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Evaluation of the Research Part of the University of Luxembourg: Evaluation Report

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Executive Summary

The Centre for Security, Reliability and Trust (SnT) is an interdisciplinary centre (IC) embedded in the University of Luxemburg (UL). Since its foundation about 15 years ago, it has experienced impressive growth. Following the last assessment in 2017, its accumulated and acquired research funding has doubled, and human resources have increased by 70 %.

Its research activities are clustered in four Strategic Research Areas (SRA): Space, Cybersecurity, Fintech and Autonomous Systems, all of which are active in large research initiatives, technology transfer and teaching (e.g. Masters in Space, Cybersecurity).

Its research strategy is driven by a combination of top-down and bottom-up dynamics, guided by an effective and visionary management team, with highly committed researchers and support staff.

SnT effectively tackles societal challenges and convincingly complies with and contributes significantly to Luxembourg's national science and technology priorities.

Some potential points of attention for future development are:

- The identification of focus and opportunities for (global) scientific leadership via a form of strategic 'Science and Technology Watch'.
- Consolidation and enhancement of its scientific excellence.
- A strategic reflection on dealing with 'growth' (induced by the many opportunities) in all dimensions of the organisation:
  - Longer term budgetary planning.
  - Equilibrating research and support capacity.
  - Optimising certain (important) aspects of human resources management.
  - A strategic focus on how to contribute to teaching.
  - Further professionalisation of the Technology Transfer function.

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1 Introduction and background

1.1 Introduction to the evaluation

The Ministry of Research and Higher Education (MESR) of Luxembourg mandated Technopolis Group with the evaluation of the research part of the University of Luxembourg. This evaluation was conducted from May 2024 to June 2025. According to Art. 50/2 of the modified law on the organisation of the University of Luxembourg of June 27th, 2018, based on the original law of 2003, the University is subject to external evaluation every four years, the present evaluation assesses both the research and institutional aspects of the University.1. The period to be covered by this exercise is 2018-2023. Next to a retrospective assessment of achievements, the evaluations' prospective elements include the evaluation of the strategies and plans of the University as well as the evaluators and the panel assessment of challenges and opportunities ahead.

The University's mission, as defined by law, is threefold: to offer higher education courses leading to degrees, diplomas and certificates; to conduct research; and to contribute to the social, cultural and economic development of Luxembourg.

This report is part of the assessment of the research performance of the Universities' 13 research departments and three interdisciplinary centres (ICs) and covers the Interdisciplinary Centre for Security, Reliability and Trust (SnT). The evaluation is based on international external peer review and covers the performance of the ICs, considering various aspects such as inputs (e.g., finances, human resources, infrastructure, strategy) and outputs/impacts (e.g., research outcomes, innovation activities, services). A separate report covers the assessment of organisation, management, and governance matters.

The observations and recommendations presented in this report are based on a peer review by the following experts working in the research entities' research fields: Prof. Dr. Bart De Moor (chair, KU Leuven), Prof. Dr. Antonia Bertolino, (CNR, Pisa), Prof. Dr. Ana Perez Neira (Centre Tech. Telecomunications Catalunya), Prof. Dr. Maarten Steinbuch (TU Eindhoven) Prof. Dr. Jean-Marc Jezequel (Rennes*)*. All panel members declared beforehand not having any conflict-of-interest. Overall, the visitation was extremely well organised and planned, both by SnT and the supporting consultant, so that the assessment took place in optimal conditions. A short preliminary debriefing of the main findings was presented at the end of the 2nd day.

The assessment is based on a self-evaluation report submitted by the IC, background information on the Luxembourg research system information provided by Technopolis Group, an on-site visit of SnT in January 2025. The hearing, which was organised and moderated by Technopolis, consisted of a self-presentation by the research unit and its research four priority areas as well as group interviews with external partners and clients.

The committee applied the following evaluation criteria and organised the present report accordingly: quality of the research, impact of the research (third mission), and future potential of the research in the department/IC.

[1] The external evaluation of the University covers teaching and research activities, central administration and internal organisation. The focus alternates between research and education. All evaluation reports are published by the Ministry. https://mesr.gouvernement.lu/fr/dossiers/dossiers/rapports-d-evaluations.html

The panel would like to express its sincere gratitude for the impressive, professional and interesting yet informal and enjoyable interaction with all SnT co-workers.

