

LUT University: Research and Impact Assessment 2019

Terms of Reference for the Assessment Panel

1. Background and rationale

LUT carries out a Research and Impact Assessment (RIA) in 2019 to evaluate the **development, performance, and the future potential** of its research. The Assessment will be carried out as a peer-review process conducted by an external, international, independent, and high-level expert panel. The results of the Assessment, to be published in July 2019, will be used to refine the strategy of the university for a new period beyond 2020.

The Assessment is based on the written self-assessments of the Units of the Assessment (4), including impact cases, bibliometric data, and other indicators of quality and impact of the research work, as well as on the interviews conducted by the panel during the site visit.

Lappeenranta-Lahti University of Technology (former Lappeenranta University of Technology) is an international community of more than 6,000 students and experts, which conducts scientific research and academic education. Ever since the year 1969, the university has combined two fields of science that complement each other – technology and business. After the first LUT's Research Assessment Exercise (RAE) in 2012, many changes have occurred.

The focus areas of our Strategy 2015-2020 are 1) clean energy, 2) the circular economy, emphasising clean water and waste streams, and 3) sustainable business and entrepreneurship. In 2015, LUT was organised into three schools: the School of Energy Systems (LES), the School of Engineering Science (LENS) and the School of Business and Management (LBM). In 2015–2016, LUT established six research platforms based on an international peer-review process to develop interdisciplinary research on the focus areas related to LUT's strategy.

In the beginning of the strategy period, there were unexpected government budget cuts affecting Finnish universities, especially by decreased direct funding from the Ministry of Education and Culture as well as remarkable cuts to the project funding from Business Finland (national funding agency for business and technology). We updated our strategy and action plans in 2016 and 2018, partly due to the budget cuts, but largely also due to positive developments.

Since 2015, the Ministry of Culture and Education has encouraged Finnish universities to profile their research, to strengthen collaboration between universities and to decrease overlapping research areas. The Academy of Finland allocates yearly 50 M€ through competitive calls for universities' profiling applications. To implement our strategy, we have applied and received funding for to strengthen our three focus areas, to direct our research and to strengthen digitalisation and data science. During application processes, we have negotiated with all the relevant Finnish universities and research institutes to collaborate strategically.

Impact of research on society is at the core of LUT's research. We base our collaboration with companies on a strong international entrepreneurship ecosystem and an international process for the commercialisation of research-based innovations, involving students, alumni, and investor and enterprise networks. Our core business ecosystem includes LUT research and education units, LUT business accelerator Green Campus Open (2017), rapid prototyping centre, the J. Hyneman Center (2018), LUT entrepreneurship society LUTES, and the cleantech seed investor Green Campus Innovations Ltd.

2. Organisation and Implementation of the Assessment

Objectives of the Assessment

- to assess quality, academic impact and future potential of LUT research
- to assess the success of multidisciplinary collaboration
- to identify current and emerging research strengths
- to assess societal impact of research and the entrepreneurial and innovative capacity
- to stimulate and encourage world-class research and impact
- to give feedback to the Units of Assessments (UoA)
- to position UoAs internationally and nationally
- to strengthen the brand of LUT research
- to provide cases and evidence of LUT's development

Assessment panel

The Assessment is carried out as a peer-review process conducted by external, international, independent, and high-level experts in fields relevant to LUT's research profile. Experts of the assessment panel are presented in Appendix 1.

Assessment period

The assessment period is for six years, 2013–2018, reflecting the period after our first Research Assessment Exercise in 2012. Special attention shall be given to the strategy period of 2015–2018.

Units of Assessment (UoA) and Fields

LUT	Units of Assessment (UoA)	Fields
UoA 1	School for Business and Management	Business
UoA 2	School for Energy Systems	Electrical engineering, Energy technology, Mechanical engineering, Sustainability science
UoA 3A	School for Engineering Science A	Separation and purification technology, Computational engineering, Material physics
UoA 3B	School for Engineering Science B	Industrial engineering and management, Software engineering

Special attention should be given to the **LUT Research Platforms** (6) established in 2015–2016. How have the research platforms succeeded in contributing and giving added value to the research and impact of the Units of Assessments?

Utilisation of the Assessment results

The Research and Impact Assessment will provide LUT with essential information and recommendations regarding the strengths, potential, and challenges in research activities and their impact on society. LUT will use the results and recommendations of the Assessment as well as the material collected during the process in setting goals and developing LUT strategy for the period beyond 2020.

