promotion systems should encourage, but not demand impact, reflecting the fact that the best impact often arises from the most unexpected of places and that different people have different skills and aspirations to deliver practical change. All research should be undertaken with the potential for impact in mind, but those who deliver the impact may not be the same as those who drive the research.

B.1.2.6. Recommendations to strengthen department and future potential

Generally speaking:

- The faculty of all divisions is extremely strong. As such, they should be able to attract top faculty candidates in Europe and beyond. Retirement replacements and new faculty openings commensurate with the current high level of intellectual strength is necessary to keep the standards of world-leading research in the foundations of the digital future.

- The diversity, evident in the multiple research groups within the Department, could lead to greater strength if faculty spent more time discussing their individual aspirations and ideas. A more coherent Departmental strategy need not constrain creativity ad individualism in research, rather lead to increased coordination and synergy across the Department, leading to further opportunities for collaboration.

- The current faculty profile affords few opportunities for change in the medium-term, making it more difficult to follow external trends and research needs to retain a world-leading profile. The fixed faculty pool also limits the benefits of refreshing the leadership from time to time, particularly with such a flat organisational structure.

B.1.2.7. Final remarks

The Department faculty gender diversity is poor at present. Given the excellent reputation of the group, it should be possible to attract top faculty candidates who are female in the future.

Research, teaching and impact are all dynamic and well aligned to industry and societal needs. Research funding is excellent, dependent on a range of large and small projects. The future agility of the Department's divisions is critically dependent on the character and interests of the current faculty and serious thought should be given to a more unified departmental strategy that not only preserves its current diversity and strength, but also provides a more powerful case, and hence resilience, for the future in the form of the flexibility afforded by new hires, strategic alliances and appropriate University support. There are a couple of challenges for the future. 1. Due to the lack of retirement there will be less opportunities for renewal of the research agenda and respond to future (research funding) opportunities. 2. There is a risk that all researchers follow their own agenda, and the coherence of the divisions (and their common aims) and the Department will get lost out of sight. 3. Some of the administrative tasks could become a burden of the time that the staff can spend on research and education. Proper appraisal of necessary administration is needed. 4. Because of the strong dependency of external funding, a long-term plan for the follow up of projects and the connected strategy should be made.

Part B.2. Report on the Department of Medical Technology and Health (MTH)

The panel has appreciated very much the careful preparation of the self-assessment report of the department of Medical Technology and Health, which was extremely informative and sufficiently detailed to have a realistic view of the status of the department. We would like to thank all members of the department who contributed to this thoroughly.

MTH has about 110 employees spread over 7 divisions, which were presented to the panel in 3 clusters (Biomedical imaging and simulation, Sustainable Work Life, Digitalisation of Health and Care). The annual turnover is about 85 MSEK. The department has a (recent) history of mergers and reorganizations, which are still quite noticeable as of today. Important feature is also its location, which is on the Campus Flemingsberg.

B.2.1. Major findings on Medical Technology and Health (MTH)

B.2.1.1. Strengths and weaknesses of the department

The Department of Biomedical Engineering and Health Systems (MTH) has emerged from the former School for Technology and Health (STH) and, under strong leadership, is transforming into a coherent and integrated academic community. Its location in a brand-new building at KTH Flemingsberg affords adjacency to the Karolinska Huddinge hospital and Karolinska Institute campus Flemingsberg. However, is also creates distance between STH and Karolinska Institute Department of Medicine, Solna, Karolinska University Hospital and KTH Campus. The division of Environmental Physiology remains at KTH Solna. The Department of eight divisions, each of smaller scale (as e.g., compared to the Department of Intelligent Systems), has restructured with the formation of three research themes: Biomedical imaging and simulation, Sustainable work life and Digitalisation in health and care. This represents a significant and positive change, bringing clarity and critical mass to a more focussed and societally relevant set of research goals. There is further progress to be made in this necessary consolidation.

There have been several recent high-quality recruits in response to reorganisation and retirements. However, further appointments will be required to improve critical mass in the chosen areas of work, improve the gender balance, facilitate a better match between teaching and research, and enable moves towards a more stable funding structure.