1.2 The Centre for Security, Reliability and Trust (SnT).

The Centre for Security, Reliability and Trust (SnT) is an interdisciplinary centre (IC) embedded in the University of Luxemburg (UL). Since its foundation about 15 years ago, it has experienced impressive growth. Following the last assessment in 2017, its accumulated and acquired research funding has doubled, and human resources have increased by 70 %. Research activities are clustered in four Strategic Research Areas (SRA): Space, Cybersecurity, Fintech, and Autonomous Systems, all of which are active in large research initiatives, technology transfer and teaching (Masters in Space, Cybersecurity). They comprise 18 research groups with a total of +/- 500 FTE and 65 nationalities) and about 12 didactical and experimental laboratories/infrastructures.

2 Research strategy and organisation

SnT's visionary management committee was supervised by Prof. Bjorn Ottersten, and for 1 year now has been led by Prof. Yves Le Traon, with well-developed short- and longer-term objectives. It maintains excellent relations with UL's leadership. The overall governance comprises an SnT Advisory Board, an executive and management team, and support from an SnT Office (34 FTE) and TTO (19 FTE).

SnT's research strategy and organisation are very effective. They successfully use a *combination of top-down and bottom-up approaches.* They have a proven approach to address societal challenges and develop long-term partnerships with industries and NGOs locally and internationally. The positive interaction of SnT with the University leadership exemplifies how a research entity can align effectively with institutional goals while maintaining independence.

SnT is a large research centre, but it has a flat organisation. Research is conducted across 18 independent groups (5 more than in the previous evaluation period). 12 laboratories enable experimental activities in several validation/demonstration projects. The flat organisation is motivated by the explicit intent to maximise research freedom (*bottom-up direction* of their strategy), which has helped establish a nice collaborative and effervescent environment.

For large projects requiring multidisciplinary competences, the groups coordinate on the basis of spontaneous initiative, which is facilitated (*top-down direction*) by an efficient and effective framework for smooth internal communication and coordination. SnT reports that the Technology Transfer Office assists with outreach to industry and other stakeholders, acquisition of collaborative research projects, contract negotiation, IP management and valorisation through licensing and spin-offs.

Strategy for impact

The four SRAs provide a successful branding strategy and have been instrumental in interfacing with companies and funding agencies, both nationally and internationally. There is a good balance between the SRAs on the one hand and the research groups on the other, which has made it possible to find a good equilibrium between more 'fundamental' engineering research and more applied research in climbing the TRL levels.

Research strategies and results vary across the four SRAs. Space Systems and Cybersecurity have acquired high international visibility and are looking to developing their position further.

Fintech faces huge opportunities for growing is reputation and is proactive in promoting the area and forming its own reference community. Finally, the Autonomous Systems SRA combines differing topics, and while it is making good research products, it so far lacks a well-defined identity. This SRA needs to find a clear focus, which could develop into energy or self-driving cars, because in both there are timely opportunities for engaging in large collaborative projects strategic for Luxembourg, as evidenced during the Panel's meeting with the representative of the Ministry of Economy and Foreign Trade.

Governance

The management has been successful in establishing a *lightweight and cohesive governance strategy* aiming to adapt organisation to activities (not the other way around). For example, the overheads from the funding acquired are returned through meritocratic incentives that reward success in project acquisition, research excellence, and collaboration among teams.

The transparency and shared governance at SnT, though, seems to *contrast with the established procedures for recruitment and promotion* managed at university level, based on rigid regulations that are not adequate to the current situation. A core element of the research success is the many PhDs and postdocs contributing to the IC projects. They appeared to be quite happy with the stimulating landscape in which SnT operates but are frustrated by the lack of career opportunities and the resulting uncertainty about their future.

Planning for the long term - especially *human resources - is very critical*, due to UL's restrictions on recruitment into permanent positions. From the financial perspective, the centre has demonstrated *excellent capacity to attract research funds* both at national and international level. While in recent years SnT has demonstrated financial stability through its robust external funding model (70% external income, 30% endowment), addressing the lack of permanent scientific staff positions is critical for long-term sustainability.