3. Assessment criteria

The Assessment Panel is requested to present, for each Unit of Assessment:

1. A written statement on the research profile and how the activities relate to the LUT strategy
2. Numerical ratings and written statements for each of the following:
 - 2.1. Scientific quality and the extent and impact of multidisciplinary collaboration of the research
 - 2.2. Academic impact (impact of the research on the research community)
 - 2.3. Societal impact and the entrepreneurial and innovative capacity
 - 2.4. Strengths and weaknesses of the research environment
 - 2.5. Future potential
3. Recommendations for the future

1. Research Profile

The UoA's profile shall be considered both in terms of comparing to international benchmarks and in relation to LUT strategy and multidisciplinary collaboration.

2. Numerical Ratings and Written Statements

The Panel is asked to rate numerically, in international perspective, the quality, academic impact, societal impact, environment and potential of the research and of the UoAs on a scale from 1 to 5 (1=emerging, 2=fair, 3=good, 4=very good, 5= excellent international level; *see Appendix 2 for definition of the criteria*) and to motivate the numerical ratings in written statements. The written statements and numerical ratings together form the quality rating of the UoAs.

2.1 Scientific quality and multidisciplinary collaboration of the research activities

The Panel is asked to assess on all research work, whether fundamental or applied, topical or multidisciplinary with equal weight. The written comments shall address the quality of the activities as well as the scope and success of the multidisciplinary activities (including research platforms).

2.2 Academic impact (impact of research activities on the scientific community)

Academic impact of the research activities should be assessed in terms of international leadership, influencing global research directions, citations, taking part in the international dialogue and networks, and contributing to the development of the fields of research activities.

2.3 Societal impact, and the entrepreneurial and innovative capacity

Societal impact is demonstrated by case studies and self-assessment provided by the UoAs. Panel is also asked to assess how the UoA is developing its strategy to support and enable impact of its activities.

Impact of the research activity may appear as or lead to:

- Societal quality (e.g. interaction with and communicating results to external stakeholders, engagement in entrepreneurial activities)
- Societal impact (e.g. influence on stakeholders or societal procedures);
- Valorisation (e.g. activities aimed at making results available and suitable for application in products, processes and services, utilisation of innovation potential)
- Dissemination (e.g. activities aimed at making results widely known or providing stakeholders a window to current research and novel results).

The panel will assess the *reach and significance* of impacts on the economy or society that is underpinned by excellent research conducted in the UoA. *Reach* will be understood as the extent and/or diversity of the beneficiaries of the impact, as relevant to the nature of the impact. *Significance* will be understood as the degree to which the impact has enabled, enriched, influenced, informed or changed the performance, policies, practices, products, services, understanding, awareness or well-being of the beneficiaries. The panel will make an overall judgement about the reach and significance of impact rather than assessing them separately. Impact must be achieved during the assessment period, regardless of its stage or maturity. No account will be taken of anticipated or future potential impact.

2.4 Strengths and weaknesses of the research environment

The Panel is asked to comment on the research leadership and long-term strategic planning of the UoA's research activities, including human resources strategy and the focus of research activities. Further indicators include international networks and collaborations, availability and quality of support services, research infrastructures, technical staff, and the ratio of students to teaching personnel.

The Panel is asked to identify assets of the research environment that require further strengthening and structural obstacles that prevent the UoA from realising its full potential. Although the Panel is not asked to evaluate individual researchers, it is invited to identify particular strength areas and the balance of the overall research profile of the UoA and of the University as a whole.

2.5 Future Potential of the Unit of Assessment

The Panel is asked to comment on the future potential and research leadership within each UoA. The assessment shall consider the potential of:

- Researchers in the international competition
- Research environment to provide support for the chosen activities
- Making an international-level impact on the research community and/or society
- Emerging research fields

The assessment may include but is not limited to indicators such as the vision and plans for the future, plans on utilising the multidisciplinary opportunities at LUT, the level at which the UoA recognises its strengths and weaknesses, emerging future opportunities and challenges, and the plans for managing such factors. Issues such as age and career profile of the faculty and staff, the size of the UoA, and the ability of the UoA to attract high-quality and international doctoral students and faculty may play a role. Panel is invited to comment on the UoA's infrastructure and the investments needed in the future to maintain the attractiveness. Further indicators may include the ability to secure competitive funding, the capacity to focus the UoA's research activities on timely issues, or the existence of international collaboration networks.