MTH is clearly in transition, making extraordinary progress from a difficult past, being confronted by challenges on integration of teaching and research, the necessity of cultural changes here and there, a merging exercise towards larger research groups (from 14 to 7), decluttering overlap with other research entities in KTH, financial challenges, etc. In particular, the most significant challenges to overcome include a real mismatch between teaching demands and research interests, high rental and other fixed costs, and a lack of succession planning and leadership development.

B.2.1.2. Relevant and forward-looking objectives

The overarching goal is to ‘normalise’ MTH from a splintered separate school on a decentral campus to a high-quality, integrated, and well-connected department within KTH and the wider KI and KH community. The work on the themes (and restructuring of the educational programs) opens for better integration, and the aim to get sufficient critical mass to create stable research environments is important and appropriate. An increase of external funding of 30% in the shorter term and potentially 50% in the long run is deemed possible and would further build a credible and productive academic environment.

The focus on medical technologies and the link to technologies for health care have an obvious impact on engagement in society. Good use is being made of these opportunities and the development of a

translational research hub is being supported centrally. The alignment of research objectives with medium-term heath care needs and trends will continue to strengthen immediate pathways to impact, while the development of a visionary long-term research strategy will lead to greater academic credibility and contribution to future, and potentially more radical, health care directions.

B.2.1.3. International community engagement

The department has a broad portfolio of international collaborations distributed across all its divisions, with most of these links within Europe. There is active engagement within specific international academic communities and a lead presence with an emerging Health Systems Design community. The level of engagement is commensurate with the current scale of the department and significantly greater that many comparable academic research units. This is coupled with a unique local focus on health care which is already strong, and essential given the different national approaches to health care and the particular desire to support the development of excellence in Swedish health care.

B.2.1.4. Future potential of the department

Significant efforts are being made by the department chair, Dr. Sebastiaan Meijer, to restructure the department and to create synergy within the three 'clustered' research themes. Much progress has been made, but central support will be critical if the real benefit of this visionary leadership is to be fulfilled. Particular efforts should be made to support the longer-term leadership of this department to ensure it can continue on its upwards trajectory, fulfil its real potential and complete effectively on the national and international stage. There is unique capability here and a forward-looking, whole systems perspective that could ensure real leadership in Biomedical Engineering and Health Systems. The department has real potential for the future, not only to deliver world-leading research, but also as exemplar for delivering meaning impact in health technology and care.

B.2.1.5. Recommendations

Previous evaluations focused on the development of a long-term strategy, appointments, research links to clinical practice and maintaining focus on priority areas. In the past decade there has been significant upheaval in transforming the previous groups into MTH, and in the installation of most of this team in new premises at Flemingsburg adjacent to KI and KH. Three strategic appointments were made that have had a positive impact on STH, with one moving quickly to become the Head of Department. Significant consolidation of research groups has led to the formation of three key research themes and seven Divisions (soon to be consolidated further). Excellent progress has been made, but there is further work to be done to build on the clear benefits of a more integrated Department with its potential for greater collaboration with KI and KH, set against the sense of isolation from the rest of KTH with its position on the Southern Campus. Further clarity on how the aspirations of the long-term strategy might be realised is needed to ensure the future success of this emerging Department.

The presence of the MTH department at KTH's Campus Flemingsberg presents opportunities and also challenges. A strategic review of its location, in the context of current and future teaching, research and impact demands, needs and costs, should be undertaken with reference to its unique importance and position in the wider KTH bioengineering and health care landscape. Such a review should lead to insights and decisions that actively lead to central support to mitigate current challenges. The research within the department is recognised internationally, however, more efforts will be needed to raise the recognition to the top levels needed to make the research groups essential partners in local and international collaboration. This position needs to be reinforced by future staff hiring and by creating a KTH wide platform for biomedical engineering, allowing MTH to raise research output and hence make then an essential partner for research collaborations within KTH, Karolinska Institute, Karolinska hospital, and beyond.

There is a need for a clear long-term strategy for MTH that builds on the excellent progress made so far in restructuring and refocussing the department. This should help to combine the powerful bottom-up

approach to research development with the support required to nurture the development of a world-leading critical mass of researchers who have a clear view of what that can and cannot do. Such a strategy should not only be adopted by the department, but also serve as a clear commitment from the centre to support the ongoing development of MTH faculty and infrastructure, including a specific commitment to support the current leadership and develop future leadership in this important area.