Positioning

The centre appears to be *very well integrated in the national ecosystem*. The scope of research is similar to that of the LIST Institute, with which SnT collaborates and competes at the same time. The Panel believes that their collaboration should be based on some joint strategy and shared goals.

The overall strategic vision of SnT could be improved by an international positioning exercise of the SARs in relation to worldwide peers: what are the international trends and opportunities (*Science and Technology Watch*), where and how are they unique, where and how are they complementary, where and why are they following and lagging behind, who are their peers and role models, where can they claim scientific and/or technological leadership ? Such an exercise could later be used to develop a better international branding strategy.

Recommendations to the IC:

- To further solidify its position as a leader in research, SnT must carefully define its role in thought leadership versus followship and establish a clear scientific identity when pursuing competitive grants, such as ERC projects. Concretely, they should think deeply about how to (continue to) take scientific leadership, based not only on internal signals but also through proactive "technology watch" efforts to identify emerging dimensions where SnT can make distinctive contributions.
- While acknowledging the success of academic freedom and flexibility, the IC should recognise that growth (in number of groups and number of projects) cannot continue

indefinitely. It is essential for SnT to consolidate its focus on key strategic priorities where it can deliver the greatest value, avoiding overextension and maintaining excellence.

- Lastly, SnT's international branding, though solid, can be further enhanced to reflect its global leadership. Initiatives such as hosting international conferences, strengthening collaborations with global peers, and amplifying its visibility through flagship projects will ensure SnT continues to stand out on the world stage.

3 Quality of Research

Research excellence

SnT has made a significant top-tier, contribution to advancing the state of the art in ICT systems at both national and international levels. By combining academic freedom and flexibility with the establishment of Strategic Research Areas (SRAs), *SnT effectively tackles critical societal challenges through innovative approaches and excellent research*. It is very positive that they pursue questions that emerge from demand. SnT contributions are evidenced by its global ranking in computer science (top 125) and software engineering (top 10), with over 35% of its publications appearing in the top 10% of journals globally. The centre has won six ERC grants, several best paper awards and various individual prizes. The awards list reflects a selective recognition of the centre's vast scope.

Recommendation:

- The SWOT analysis of the Self-evaluation Report recognises SnT's limited ability now to attract top senior and junior researchers as a potential threat to research quality. *These factors could be improved if the ratio of permanent to non-permanent researchers is increased,* as highlighted in the *SWOT analysis*. Notably, only 8% of researchers hold a permanent contract with a five-year limit that cannot be extended, whereas, at the University of Luxembourg, 80% of staff have permanent positions. With an average researcher age of approximately 40 years, offering more permanent positions would enhance the centre's ability to attract talent and foster research maturity over time.

Publications

The publications from SnT *are of exceptional quality*, frequently receiving citations in high-impact journals and conferences. The resulting field-weighted citation index is high. It is observed that this index reflects a changing trend, as outlined in the document UL_scientometrics_summary_SnT.

Recommendation:

- While not currently a concern, this trend underscores the importance of *maintaining a well-balanced approach between fundamental and applied research* to ensure long-term sustainability of the publications' high impact. The incentive policy for research groups and individual researchers plays a key role in fostering this equilibrium.

The centre hosts several research groups that have achieved international excellence. For instance, the Software Engineering research has been ranked 10th worldwide, and the space research field stands out with remarkable achievements and unique laboratory facilities. The Fintech research area, though still in its early stages, is steadily developing a strong identity with promising prospects. Similarly, the Space SRA's research is well-focused and highly productive.

Recommendations:

- To further strengthen the centre's impact, there is an opportunity to *refine the focus of the Autonomous Systems research area*, which could benefit from a clearer scope and stronger alignment with emerging fields such as energy or self-driving technologies. Ongoing discussions in this direction indicate a proactive approach toward enhancement.
- Last, there is significant potential to expand the production of monographs and books. Producing accessible and comprehensive books would not only enhance the centre's thought leadership but also contribute to broader public engagement and knowledge dissemination.

