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1. Introduction

This document defines the Terms of Reference for the expert panel in the Research Assessment Exercise of Tampere University of Technology (TUT RAE 2017).

Tampere University of Technology (TUT) conducts scientific research in technology, natural sciences and architecture and provides higher education within these fields. Established in 1965, TUT is today a community of 10,500 undergraduate and postgraduate students and close to 2,000 employees. There are five Faculties encompassing 15 laboratories. The University started operating in the form of a foundation in the beginning of 2010. The foundation status and the foundation capital provide the University a host of opportunities for focusing and developing its research activities.

The strategy for 2016-20 defines TUT’s profile areas as follows: digital operating environment, energy- and eco-efficiency, health technology and light-based technologies. TUT’s distinctive strengths lie in the interaction between fundamental and applied research, expanding international networks, and research projects that cut across conventional disciplinary boundaries.

The three higher education institutions in Tampere, TUT, the University of Tampere (UTA) and Tampere University of Applied Sciences, have recently joined forces and the goal is to merge these institutions to create an inspiring and internationally attractive university that is built on a solid foundation of scientific and technological expertise. The new university will bring together a unique combination of research in the fields of technology, health, society, economy and leadership along with the full cycle of research, development and innovation.

2. Background of the Assessment

Tampere University of Technology conducted a comprehensive external and international assessment of its research for the first time in 2011. The units of assessment were departments and the assessment comprised three elements: international peer evaluation, departments’ self-evaluation and bibliometric analyses of publications.

This time around the assessment is voluntary and selective, and there are two assessment categories:

1. *Existing Research Communities* (= established RCs that have co-authored publications and conducted joint projects)
2. *New Openings* (= new RCs with a new research opening in regards to the state of the art in the field)

Taking part in the assessment is voluntary and researchers have formed the units of assessment themselves. A TUT RAE 2017 unit of assessment is a Research Community (RC) that is independent of organizational structures. In anticipation of the new university, the RCs were invited to also include researchers from University of Tampere. There was an internal review of the RCs in the beginning of 2016 where the RCs applied to be accepted as units of assessment in TUT RAE 2017 in either one of the categories explained above. The applications were assessed by an internal panel comprising the Deans, the members of the Science Council and a representative from the University of Tampere. The internal panel selected the best and the most potential RCs to be assessed by the international evaluation panel in TUT RAE 2017. Altogether 30 RCs applied and 20 were accepted as units of assessment of which 15 belong to the category of Existing
Research Communities and the remaining 5 to the category of New Openings. For a list of Research Communities to be assessed, see Appendix 1.

TUT RAE 2017 is an evaluation of research activities, of the people who conduct the research and, most importantly, of the potential found in both the activities and people.

3. Objectives of the Assessment
The Research Assessment Exercise is geared firmly towards the future. TUT seeks excellence, including potential excellence and wants to find out if the RCs are sufficiently ambitious in their research questions and methodological approaches and if the scientific output of the RCs is significant, compared to the best units in the world. TUT welcomes all recommendations on how to improve the overall quality of research conducted in the university.

More specifically, TUT is conducting the Research Assessment Exercise in order to:
- identify those RCs that have the potential to be among the best in the world
- get recommendations from the panel on how to transform good RCs into excellent RCs
- find out if the RCs are dealing with new pertinent and high impact research questions in their fields
- get the panel’s feedback on how to support potential and sustain existing excellence

4. Utilization of the Assessment
In TUT’s first Research Assessment Exercise in 2011, one of the objectives was to get up-to-date knowledge on the quality of research conducted in the university. The aim of TUT RAE 2017 is to improve the quality of research. TUT will use the results of the Assessment as basis for updating its strategy and for allocating resources to the most promising RCs. The results will also contribute to the development of the research strategy of Tampere3.

5. Organization of the Assessment
The assessment process is managed by a Steering Group consisting of members representing also other Finnish universities and having substantial experience in research evaluation. A Working Group comprising the members of the Science Council and the Vice-President in charge of research at TUT supports the planning of the Assessment. These groups are assisted by a Secretariat. For more detailed information on the organization, see Appendix 2.