In addition, we recommend:

- To maintain and consolidate the empathic leadership despite the complicated situation, both in space (location) as in time (merging and reorganizations).
- The implementation for actions w.r.t. continuity in and additional support for the leadership.
- The implement a long-term plan to grow towards research excellence.
- Invest in internal cohesion, extra departmental collaboration, and complementarity with external partners (e.g., Karolinska).
- To find solutions to cope with the excessive teaching load.
- To analyse the lack of critical mass of some divisions and improve their interaction with related and relevant KTH research entities (e.g., structural biology).

B.2.2. Specific issues on the department of Biomedical Engineering and Health Systems

The panel has opted to use this section to provide feedback based on the interactions/interviews with the individual divisions. Not all topics were treated in all sessions, nor were the questions the same. This explains why for some divisions for some issues, no comments are given. The comments provided here basically contain information or clarification in addition to the self-assessment report, based on the notes of the individual panel members. In addition, we do not repeat the more general recommendations that we make elsewhere in this report, and which are basically common to both departments and their divisions that were assessed by this panel. We have grouped our specific comments according to the 3 clusters as they were presented to the panel: Biomedical Imaging and Simulation (BIS), Sustainable Work Life (SWL) and Digitalisation of Health and Care (DHS).

B.2.2.1. Research profile and quality

B.2.2.1.a. Central research questions and themes, and main research activities

BIS: Within the theme Biomedical Imaging and Simulation, three divisions and one centre provide contributions: Biomedical Imaging, Neuronics Engineering, Structural Biotechnology and the Jonasson centre for biomedical imaging. The research focuses on image processing (a.o. using AI techniques), development and validation of biomechanical models of head and heart, and the study of biological structures and their functions at molecular and cellular level.

SWL covers a broad area of ergonomics and has unique facilities. Their main research questions focus on how to keep workers safe under repeated stress, and under extreme circumstances. In the ergonomics society they play an important role and are very visible.

DHS: Digitalisation of health and care consists of two divisions which will soon be merged: Health informatics and logistics, and Technology in Health Care. At present, the scope and the research flavour of these two groups are different. One is concerned with transformation of society with digitalization and is in the humanities (sociology) area. The other is concerned with data-driven health

care and technologies and systems that facilitates it, e.g., communication of medical devices and embedded systems. Overall, this combines expertise in modelling, simulation, and logistics with a sociological perspective to address questions on how to integrate IoT sensors for health in preventative and chronic health settings, what it means to age, and the role of technology and the need to organize to deliver meaningful care, with a particular interest in the development of home care.

B.2.2.1.b. Contributions to advancement of state of art within the research fields of the department

BIS: Significant contributions have been made to new image segmentation models, non-invasive intravascular pressure estimates in large arteries, computational modelling of human head and brain response to mechanical impacts and the link to injury. In all these fields, international recognition is enjoyed.

SWL has made important contributions to the field of ergonomics. One example is, RAMP (Risk Assessment and Management tool for manual handling), which has been developed in collaboration with two large Swedish companies and is worldwide used in 89 countries. Another example is research and 40 publications connected to ergonomics in the extreme circumstances and of future travels to the Moon and Mars.

DHS: Technology in Health Care is concerned with interdisciplinary problems on the interaction of technology and humanities. Digitalization and its impact on population at large is the focus area, for example in social changes in aging demographics due to digitization. Health informatics and logistics is concerned with interdisciplinary problems facilitating data and technology driven health care. Technologies such as internet of medical devices, signal acquisition, embedded systems, and low-power area networking are investigated, and the group members' research is driven to be the integrator of these technologies and in general data driven health care systems.

There has been success in laying the groundwork for introducing Advanced Adaptive Systems through understanding users' needs, and in the use of mixed models to explore the design of systems of care. The integration of research expertise from social science, engineering science and health and care has been critical to this success, combined with a broad systems perspective supported by the provision of makerspace, network and software labs. The application of this combines expertise to the challenges of moving care from the hospital to the home and to mental health shows awareness of important topical themes in health and care.

B.2.2.1.c. Quality and quantity of contributions to the body of scientific knowledge, engagement in national and international research collaboration within academia and its outcomes

BIS: A continuous and high-level scientific output remains a point of attention. The international recognition of this research theme needs to be translated in more high-level journal publications. Younger faculty is finding these paths.