Collaborative research projects

Cross- Institutional collaboration is a cornerstone of SnT's strategy, as highlighted in the *Self-evaluation Report*, through its strong interdisciplinary research and partnerships with more than 60 academic, industrial, and governmental organisations. National collaborations support Luxembourg's socio-economic priorities, while international partnerships with institutions like UC Berkeley and UCL amplify its global impact. Interdisciplinary integration is further strengthened by cross-domain projects like NCER-FT, bridging software engineering, finance, and law. Prominent projects like AI4Space (highlighted in the *SnT Executive Committee presentation*) and collaborations with Horizon Europe and ESA position SnT at the forefront of scientific innovation, leveraging advanced technologies in quantum computing, AI, and space systems.

Regarding the IC's ambitions and achievements in interdisciplinary research, the *Self-evaluation Report* demonstrates that this is evident across three levels: within research groups, at the institutional level, and in cross-institutional collaborations. *The presentations of the Strategic Research Areas (SRAs) further highlight this interdisciplinarity* (e.g., the Master in Space Technologies and Business or some of the labs visited, such as the Zero-G lab). SRAs serve as an effective mechanism for breaking down the silos between research groups, fostering collaboration by bringing together individuals with diverse expertise. Their key value lies in providing a platform for cross-sectional discussions and exchange of ideas. This collaborative environment encourages interdisciplinary engagement and innovation.

Recommendation:

- To do more work on co-publications and projects generated between different research groups.

4 Resources

4.1 Financial resources and infrastructure

Over the evaluation period, the annual SnT budget nearly doubled, from €22m to €41m. Around 1/3 is provided by public endowment which is used at 75% for research activities: the remaining part comes primarily from FNR (40% in 2023). Public sector and industry both count for 8% of 2023 annual funding, with an income of €3,1m and €3,4m respectively, and the strongest growth of all income types (+300% and +240% since 2018).

A point of recurring concern is the *ratio between external funding and the contribution from UL*. This ratio is now at +/- 30 % and acts as a stabiliser/leverage but could come under pressure as the external funding increases.

SnT's research capacity has been professionalised (>400 national and >140 EU projects, 6 ERC grants, 4 PEARL grants, several other manifestations of scientific excellence, e.g. awards and rankings).

The track record in funding is very impressive, with a clear strategic objective-oriented focus for last 10 years or so. There is an incentive scheme in place where part of the structural funding of the UL is deployed to reward PIs that are successful in attracting external funding. This acts as a 'stabiliser' and leverage to acquire external funding, as in the longer run, the internal funding cannot follow the growth rate from external resources.

At the European level, the SnT hosted five ERC grants (three awarded since 2018), three ERC Advanced Grants, one ERC Starting Grant and one ERC Proof-of-Concept, funds from ERC however declined more recently. Other European Funding (Agency and EU Programmes) vary around €1m and €2m respectively, the panel therefore sees a need for a more even balance between FNR funding and Collaborative European Project funding

Recommendation:

- These initiatives serve as a model for other SnT areas, as greater emphasis should be placed on *balancing the reliance on FNR national funding with increased EU funding.* Although SnT has strong international ties, its collaborations are concentrated in specific geographic regions and sectors. Therefore, it is recommended to continue broadening partnerships with institutions and industries in underrepresented regions (e.g., Africa, Latin America) and explore non-traditional partners in the arts and humanities. By addressing these gaps, SnT can enhance its already strong contributions to science and society.

SnT's infrastructure capacity will support long-term sustainability and growth. Due to SnT's growth, there seems to be an increasing need for office space and facilities, so that longer-term facility management planning is becoming necessary.

SnT experimental facilities have grown commendably, which not only enhances their appeal in projects and education but also serves as a unique source of research challenges, distinguishing SnT from other international institutions. The visit of the review panel to some of the labs helped to get this kind of useful insight. In addition to the Quantum lab, the Panel also visited the Radar, Luna and Zero-G Labs. The Radar Lab stands out for its case study on 'Contactless Vital Sign Monitoring using Radar Technology,' while the Zero-G Lab distinguishes itself through both its groundbreaking case study and its unique infrastructure. This lab is globally one-of-a-kind and highly interdisciplinary, integrating expertise from multiple research groups. The same team oversees the LunaLab, which is equally exceptional and can also be considered unique on a global scale. In its presentation, the Executive Committee described fourteen labs, and the review panel *encourages SnT to foster their growth* by leveraging their unique features to gain a competitive edge and excel in originality.