6. Working arrangements
One panel consisting of ten members will evaluate all 20 Research Communities. A Chair is appointed to direct the assessment panel’s work. It is the Chair’s responsibility to ensure that the panel produces its reports on time. The panel should ensure through discussions that all the panel members have a similar understanding of the application of the assessment criteria and the rating scale. The panel should also ensure that the assessment report takes into account all the material available to them, including all the assessment documents, site visits and interviews. The panel is expected to finish the final drafts of the assessment reports including the recommendations during the site visit week in Finland. The reports are to be written on the assessment form, which is provided by the assessment organization.
The assessment and its organization are funded by TUT, which will pay expert fees to the panel Chair and panel members as well as reimburse all the travel and accommodation expenses relating to the site visit week.

The reports of the panel will be included in the final report without any changes in substance. The final report will be published by TUT.

6.1 Desk work and site visit week
Panel members base their assessment on desk work at their home institutions prior to the site visits and on interviews and discussions during the site visit week in Finland.

Desk work is carried out prior to the site visit week and is based on
- the RCs’ research plans
- details concerning the members of the RCs
- details concerning the funding of the RCs
- details concerning the research output of the researchers in the RCs
- bibliometric analyses based on the Thomson Reuters Web of Knowledge database
- background information about TUT and the Finnish higher education and research system

All the material will be provided to the panel members by the assessment organization five weeks before the site visits.

During the site visit week in Finland the panel members get acquainted with the Research Communities, interview researchers representing various stages of the research career, and meet representatives of the University management.

The timetables for the site visit week will be provided by the assessment organization.

6.2 Confidentiality
The panel members agree to refrain from making use and/or divulging to third parties any non-public material, facts, information, documents or other matters brought to the attention of panel members during the Research Assessment Exercise. The materials included in the assessment reports as well as all the ratings are strictly confidential until the publication of the final report that summarizes all the results. The final report is the main instrument for communicating the results of the Research Assessment Exercise.

6.3 Conflict of interest
The panel members are required to sign a declaration of the lack of conflict of interest. For example, the panel members should not have been engaged in joint research projects with the researchers or units they assess or have written joint publications with them, from the beginning of 2011 until present time. A panel member is disqualified if his/her impartiality is endangered. If a panel member is contacted by a member of the Research Community, the panel member should discuss the issue immediately with the TUT assessment organization.
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1. Implementation of the Assessment

The Unit of Assessment is a Research Community (RC). RCs have been formed by researchers themselves and they are independent of organizational structures. The RC can include several research groups or parts of groups; the size of the RC is not limited. The RC may comprise external researchers from other universities or research organizations. Researchers from the University of Tampere are considered as equal members of the RC with TUT researchers. If the RC includes researchers from other organizations, only those achievements, publications and projects that have been made in collaboration with TUT are included in the assessment.

The assessment is focused on the future. The RCs submit as assessment material a research plan for the years 2017-21. The time period for the background material concerning the RCs (information on research output, research funding, doctoral degrees, members of RC) is 2012-2016. The bibliometric analyses cover the years 2011-15 (citations also the year 2016). The assessment materials only include the research performance of those members of RCs who were employed by TUT or UTA on the Census date, 1 October 2016.

2. Assessment criteria and rating scale

2.1 Scientific ambitiousness, quality and impact

For this criterion, the panel assesses the scientific ambitiousness, quality and impact of the RC’s research, based on the research plan, in terms of originality and significance.

The numerical rating scale:

5 Outstanding: scientific ambitiousness, quality and impact that is world leading in terms of originality and significance. In assessing the scientific ambitiousness, quality and impact of the RC to be outstanding, the panel should find evidence of or potential for research that has some of the following types of characteristics: research that is leading or at the forefront of the research area, that can be described disruptive or non-incremental, that has major influence on a research theme or field, that develops new ambitious paradigms or fundamental new concepts for research.

4 Excellent: scientific ambitiousness, quality and impact that is internationally excellent in terms of originality and significance, but which falls short of a leading position. In assessing the scientific ambitiousness, quality and impact of the RC to be excellent, the panel should find evidence of or potential for research that has some of the following types of characteristics: research that makes important contributions to the field at the international level, that contributes important knowledge, ideas and techniques that are likely to have a lasting influence, but are not necessarily leading to fundamentally new concepts.

3 Good: scientific ambitiousness, quality and impact that is recognized internationally in terms of originality and significance. In assessing the scientific ambitiousness, quality and impact of the RC to be good, the panel should find evidence of or potential for research that has some of the following types of characteristics: research that provides useful knowledge and influences the field, that involves incremental advances, which might include new knowledge conforming with existing ideas and paradigms, or model calculations using established techniques or approaches.