SWL: In the field of ergonomics, they work in collaboration with international and national academic partners. Also, projects with renowned hospitals are conducted for example with KI, Mayo Clinic, Minnesota, and Cambridge University Hospitals assessing and improving the static workload of surgeons.

DHS: The engagement in national and international research collaboration is appropriate for a division of this size and maturity. Existing collaborations, based on historical interest, are being maintained alongside the development of new international networks in health systems design and local partners for applied and translational research.

B.2.2.1.d. Follow-up from previous evaluations

A follow-up from previous evaluations is difficult to make, because of the re-organisations that have taken place since. Significant efforts have been made to reinforce the quality of the researchers and to focus the research. Nevertheless, the panel recognizes the challenges induced by the previous evaluations, which were followed by a financial reorganization, during which about 15 people were forced to leave and another 5 chose to leave. After this period the new division hired new talented staff members.

B.2.2.2. Viability and research environment

B.2.2.2.a. Internal and external funding; current status and strategies for the future

BIS: The international recognition of the theme Biomedical Imaging and Simulation is translating into a general upwards trend in external research funding from various sources.

SWL: The panel has noticed that the funding per faculty member in research went up and feels that the early career staff members have the potential to grow the total amount of external funding.

DHS: External funding for this theme is rather limited but increasing, but there is start-up funding from Region Stockholm to support an increasing number of projects.

B.2.2.2.b. Academic culture

An integrated academic community is being shaped since moving into one building at the Flemingsberg campus. This work is however still ongoing, the department is clearly still in a transition mode. Nevertheless, the academic culture is in good shape. The broad spread of disciplines, coupled with a common desire to improve health and care for the public through excellence in research, has led to an environment of mutual respect, collaboration, and a desire to do things that matter.

B.2.2.2.c. Current faculty situation and composition of the research team(s)

MTH faculty is undergoing a massive generational shift. With 30% females the gender balance is acceptable for an engineering group, although in biomedical engineering this percentage merits to be higher.

SWL consists of two groups which differ in size and build -up concerning professors and associate professors. If the groups are really integrated in the theme this would also increase their critical mass. It was clearly visible that the move into one building, and the subsequent organizational changes, resulted in a division with more integrated academic community. Half of this theme however is still located on Campus Solna due to the research infrastructure.

DHS: The faculty team delivering teaching and research in this theme is relatively new and small, with addition of adjuncts to cope with the teaching volume. There is a good spread of expertise and experience, but there is not (yet) a critical mass, particularly since one of the senior academics is also Head of Department.

B.2.2.2.d. Recruitment strategies

Recruitment has been very effective with the appointment of professors in Biomedical Image Processing, Technology in Healthcare and Health Care Logistics, who are leaders in their respective fields and capable of driving real change. The effect of these appointments is positive and clearly visible on the recent research developments. The digitalization of health and care division plans to have its next three hires at the associate professor level in informatics, system integration, and health system engineering (sensors, informatics). This is a reasonable plan as the mid-level faculty can help further energize the research portfolio.

B.2.2.2.e. Infrastructure and facilities

The facilities on the new Flemingsberg campus are excellent in terms of their space provision and adjacency to KI and KH. However, their location on the Southern Campus makes integration with other KTH, KI and KH activities on the Central and Northern Campuses difficult. High rental charges are also a barrier to sustainable research success. Digitisation of health and care is an integrating activity with many opportunities for further collaboration across all Schools within KTH. The questions of the best location for MTH to maximise this potential should be actively addressed. The presence of the MTH department at the Flemingsberg campus presents opportunities but also challenges. Opportunities come from the physical neighbourhood of Karolinska hospital. Challenges are related to the location remote from the centre of Stockholm. If KTH leadership decides that the location of MTH must remain in Flemingsberg, then extra support for teaching and research is needed.

Equipment for structural biotechnology should contribute to provide data for multi-scale biomechanical modelling of different organs. In this respect, more links with Prof. Christian Gasser should be established, or more general with other Life Science activities and opportunities within KTH, but also outside KTH in Sweden, as there are many new developments and hence opportunities going on.

There are unique facilities to study ergonomics in extreme circumstances. The Environmental Physiology labs has centrifuge (up to 10 G), hyper- and hypobaric pressure chambers as well as a climatic chamber, all designed for experiments in humans.