Recommendations:

- *Stabilising the research staff* is essential to ensure the continued growth of the labs. An example of this is the Quantum Lab, which is still in its early stages of development but has experienced a slowdown in growth due to the departure of a prominent researcher in the field, who was instrumental in establishing the lab.

4.2 Human resources, careers, and related policies

Due to the expansion in research activities, SnT nearly doubled the number of its employees (excl. Phd students) since 2018, increasing from 131 in 2018 to 255 in 2023. The number of

permanent academic staff also nearly doubled from 19 in 2018 to 34 in 2023. At the same time, three full professors, two assistant professors and two permanent research scientists left SnT. Approximately two thirds of staff are hired with a time-limited contract (CDD). Including PhD students, more than 90% of researchers are employed with CDDs.

SnT provides a stimulating and dynamic work environment that is highly valued by its staff, despite the challenges of a high workload. Employees appreciate the international and collaborative atmosphere, with opportunities to engage directly with industry and benefit from robust administrative support. This combination fosters both professional growth and meaningful connections across sectors.

However, there are opportunities to further enhance the work experience.

Recommendations:

The panel perceives HR policies as very important. The number of permanent positions is too low based on the centre's dimensions and workload. Despite the nice social and collaborative environment, this sometimes causes stress and frustration.

- The panel therefore sees some room for improvement: there is a need for clearer explanation of academic career paths and promotions. A system of regular and recurrent 'function assessment evaluations' at all levels seems lacking.
- Transparency in career pathways could be improved, as current limitations on permanent research positions and the absence of clear appraisal systems or structured career support procedures may hinder long-term career development. Introducing comprehensive career frameworks and transparent progression opportunities would significantly benefit staff satisfaction and retention.
- A longer-term projection for (more) academic positions seems necessary. Some of the approval mechanisms or constraints (5-year rule) are limiting factors in the growing success of SnT.

Diversity and gender representation are areas where progress is needed. Despite a Gender and Diversity committee being in place for more than 5 years, currently, only 1 of 20 principal investigators (PIs) is female, reflecting a significant gender imbalance.

Recommendation:

- Addressing the masculine culture of "more is better" and increasing awareness of unconscious bias in recruitment processes will help foster a more inclusive and balanced workplace. Expanding efforts through gender representation policies and targeted recruitment initiatives can make meaningful strides in this direction.

Although there seems to be a Single Point of Contact for Social Safety in place within UL, it remains largely unknown to the employees of SnT, as was apparent in some of the interviews.

Recommendation:

- Social safety measures could be more clearly communicated to ensure staff feel secure and supported in their roles. Implementing visible programs that promote workplace well-being and inclusion would enhance the centre's research culture further.

For professors, the introduction of KPI-driven incentive schemes offers a structured approach to recognise and reward contributions, though these should be complemented by broader support systems. SnT's doctoral schools are invaluable assets, fostering the next generation of researchers and strengthening the talent pipeline for academia and industry.

Finally, one of the most pressing concerns for staff is housing. The high cost of living in Luxembourg, especially housing, is a significant challenge for many employees.

Recommendation:

- Proactive measures to address housing affordability, such as partnerships with local stakeholders or housing assistance programs, would greatly alleviate this burden and improve overall staff well-being.

By addressing these areas with targeted solutions, SnT can build on its strong foundation, ensuring that it remains a highly attractive and supportive environment for researchers at all career stages

5 Contribution to teaching

The main strategic goal of SnT is to excel in research and technology transfer. To leverage its high-level research, SnT has been invited to contribute to teaching at the University of Luxemburg, with each of its professors doing up to half the teaching load of normal full professors. SnT is mostly involved in teaching at master level, especially for the master's on (1) space and (2) cybersecurity, which nicely aligns with some of SnT scientific priorities and (inter)national demands.