2 Satisfactory: scientific ambitiousness, quality and impact that is recognized nationally in terms of originality and significance. In assessing the scientific ambitiousness, quality and impact of the RC to be satisfactory, the panel should find evidence of or potential for research that has some of the
following types of characteristics: research that is useful but unlikely to have more than a minor influence in the field, that mainly re-confirms earlier research work and has little novelty value.

1 Unsatisfactory: scientific ambitiousness, quality and impact that falls below the quality levels described above.

2.2 Societal relevance of research
For this criterion the panel assesses the reach and significance of the research conducted in the RC in terms of the society at large. Are research results relevant to the needs of many user communities? Are the user communities mainly local or global? Do the RC’s research questions address globally relevant topics? Is the research conducted in the RC relevant in the production of new knowledge and solutions for, e.g.:

- business life
- civil society
- health and welfare
- environment
- policy-makers

on the national and/or global scale.

Please note that even the highest rating does not necessitate a primarily international relevance.

5 Outstanding: the research conducted in the RC is outstanding in terms of reach and significance. The research results are highly relevant to the needs of multiple user communities and the RC’s research questions address topics that are globally very relevant and timely. The research conducted in the RC provides new knowledge and solutions that benefit the society at large significantly.

4 Excellent: the research conducted in the RC is excellent in terms of reach and significance. The research results are relevant to the needs of multiple user communities and the RC’s research questions are globally relevant. The research conducted in the RC provides new knowledge and solutions that benefit the society at large.

3 Good: the research conducted in the RC is good in terms of reach and significance. The research results are useful for different user communities and the RC’s research questions have relevance. The research conducted in the RC has influence on the society at large.

2 Satisfactory: the research conducted in the RC is satisfactory in terms of reach and significance. The research results can be useful for some user communities but the RC’s research questions have only limited relevance. The research conducted in the RC is unlikely to have influence on the society at large.

1 Unsatisfactory: the relevance of research conducted in the RC falls below the relevance levels described above.

2.3 Research environment
For this criterion the panel assesses the intellectual competence of the RC and its environment, the extent to which the RC provides an adequate environment for research, is engaged with other research communities and is able to attract excellent researchers. More specifically, the panel...
should consider if the RC has sufficient infrastructure, if the personnel structure supports conducting high quality research, if the RC has a well-balanced funding structure that enables it to fulfil its research plan, if the RC is international in terms of recruiting, networking and collaboration, if the mobility and networking (national and international) are relevant, and if the RC has a sufficient number of PhD-students to ensure continuity in its field.

5 Outstanding: the research environment of the RC is fully comparable to the best international units in the field in terms of infrastructure, personnel structure and research funding. The RC is highly networked internationally as well as nationally, and its members’ mobility is very active and highly relevant.

4 Excellent: the research environment of the RC compares well to the best international units in the field in terms of infrastructure, personnel structure and research funding. The RC has good networks internationally as well as nationally, and its members’ mobility is active and relevant.

3 Good: the research environment of the RC is adequate in terms of infrastructure, personnel structure and research funding. The RC has relevant networks but its members’ mobility could be more active.

2 Satisfactory: the research environment of the RC is not adequate in terms of either infrastructure, personnel or research funding. The RC is not very active in networking or mobility.

1 Unsatisfactory: the research environment of the RC falls below the levels described above.

2.4 Potential of the Research Community
For this criterion the panel assesses the potential of the RC in terms of its scientific ambitiousness, quality and impact, wider relevance and research environment. More specifically, the panel should consider the following questions:

- what is the potential of the RC’s research plan and is the plan feasible?
- does the RC’s research work have the potential to make an impact on the scientific community and society at large?
- is the RC aware of its standing in the scientific community?
- how could the RC be more attractive in the eyes of potential new PhD-students and researchers?
- how innovative is the research conducted by the RC?
- how can the university best support the RC?

The panel can also give general recommendations for the RC in terms of the future plans and efforts.

3. Report outline
The panel is asked to present a written statement and a numerical rating of scientific ambitiousness, quality and impact, relevance of research and research environment (discussed in sections 2.1-2.3) and a written statement of the potential of the research community (section 2.4).