B.2.2.3. Strategies and organisation

B.2.2.3.a. Goals for development 5–10 years ahead

The overarching goal is to ‘normalise’ MTH from a splintered separate school on a decentral campus to a high-quality, integrated, and well-connected department within KTH. The work on the themes (and restructuring of the educational programs) opens for better integration, and the aim is to get sufficient critical mass to create stable research environments. An increase of external funding of 30% in the shorter term and potentially 50% in the long run is deemed possible and would further build an academic environment.

There are immediate plans to combine the Divisions of Technology in Health Care and Health Informatics and Logistics to further consolidate the Digitisation in Health and Care theme. This would encourage and facilitate greater integration across systems of care from people and their needs to technology and its potential for transforming health and care. There is a desire to appoint further expertise in informatics.

B.2.2.3.b. Congruence with university-level goals

The aspirations of the Digitisation of Health and Care theme is to have synergies across all Schools within KTH. There is significant potential for increasing levels of collaboration across KTH and with the wider health, care and medtech communities. There is also an excellent match to university-level goals.

Output in peer reviewed publications seems to be aligned with the university level goals, although there is on average a relatively high teaching load for the staff members.

B.2.2.3.c. Leadership structure and collegial structure

Significant efforts are being made by the department chair Sebastiaan Meijer to restructure the department and to create synergy within the three research themes.

The leadership of the digitisation in health care theme is excellent. There is real vision here and the ability to see the potential for and enter new areas of interdisciplinary research that have real significance for society.

In **SWL**, the leadership of the division of Ergonomics has successfully worked towards a cohesion of the entire division. The next step will be a strategic focus on being part of bigger projects in KTH (for example digital society).

B.2.2.3.d. Strategies for achieving high quality

The provision of appropriate laboratory facilities and good guidance, often by example, to research across disciplinary and maturity boundaries is very good. There are many excellent examples of excellence in teaching, basic research, and translational research within this theme. A strategy for maximising the potential for collaboration at Flemingsburg and across the wider KTH campus would be useful, leading to more synergy (e.g., by continuing the merging of the divisions within each theme or cluster) combined with putting more focus in the research themes, which will automatically also increase the standards of research and the associated research output.

In **BIS** strategies to increase the quality of research are in place and will be implemented gradually. It is recognised that progress needs to be made here to position all research lines within MTH in the international top.

In SWL the culture is focussed on high quality of scientific output.

B.2.2.4. Interaction between research and teaching

The courses offered to PhD students (60 ECTS) seem well organized and announcement (central KTH website), with 15 credits reserved for mandatory courses and the others to be chosen at will.

The department is located in the southern suburbs of Stockholm and has a high teaching load with undergraduate students in data science. MTH carries responsibility for a significant amount of preparatory and bachelor level teaching. This is combined a healthy and varied curriculum of master level teaching and PhD training. The preparatory and bachelor teaching appears to impose a disproportionate challenge to this Department.

MTH has a unique position in that they teach on 4 levels: preparatory year, BSc, MSc and PhD. With around 1200 students, divided over 11 programs, the integration between research and teaching is important, but also challenging. The preparatory year offers opportunities to attract more students (and also female students) to an academic education and merits more support from KTH management. The transition that is made towards project-based learning at master level is appreciated by students and teachers and is a valuable tool to increase the synergy between research and teaching.

SWL also carries a high teaching load for the staff members is also related to their location and the willingness of other KTH staff to come to the ‘southern’ part of Stockholm.

B.2.2.5. Impact and engagement in society

B.2.2.5.a. Relevance, scale, and impact of the department’s current engagement with society and industry

The focus on medical technologies and the link to technologies for healthcare have an obvious impact on engagement in society. Good use is being made of these opportunities. The focus of the digitisation in healthcare theme naturally responds to current challenges to health care systems and the social world. The work of this theme aligns well to this challenge, with appropriate partnerships and networks to ensure relevance of the work, encourage innovation in research and facilitate pathways to impact.

The research staff has a large network in as well industry as scientific community and are well known in the field of ergonomics.

B.2.2.5.b. Research dissemination beyond academia

BIS: Neuronic engineering have a long tradition of working together with industrial partners such as Autoliv AB, Volvo CC, Saab Automobile and Scania on automotive safety. The computational head and neck models developed at Neuronic engineering are currently being used at those companies for development of innovative safety devices such as new airbag systems. The division is also involved in national and European actions such as being committee member of COST Action TU1101, towards safer bicycling through optimization of bicycle helmets and usage, member of FIS working group for alpine helmets 2011-2013, and convenor for CEN/TC 158 Working Group 11 - Shock absorption including measuring rotational kinematics.