3. Recommendations for the future

The Panel is asked to provide recommendations on the future development of the UoAs. The recommendations shall focus on the UoAs, not on individual researchers. The recommendations shall support the UoAs in developing a roadmap from the present quality to the internationally excellent level and maximal societal impact, and in identifying necessary changes. The Panel is also invited to comment on the UoAs' prospects for innovative new collaborations within and outside LUT. The Assessment Panel recommendations and strategic guidance may include:

- Research activities (e.g. disciplinary and multi-disciplinary activities, potential for innovative multidisciplinary activities in the LUT context)
- Societal impact (e.g. strategy for increasing impact and creating networks)
- Research environment and infrastructure (e.g. investment and development needs)
- Research active personnel (e.g. personnel profile and strategy)
- Doctoral and post-doctoral training (e.g. role in research activities)
- Other issues

Key topics to be addressed include:

- Main strengths, opportunities and challenges of the UoA
- Recommendations for improvements

4. Tasks and responsibilities of the assessment panel

Preparatory work and site visit

The peer review work of the Assessment Panel consists of a site visit to Lappeenranta, Finland, on 3-7 June 2019, and desk work prior to the site visit. Panel members are assumed to familiarise themselves with the material provided (approximately five weeks) prior to the site visit. The site visit will include interviews, and provide an opportunity to clarify open issues. The materials to be provided for the panel are listed in Appendix 4.

The RIA Office will provide specific schedule for the site visit.

Assessment report

The Panel is expected to produce during the site visit an advanced draft of the evaluation report, which will be finalised thereafter by the Chair, technically supported by the LUT personnel. See Appendix 3 for the structure of the Assessment report.

Conflicts of interest and confidentiality

The Panel members have no conflict of interest to declare.

All the information and material received during the assessment process is confidential. Once the assessment has been completed, all material must be destroyed. Reviewers are not allowed to disclose any information concerning the assessment to outsiders.

Remuneration

LUT will cover the travel and accommodation expenses of the panel members and provide a remuneration for the assessment of the written material provided before the site visit, the site visit, and contributions to the Assessment Report.

APPENDICES 1-4

Appendix 1. Assessment panel

Brian Norton, Professor, President of the Dublin Institute of Technology, Ireland, Chair

Fioralba Cakoni, Professor of mathematics, Rutgers University, USA

Mats Engwall, Professor of industrial management, KTH Royal Institute of Technology, Sweden

Elzbieta Frackowiak, Professor of chemical engineering, Poznań University of Technology, Poland

Anders Kecskemethy, Professor of mechanics and robotics, University of Duisburg-Essen, Germany

Patricia Lago, Professor of software and services, Vrije Universiteit Amsterdam, the Netherlands

Tage Koed Madsen, Professor of marketing, University of Southern Denmark, Denmark

Øystein Moen, Professor of industrial economics, Norwegian University of Science and Technology, Norway

Piero Salatino, Professor of chemical engineering, Università degli Studi di Napoli Federico II, Italy

Lennart Söder, Professor of electric power systems, KTH Royal Institute of Technology, Sweden

Appendix 2. Rating of the Units of Assessment

The numerical rating scale applied in the Assessment is the following:

- 5 - Excellent**
- 4 - Very Good**
- 3 - Good**
- 2 – Fair**
- 1 – Emerging/ Weak**

2.1 Scientific quality and multidisciplinary collaboration

5 Excellent International Level	The UoA's research exhibits quality that is internationally excellent in terms of originality, significance and rigour. Work at this level is able to generate significant interest within the international research community, and is suitable for publication in leading international journals or publishers with rigorous editorial standard.
4 Very Good International Level	The UoA's research work exhibits quality that is internationally recognised. Work at this level is suitable for publication in the leading international journals or publishers.

3 Good International Level	The UoA's research work is of undisputed relevance for the international academic community. Work at this level is suitable for publication in well-known international journals or by well-known international publishers.
2 Fair International Level	The UoA's research work is of possible relevance for the international academic community. Research outputs at this level is suitable for publication by international or national publishers or in well-known national journals.
1 Emerging International Level	The research outputs of the UoA include new scientific knowledge. The UoA mainly operates on a national level.

2.2 Academic impact (Impact of the research activities on the research community)

5 Excellent International Level	The UoA is internationally acknowledged as a globally leading unit in its field. The UoA is a valued partner in international research and networks, and members of the UoA frequently take part in leadership and expert tasks in the field. The UoA is highly competitive in securing external research funding.
4 Very Good International Level	The UoA is an important player in its field, and among the leading groups in its field within Europe. Members of the UoA hold potential for and take part in leadership and expert tasks in the field. The UoA participates in international research projects and networks and receives substantial external research funding.
3 Good International Level	The UoA has a solid position in the international research community as a respected and well-known centre of expertise. The UoA's impact is comparable to that of the leading groups within Scandinavia.
2 Fair International Level	The UoA is in the process of establishing its position in the international scientific community as a recognised actor in its field. The UoA's impact on the international community is irregular.
1 Emerging International Level	The UoA's publications and other research impact is aimed mainly at the national research community.