At PhD level, it is worth noting that SnT trains about 20% of the PhD students at the university, with only 4.5% of the UL budget and 5% of its Full Professors. Nearly half the PhD students are "industrial PhD students", leveraging the close links SnT has with industry, and in return providing industry with key, albeit informal, technology transfer. The PhD programme at SnT depends on the university's Doctoral School and overall seems to be under control. SnT PhD graduates' first job destinations are fairly evenly balanced between the private sector (43%) and academia (54%). Some 79% of SnT PhD graduates remain active in Luxembourg, with 63% of these as postdoctoral researchers at the UL while the remaining 37% choose the private sector, demonstrating SnT's contribution to attract talents and fuel the Luxembourgish ecosystem.

Recommendations:

- SnT seems to have a good working relationship with the Department for Computer Science (CS) of UL concerning teaching, but the current organisation looks suboptimal for the university. The panel recommends a better balance of responsibilities, especially at master level, to better align with the overall priorities of the UL and the country.
- Considering the importance of the Fintech sector for Luxemburg, as well as SnT's ongoing interdisciplinary NCER project on Future Fintech, we recommend the opening of a new master's course in Fintech. Wherever possible, it should leverage existing courses from the CS department (as well as from the Law and Economics departments) and complement it with advanced courses from members of SnT. This would be strongly supported by SnT FinTech industry partners such as BNP Paribas, as was highlighted during the hearings.

6 Contribution to the third mission

The SnT centre has a strong and well formulated goal to work with (local) industry and government and to generate impact as part of the third mission. The material provided convincingly demonstrates that SnT complies with the national priorities for R&D and economy.

The alignment with other faculties and departments of the UL could even contribute more to this endeavour (e.g. Law, Economy, …).

SnT's innovation and commercialisation policy is very clear and well adopted by the researchers within the Centre as well as being embedded in the organisation. The operation is also strongly supported by the TTO, with additional human resources for funding, and project management as well as communication and outreach.

The four aspects of impact mentioned in the self-evaluation report - prototyping, knowledge capabilities, people and funding - were clearly visible to the panel during the on-site visit and have clearly been successfully implemented both in terms of quality and in quantity.

In an open discussion with some of the external stakeholders it became clear that the partners approve of SnT's collaborative and professional way of working. As shown in the self-evaluation report, there are many good examples of collaboration outcomes. The panel was also impressed by the demonstration of collaboration outcomes in the poster session as well as during the laboratory visit.

The third mission has been implemented by SnT in a way that shows how the 4th generation university could work: focused on societal challenges with strong partnerships with local industry and NGOs. In this way, the SnT can have a greater impact as a role model for the University of Luxembourg.

The tight schedule of the panel visit means that there was little time to consider Science Communication. However, responding to questions from the panel, the IC provided a list of past events that has involved both society at large and schools. Nevertheless, IC pointed out that science communication is not an explicit strategic goal of SnT, and the panel could not identify a systematic commitment to it.

Recommendations:

- The current funding model is applied to all partners, with a significant role for the FNR. It would be useful to think about diversification (e.g. small SME's pay 50%, large companies pay 100%). SnT should look at other regions that employ such models and reflect on whether lessons can be learnt.
- The partnership Program is strong, but it can benefit by further increasing the (thought) leadership of the researchers, who should stay ahead of industry and provide longer-term intelligence.
- The policy to give most attention to partners and less to start-ups is understandable, but may lead patents and spin-outs to receive too little attention. Given the enormous number of PhDs and Postdocs at SnT the committee thinks there are many more opportunities that could be exploited.
- Think about strengthening the partnership programme further by exploiting a human resource roadmap together with selected partners. Some examples are 0,2 FTE appointments at SnT of past PhDs now working with the industry partner, etc.
- Further strengthen the systematic plans and increase investment into a strategy for science communication especially for students, which could positively contribute to engage more female and minority researchers and demonstrate the value of research and science investments.

7 Overall assessment and recommendations

Research strategy and organisation

SnT's research strategy and organisation are very effective, successfully combining *top-down and bottom-up approaches, driven by a lightweight and consistent 'corporate governance'*. It has is an excellent track record for addressing societal challenges and developing long-term partnerships with industries and NGOs locally and internationally. The positive interaction of SnT with the University leadership exemplifies how a research entity can align effectively with institutional goals while maintaining independence.