For SWL a good example is the RAMP tool that is used in many countries and industries.

As for DHS, the faculty with the digitisation in health care theme are active in local, regional, national and European advisory boards, influencing future research directions and being informed of future research trends.

B.2.2.5.c. Relation to sustainability and the UNs' Sustainable Development Goals

The relation of the research themes and activities of MTH with respect to the SDGs, are obvious.

B.2.2.5.d. Plans and structure for increased impact

SWL: This could be done in a more strategic way with both divisions. Leading questions are 'Where do we want to be in 10 years from now?', 'What do we wish to be?', 'Who are our peers?', and 'Why are we unique in the world?'

DHS: Increased impact from the digitisation in health care theme will come through expansion and increased collaboration with the wider KTH, KI, KH and other local and regional care providers. The systems approach to health and care being adopted within this theme will likely accelerate this process and increase the potential for meaningful impact.

B.2.2.6. Recommendations to strengthen department and future potential

Although the research within the department is recognised internationally, more efforts will be needed to raise the recognition to the top levels needed to make the research groups essential partners in local and international collaboration.

This position needs to be reinforced by future staff hiring and by creating a KTH wide platform for biomedical engineering, allowing MTH to raise research output and hence make then an essential partner for research collaborations within KTH, within Karolinska Institute and hospital, and beyond. To increase their top-level research grants such as ERC and raise the level of IF of journal publications.

The department is in the southern suburbs of Stockholm and is not on the main campus. It appears the location could be a roadblock for establishing collaborations with faculty in the main campus. The department also has a high teaching load with growing number of students. An analysis of synergies between courses taught and the faculty composition could lead to moving certain course assignments to other departments or identifying 'evidence-based' the need for hiring additional faculty, with appropriate adequate funding.

The digitisation in health care theme shows real potential through its interdisciplinary, systems-led approach, focus on real-world challenges, capacity for technological innovation, and connectivity with

local and regional health and care providers. There is a need to consolidate this position through: the focused recruitment of new faculty in informatics; the rationalisation of the contribution to teaching, particularly at preparatory and bachelor levels; and the levelling of rent and overheads paid for the Flemingsburg campus. In addition, there is a critical need to address both the benefits and challenges imposed by the Flemingsburg campus to maximise the potential of this timely and important theme.

As the division of Structural Biotechnology is relatively small, more focus and synergy within the theme Biomedical Imaging and Simulation should be considered. A recommendation would be to focus on multi-scale modelling of organ systems (perhaps starting with the brain for which considerable expertise is already available). Here, imaging expertise, head and neck modelling and input from structural characterisation can be combined. Collaboration with Prof. Christian Gasser should be considered in this respect.

B.2.2.7. Final remarks

The current leadership of the Department is inspired and inspirational. Future leaders need to be identified and developed if this Department is to continue its current trajectory. There are still lessons to be learned from the past, but the current state and direction of travel of this Department testifies to visionary thinking that is not only aligned with the goals of KTH, but with those of the wider society. KTH should be very proud of the progress made so far and support all efforts to develop this Department further, with focus on developing a resilient world-leading presence in Biomedical and Health Systems.

Appendix: Agenda and survey of interviews

Who's who:
Panel chair: Bart de Moor, KU Leuven
Panel coordinator: Wouter van der Wijngaart, also deputy head for the IS division MST
Panel vice coordinators: Mikael Skoglund, Dept. head IS; Sebastiaan Meijer, Dept. head MTH

Monday 14h00-15h00: The two departments
KTH staff present: Mikael, Sebastiaan, Wouter
topic: Introduction to the Departments IS and MTH

- Wouter gives a 5 min presentation to situate IS and MTH, geographically and in the KTH organisation
- Mikael and Sebastiaan each present a 10 min introduction to their respective Departments. This should prepare for the meeting with the division heads in the following meeting slots.
- Mikael presents in 10 min the university funding landscape in Sweden/at KTH.
- 20 min Q&A

Monday 15h30-18h00: MTH Divisions
KTH staff present: Sebastiaan, MTH Division Heads, Wouter
topic: Meeting MTH Division heads

- 30 min: Six division heads present their Division in 5 minutes.
- 1 h: Split in Meetings between 1-2 experts and one specific MTH Division.
- 1 h: Joined Q&A with all experts and MTH Division heads

Tuesday 10-12h00: IS Divisions 1
KTH staff present: Mikael, IS Division Heads, Wouter
topic: Meeting IS Division heads (Mikael Johansson for DCS)

- 30 min: Each division head present their Division in 5 minutes.
- 1.5 h: Split in five Meetings between 2 experts and a specific IS Division.