In addition, the panel is asked to summarize its views on the units being assessed, as well as the assessment process in general.
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1. Implementation of the Assessment
The Unit of Assessment is a Research Community (RC). RCs have been formed by researchers themselves and they are independent of organizational structures. The RC can include several research groups or parts of groups; the size of the RC is not limited. The RC may comprise external researchers from other universities or research organizations. Researchers from the University of Tampere are considered as equal members of the RC with TUT researchers. If the RC includes researchers from other organizations, only those achievements, publications and projects that have been made in collaboration with TUT are included in the assessment.

The assessment is focused on the future. The RCs assessed in the category of New openings are not necessarily established research communities with a history of joint projects or co-authored publications. The most important assessment material for RCs assessed in the category of New openings is the research plan for the years 2017-21. As background material the panel is provided with information on the members’ performance, such as publications, research funding and other academic merits. The bibliometric analyses (when applicable) cover the years 2011-15 (citations also the year 2016). The assessment materials only include the research performance of those members of RCs who were employed by TUT or UTA on the Census date, 1 October 2016.

2. Assessment criteria and rating scale
2.1 Novelty of research
The most important criteria for a RC being accepted as a unit of assessment in the category of New openings was that the research idea of the RC is new in regards to the state of the art in the field internationally.

The panel is therefore first asked to assess the novelty and innovativeness of the research as presented in the research plan on a scale from 1 to 5. Where 5 means that the RC is dealing with a totally new research question and 1 means that the RC is dealing with an already well-established research question and cannot be considered as a new opening.

2.2 Scientific quality and impact
For this criterion, the panel assesses the potential scientific quality and impact the RC proposes in its research plan, in terms of originality and significance.

The numerical rating scale:

5 Outstanding: scientific quality and impact that is world leading in terms of originality and significance. In assessing the scientific quality and impact of the RC to be outstanding, the panel should find potential for research that has some of the following types of characteristics: research that is leading or at the forefront of the research area, that can be described disruptive or non-incremental, that has major influence on a research theme or field, that develops new ambitious paradigms or fundamental new concepts for research.

4 Excellent: scientific quality and impact that is internationally excellent in terms of originality and significance, but which falls short of a leading position. In assessing the scientific quality and impact of the RC to be excellent, the panel should find potential for research that has some of the following types of characteristics: research that makes important contributions to the field at the
international level, that contributes important knowledge, ideas and techniques that are likely to have a lasting influence, but are not necessarily leading to fundamentally new concepts.

3 Good: scientific quality and impact that is recognized internationally in terms of originality and significance. In assessing the scientific quality and impact of the RC to be good, the panel should find potential for research that has some of the following types of characteristics: research that provides useful knowledge and influences the field, that involves incremental advances, which might include new knowledge conforming with existing ideas and paradigms, or model calculations using established techniques or approaches.

2 Satisfactory: scientific quality and impact that is recognized nationally in terms of originality and significance. In assessing the scientific quality and impact of the RC to be satisfactory, the panel should find potential for research that has some of the following types of characteristics: research that is useful but unlikely to have more than a minor influence in the field, that mainly re-confirms earlier research work and has little novelty value.

1 Unsatisfactory: scientific quality and impact that falls below the quality levels described above.

2.3 Societal relevance of research
For this criterion the panel assesses the potential reach and significance of the research proposed by the RC in its research plan in terms of the society at large. Will research results be relevant to the needs of many user communities? Are the foreseeable user communities mainly local or global? Do the RC’s research questions address globally relevant topics? Will the research proposed by the RC be relevant in the production of new knowledge and solutions for, e.g.:
- business life
- civil society
- health and welfare
- environment
- policy-makers
on the national and/or global scale.

Please note that even the highest rating does not necessitate a primarily international relevance.

5 Outstanding: the research proposed by the RC has the potential to be outstanding in terms of reach and significance. The research results will be highly relevant to the needs of multiple user communities and the RC’s research questions address topics that are globally very relevant and timely. The research conducted in the RC will provide new knowledge and solutions that benefit the society at large significantly.

4 Excellent: the research proposed by the RC has the potential to be excellent in terms of reach and significance. The research results will be relevant to the needs of multiple user communities and the RC’s research questions are globally relevant. The research conducted in the RC will provide new knowledge and solutions that benefit the society at large.

3 Good: the research proposed by the RC has the potential to be good in terms of reach and significance. The research results will be useful for different user communities and the RC’s research questions have relevance. The research conducted in the RC will have influence on the society at large.
2 Satisfactory: the research proposed by the RC has the potential to be satisfactory in terms of reach and significance. The research results can be useful for some user communities but the RC’s research questions have only limited relevance. The research conducted in the RC is unlikely to have influence on the society at large.