SnT complies very efficiently with the national priorities of Luxemburg (finance, ICT, Space, Ecotech, Industry), but also efficiently reacts to the demands of industry with a well-established partnership program (+/- 70 members, > €7m/year, partnership events). It cultivates and exploits its international partnerships very effectively and acquired/ participated in more than 90 European projects (2018-2023).

SnT is one of the leading centres of UL, delivering about 20 % of the 1000 PhD students of UL, providing an impressive research funding turnover and a professional TTO. In many respects, *the best practices in SnT could serve as a role model for the rest of the UL*.

1. The steep growth in projects, funds acquisition and personnel cannot continue indefinitely. To maintain the degree of excellence achieved, the panel recommends being more selective by pointing to the key strategic priorities where it can deliver the greatest value, avoiding overextension and reducing possible overloads. One possible instrument could be to install a *Science and Technology Watch:* what are the international trends and opportunities, where and how are they unique, where and how are they complementary, where and why are they following and lagging behind, who are their peers and role models, where can they claim scientific and/or technological leadership? Such an exercise could later be used to develop a better international branding strategy.

Quality of research

Overall, the quality of research is very good to excellent. SnT has made a significant top-tier, contribution to advancing the state of the art in ICT systems on both national and international levels. By combining academic freedom and flexibility with the establishment of Strategic Research Areas (SRAs), *SnT effectively tackles critical societal challenges through innovative approaches and excellent research.*

2. The panel recommends improving the ratio of permanent to temporary positions to foster the maturity of SnT research and experimental facilities, realising a balanced approach between fundamental and applied research to ensure publication quality and impact, and fostering the incentive policy for research groups and individual researchers that plays a crucial role in this balance.
3. The SER on Autonomous Systems might benefit from a clearer scope and focus.

Resources

In terms of resources, SnT has matured and is run according to high policy and governance standards.

4. A point of recurring concern is the ratio between external funding and the contribution from UL. This ratio is now at +/- 30 % and acts as a stabiliser/leverage but could become under pressure as the external funding increases. However, this is part of the whole 'funding strategy' of SnT, which could be made more explicit (multi-year projections).

5. Stronger synergies should be found between the SnT governance and the recruitment policies at university level, for instance seeking an equilibrium in staffing between SnT and the Computer Science Department.
6. The panel perceives HR policies as very important, the number of permanent positions not being proportional to the centre dimensions and workload. There is a need for clearer explanation and elicitation of academic career paths and promotions. A system of regular and recurrent 'function assessment evaluations' seems to be lacking at all levels. The 5-year contract limitation causes loss of talent and negatively affects the loyalty and commitment of employees to SnT.
7. Diversity and gender representation are areas where progress is needed. Addressing the masculine culture of "more is better" and increasing awareness of unconscious bias in recruitment processes will help foster a more inclusive and balanced workplace.
8. Although there seems to be a Single Point of Contact for Social Safety, and apparently some university broad Social Safety plan is in place, it remains largely unknown to the employees of SnT.

Teaching

9. UL sgould achieve a better balance of teaching responsibilities between SnT and the CS department, especially at master level, to better align with the overall priorities of the UL and the country.
10. The panel supports launching a new master's in Fintech that should build upon existing courses from the CS department (as well as from the Law and Economics departments) and complement it with advanced courses from members of SnT, in connexion with their NCER project on Future Fintech. Leverage the support of SnT FinTech industry partners (such as BNP Paribas) to make its curricula relevant for them.

Third Mission

11. The panel supports further exploration of the role the SnT Centre could play for the University of Luxembourg as an example of the next (4th) gen university: outside-in, local ecosystems, partnerships (There will be soon a webpage of the EU on this subject.)
12. The panel also recommends embracing a more systematic strategy in Science Communication towards society and schools, through which SnT could demonstrate the value of research achievements as well as amplify mutual impact.
13. The panel suggests refining the partnership model (e.g. small SME's pay 50%, large companies pay 100% or also models to share human resources). What happens in other universities in neighbouring regions could be a source of inspiration.

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