2.3 Societal impact, entrepreneurial and innovative capacity

5 Excellent International Level	The UoA is exceptionally dynamic and wide-ranging in its interaction with the society, and compares with globally leading units in the field. The UoA is a highly valued partner for corporate collaboration and entrepreneurial activities, and systematically supports innovativeness. The UoA's case studies demonstrate clear examples of significant influence on the society.
4 Very Good International Level	In international comparison within the UoA's field, cooperation between the UoA's research activities and the society provide substantial impact in terms of their reach and significance.
3 Good International Level	In international comparison within the UoA's field, the cooperation between the UoA's research activities and society is at the level expected of established academic units in the same field. The entrepreneurial and innovative capacity of the UoA is at an expected level compared to established units in the same field.
2 Fair International Level	Compared with international standards within the field of the UoA, the interaction with the society plays an undersized role in the UoA's activities. The entrepreneurial and innovative capacity of the UoA has potential to be at a higher level.

1 Emerging International Level	In comparison to other UoAs in the same field, the UoA's research activities are at a stage where it is still seeking ways to interact with the surrounding society. The entrepreneurial and innovative capacity and level of activities are low.
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2.4 Research environment

5 Excellent International Level	In international comparison, the UoA offers an excellent research environment. The UoA has globally competitive capacities or combinations that make it attractive for high-class international experts in the field.
4 Very Good International Level	In international comparison, the UoA offers a functional and suitable research environment. The UoA's spearheads or combinations make it attractive at the European level for international experts in the field.
3 Good International Level	The UoA is able to offer a research environment comparable to established academic institutions in the field across the world. The UoA's spearheads or combinations make it attractive at the Scandinavian level for international experts in the field.
2 Fair International Level	The research environment at the UoA is still developing towards the level expected from a reputable unit in the international scientific community in the UoA's field research. The UoA's spearheads or combinations make it attractive at the national level for experts in the field.
1 Emerging International Level:	The UoA is still developing an internationally comparable research environment.

2.5 Future potential

5 Excellent International Level	The UoA has the potential to be among the University's top research and impact activities. The Panel expects that within the next 5-10 years the UoA will produce globally recognized results in its field and attract globally leading scholars and very promising doctoral students to work at the UoA. The research and technical excellence of the UoA breed and is likely to continue to breed new innovations adding value to collaborating corporate partners and societal development at large. The UoA has the potential to reach in the near future the level of excellence comparable to the most notable units in the world in the UoA's field.
4 Very Good International Level	The UoA has the potential to establish itself as a well-known and respected actor in the international scientific community in its field. Within the next 5-10 years, the UoA can be expected to have reached results that make the UoA a much-valued partner in international research networks, and to hold a solid position in the European research arena. The innovative activities are actively pursued and are likely to bring new innovations and activities adding value to collaborating corporate partners and societal development at large.
3 Good International Level	Within the next 5-10 years, the UoA has the potential to secure a position in the international scientific community as a solid performer and a trusted partner in international research networks. The UoA has capacities to be among the leading units in its field at the Scandinavian level. The UoA has a clear understanding and strategy how to develop new innovations and

	activities adding value to collaborating corporate partners and societal development at large.
2 Fair International Level	The UoA has the potential to be a noted actor in its field and to be a nationally leading unit. The UoA can be expected to make contributions to the activities of the international scientific community.
1 Weak	The UoA must work hard to be able to establish itself as an internationally recognised unit in its field within the near future.

Appendix 3. Structure of the Assessment report

1. Summary and key recommendations for LUT
2. Profiling, scientific quality and scientific impact
 - 2.1. Profile of research and relation to LUT strategy (For each UoA separately)
 - 2.2. Scientific quality and multidisciplinary collaboration (For each UoA separately)
 - 2.3. Scientific impact (impact on the scientific community) (For each UoA separately)
3. Societal impact and the entrepreneurial and innovative capacity (For each UoA separately)
4. Research environment (For each UoA separately)
5. Future potential (For each UoA separately)
6. Recommendations for the future (For each UoA separately)
7. Recommendations for the future and concluding remarks

Appendix 4. Main material to be provided for the panel

For LUT University

- LUT Strategy 2020
- LUT Key Figures
- LUT in international rankings
- Research output (bibliometric analyses)
- Facts concerning LUT Research Platforms

For each Unit of Assessment

Self-assessment reports (4 altogether): School for Business and Management, School for Energy Systems, School for Engineering Science (2):

- Profile of research in relation to LUT Strategy
- Facts concerning research staff
- Facts concerning funding and resources for research
- Facts concerning research output
- International benchmarks
- Societal impact highlights as case studies