1 Unsatisfactory: the relevance of research conducted in the RC falls below the relevance levels described above.

2.4 The consortium and research environment
For this criterion the panel assesses the intellectual competence of the RC and its environment. Is the RC a credible consortium to fulfil the RC's research plan? Is the combined scientific potential of the RC’s members sufficient? Are the members well-suited for conducting the research planned? More specifically, the panel should consider if the RC has sufficient infrastructure, if the personnel structure supports conducting high quality research, if the RC is international in terms of recruiting, networking and collaboration, if the mobility and networking (national and international) are relevant, and if the RC has a sufficient number of PhD-students to ensure continuity in its field.

5 Outstanding: the RC is an extremely credible consortium consisting of members with unquestionable scientific potential. The members are very well-suited for conducting the research planned. The infrastructure and personnel structure of the RC is fully comparable to the best international units. The RC is highly networked internationally as well as nationally, and its members’ mobility is very active and highly relevant.

4 Excellent: the RC is a credible consortium consisting of members with scientific potential. The members are well-suited for conducting the research planned. The infrastructure and personnel structure of the RC compares well to the best international units in the field. The RC has good networks internationally as well as nationally, and its members’ mobility is active and relevant.

3 Good: the RC is for the most part a credible consortium. However, the scientific potential of some members could be higher and the participation of all members in regards to the research plan does not seem justifiable. The infrastructure and personnel structure of the RC is adequate. The RC has relevant networks but its members’ mobility could be more active.

2 Satisfactory: at present the RC is not a credible consortium, and it is therefore unlikely it can fulfil its research plan. The infrastructure and personnel structure of the RC is still developing and the RC is not very active in networking or mobility. The RC could, however, develop into something more significant given the proper support.

1 Unsatisfactory: the research environment of the RC falls below the levels described above.

2.5 Suggestions for the future
In this section the panel is asked to consider ways in which the RC could best fulfil its potential. Are there changes needed in the personnel structure or does the RC need additional expertise in a specific area? How can the university best support the RC?
3. Report outline
The panel is asked to rate the novelty of research on a scale from 1 to 5 (discussed in section 2.1), present a written statement and a numerical rating of potential scientific ambitiousness, quality and impact, societal relevance of research and the consortium and research environment (discussed in sections 2.2-2.4) and suggestions for the future in writing (section 2.5).

In addition, the panel is asked to summarize its views on the units being assessed, as well as the assessment process in general.
Appendix 1: List of Research Communities

Existing Research Communities

Augmented Human Activities (AHA)
Big Data Analytics and Visualization (BigDataRC)
Computational Science X (CompX)
Engineering materials science and solutions (EMASS)
Field robotics for efficient work sites (FIRE)
Frontier Photonics
Integrated Technologies for Tissue Engineering Research (ITTE)
Life Cycle Effectiveness of the Built Environment (LCE@BE)
Managing digital industrial transformation (mDIT)
Prostate cancer research center (PCRC)
Sensing Systems for Wireless Medicine (MediSense)
Signal Processing Research Community (SPRC)
Smart Energy Systems (SES)
Urban circular bioeconomy (UrCirBio)
Wireless Communications and Positioning (WICO)

New Openings

Institute of Society and Space (SOCIS)
Intelligent dexterity for secure networked infrastructure and applications (IDSNIA)
Mathematical modelling with wide societal impact (MathImpact)
Multi-scaled biodata analysis and modelling (MultiBAM)
Regulation of learning and active learning methods (REALMEE)
Appendix 2: Assessment organization

Steering group:
Professor Heli Jantunen, University of Oulu, Chair
Professor Pertti Haapala, University of Tampere
Academician of Science, Professor Sirpa Jalkanen, University of Turku (member of the Board of the TUT Foundation)
Vice-president (until 31 Dec 2016), professor Ulla Ruotsalainen, Tampere University of Technology
Vice-president (as of 1 Jan 2017), professor Jarmo Takala, Tampere University of Technology

Working group:
Vice-president, professor Ulla Ruotsalainen, Chair (until 31 Dec 2016)
Vice-president, professor Jarmo Takala, Chair (as of 1 Jan 2017)
Academy professor Moncef Gabbouj
Professor Mikko Kaasalainen
Professor Juho Kanniainen
Professor Martti Kauranen
Professor Minna Kellomäki
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