Tuesday 13-14h00: IS Divisions 2
KTH staff present: Mikael, IS Division Heads, Wouter
topic: Meeting IS Division heads (Bo Wahlberg for DCS)

- 1 h: Joined Q&A with all experts and all IS Division heads.

Tuesday 14-15h00: Young researchers
who: Wouter, five young senior researchers (tenure track and non-tenure track):

Gustav Henter (Assist Prof Speech Music and Hearing);
Erica Zeglio (senior researcher Micro and Nanosystems)
Yvonne Sturz (Assist Prof Decision and Control Systems)
Xiaogai Li (Assist Prof Neuronic Engineering), invited
Adam Darwich (Assist Prof Health Informatics and Logistics)

topic: Young researchers
Five young researchers introduce themselves and thereafter Q&A with the Panel.

Wednesday 10-12h00: Major collaborations
who: Sebastiaan, Mikael, Wouter + all names listed hereunder
topic: Major collaborations
This session will focus on

- WASP (Bo Wahlberg, 5 min presentation)
- Digital Futures (Karl H. Johansson, 10 min presentation)
- the KTH-Region Stockholm-KI collaboration landscape:
    - The strategic partnership with Region Stockholm (Joakim Jalden; 5 min presentation)
    - MedTechLabs (Niclas Roxhed; 5 min presentation)
    - AIMES (Anna Herland; 5 min presentation)
    - Collaborations in Huddinge (TBD); (Sebastiaan Meijer / Malin Linngård; 5 min presentation) – Malin invited
- Our interaction with EIT Health (Sebastiaan Meijer; 5 min presentation)
- Q&A with the Panel.

Wednesday 13-14h00: Valorisation
who: Wouter, Mikael, Sebastiaan, KTH Innovation, 3 representatives of Spin-off Companies
topic: Valorisation

- KTH Innovation to present the valorisation landscape at KTH & venture cap for spin-offs – 10 min – Lisa Eriksson
- Wouter to shortly overview the spin-off activities for both Departments.
- 3x5 min presentation by spinoff companies: ’

  Furhat (Skantze), Capitainer (Niclas), Novamia (Örjan Smedby) (see “impact cases” in the self-assessment for more info about these companies)

- Q&A with the Panel.

Wednesday 14-15h00: Industry collaborations
who: Wouter,
Gabor Fjodor (Ericsson),
Bo Göransson (Ericsson),
Alf Isaksson (ABB),
Zhibo Pang (ABB)
Henrik Petterson (Scania).

topic: Industry collaborations / affiliated faculty

- Each affiliated professor presents themselves and their research in 5 min.
- Q&A with the Panel.

Thursday 10-11h00: Alumni
who: Wouter, Five Alumni:

- MTH: Vinutha Shreenath (ai.se), Vinutha@ai.se
- MTH: Fabian Sinzinger (Stanford)
- ISE: Diana Wang (Qiwen) <diana.wang1@huawei.com>
- RPL: Judith Bütepage, judithb@spotify.com,
- DCS: Märta Barenthin Syberg https://www.linkedin.com/in/m%C3%A4rta-barenthin-syberg/, marta.syberg@raysearchlabs.com.
- DCS: Mariette Annergren https://www.linkedin.com/in/mariette-annergren-56314780/ Scania mariette.annergren@gmail.com
- TMH: Anna Hjalmarsson https://www.linkedin.com/in/anna-hjalmarsson-b8b8392/ Artificial Solutions, Electrolux

topic: Alumni

- Alumni shortly introduce themselves.
- Q&A with the Panel.

Thursday 11-12h00: Backup slot
who: Wouter, All Dept and Division heads – on standby
topic: Final Q&A
This slot is currently open. If outstanding topics require more discussion, specific people can be invited for further discussion.