



Sinikka Eskelinen and Aija Ryyppö (eds.)

# RESEARCH ASSESSMENT EXERCISE REPORT 2014

*International Evaluation of Research at the University of Oulu*

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## FOREWORD

University of Oulu, founded in 1958 and consisting of nearly 16 000 students and personnel of 3 000, is one of the largest universities in Finland. The University is an international science university, and it has an exceptionally multidisciplinary profile in its research and education. The aim of the Research Assessment Exercise, RAE, is to further raise the profile of the University of Oulu as an internationally recognized high-level science university by recognizing its strong areas of research and possibilities for significant new openings. The RAE exercise was begun two years ago, and now we enter the next phase, where the results of a major endeavor can be taken into use. I would like to thank our researchers for their participation and innovative planning, and the highly esteemed group of external evaluators from abroad and Finland for their insightful and committed work. Special thanks are due to the University of Oulu's Board of Directors, the Rector and the Research Council for guiding the evaluation process. All of the practical plans and arrangements were made by the RAE Steering Group, and I would like to warmly acknowledge this Group as well as the Head of the Research Services Doc. Sinikka Eskelinen and Coordinator Dr. Aija Ryyppö for their enthusiastic and knowledgeable work. Moreover, I thank the personnel of the Oulu University Library and the Centre for Science and Technology Studies at the Leiden University, the Netherlands, for performing bibliometric analyses.

Instead of a traditional department-based evaluation we chose to foster the formation of researcher-based units according to research themes, regardless of institutional boundaries. The designation of three participation categories, *veni, vidi and vici*, aimed at assessment of research at different stages of maturity and international significance. The 49 self-formed research communities typically contain researchers from several departments and faculties. Participation was voluntary, but nevertheless the coverage is excellent and no major gaps in the research topics of our university are evident. The result thus reflects the research topics that are planned to be carried out, and the multidisciplinary nature of the University of Oulu is strongly evident in the various consortia.

The three evaluation panels, covering Health and Biosciences, Human Sciences, and Technology and Natural Sciences, have provided detailed evaluations of each of the research communities. The communities were also ranked, 13 being placed in a top group, rated as excellent-to-outstanding, and 9 in a group of excellent communities. Altogether, a vast majority of the research at the University of Oulu was found very good, excellent or outstanding.

While faring well in the ranking has undoubtedly been an important motivation for participation, I would like to stress the importance of the process itself, namely the thinking among our researchers that has been undertaken to plan their future. The evaluators' comments provide much food for further thoughts on how to develop our activities, and even the most successful consortia receive valuable advice on how to further improve their work.

The evaluation panels also provided a number of general comments, including a strong message to strengthen international recruitments as a top-level strategic action to attract new star researchers, and the promotion of mobility among our local researchers. In addition to the identification of strong research areas, the panels also point out key strategic areas, where the University of Oulu should use its special advantages, especially related to the Arctic dimension and natural resources. Securing and developing relevant core facilities should also be a strategic priority.

The outcome of the RAE will be instrumental in defining strategic priority areas at the University of Oulu. It is gratifying to note the generally very good level of research identified in this report, and the excellent possibilities to develop the University of Oulu to become an even more internationally competitive research environment.

Taina Pihlajaniemi

Vice Rector, Chair of the RAE Steering Group

## EXECUTIVE SUMMARY

The University of Oulu is an international science university which creates innovation for the future, well-being, and knowledge through multidisciplinary research and education. It was founded in 1958, its research and education community is 16 000 students and 3000 employees strong, and it is one of the biggest and the most multidisciplinary universities in Finland. The University of Oulu researches people and culture in a changing living environment, as well as opportunities that new technology provides for improving the well-being of people and the environment. The University is a multidisciplinary expert in Northerness.

The faculties and the specialized research units of the University create the foundation for multiscientific research, innovation and training of experts for demanding professional tasks. Open-mindedly combining technical sciences, natural sciences and human sciences creates a unique foundation for new multidisciplinary research knowledge, innovation and education. The research areas of strength include four focus areas; Biosciences and health, Cultural identity and interaction, Environment, natural resources and materials, and Information technology, and four development areas; Business and economy, Steel research, Research-based teacher education, and Mining and mineral field. The research organizations of the focus and development areas are typically multidisciplinary, and they encourage researchers to make new scientific initiatives and discoveries. The University of Oulu conducts research in close cooperation with sector research institutions and corporations. Acting in the international scientific network is the foundation of renewal.

The mission of the University of Oulu is to further advance the level of internationally high ranking research, education and culture, to strengthen skills that increase well-being, and to secure the availability of highly educated labour and research personnel in its region. The University of Oulu aims to distinguish itself as an internationally regarded high-level science university, whose research is developed to reach an ever higher level of quality and international esteem. The University operates systematically in order to enhance the international cooperation of research and innovation universities, and aspires to a leading position in such activities.

The University of Oulu has carried out one evaluation of scientific activity, RAE2007 and that had a great impact on the strategic planning of the university. Now the second research assessment exercise is on-going. The Research Council decided on the meeting on the 22 February, 2012, that the next overall Research Assessment at the University of Oulu will take place in 2013, so that researcher-based operational units, research communities (RC) will be the target of evaluation. Rector Lauri Lajunen nominated a steering committee for the task on 2 March, 2012. The members of the steering committee are Research Rector Taina Pihlajaniemi (chair), Education Rector Olli Silven (vice chair), Research Director Sinikka Eskelinen, Professor Raimo Kaasila, Chief Librarian Päivi Kytömäki, Professor Jari Oksanen, Ph.D. student Elina Pernu and Professor Petteri Pietikäinen. Research Coordinator, Dr. Aija Ryyppö served as a general manager of the process. The steering committee has had 23 meetings.

The steering committee has set the aims for the second RAE as follows: to stimulate the use of multidisciplinary and interdisciplinary research approaches for the purpose of building larger, innovative and internationally significant, researcher-driven, functional entities. The outcome of RAE will strongly influence the scientific profile of the University of Oulu as the focus areas of research and future developmental directions will be identified based on the evaluation report. The strongest-performing units in the RAE evaluation will receive long-term strategic financing.

In order to take into account the different phase or maturity of the RCs, the evaluation was to be done in three different categories:

1. **Veni** –New research vistas/openings: The research of the participating RC represents an innovative new opening
2. **Vidi** – On the threshold of international breakthrough/recognition: The research of the participating RC is of high quality, but the community has yet to achieve strong international recognition and scientific breakthrough in their field.
3. **Vici** – World class research: The research of the participating RC represents the international cutting edge in its field.

The evaluation was conducted by three panels, “Health and Biosciences”, “Human Sciences” and “Technology and Natural Sciences”, formed primarily according to the special research focus areas of the University of Oulu, and including 10 - 12 members in each panel. The panel members were national and international experts who based their evaluation on the materials submitted by the participating Research Communities and on bibliometric analyses of their scientific productivity. Country distribution of the 32 panellists is the following: 8 from

Finland, 7 from USA, 5 from U.K., 2 from Denmark, Germany, Sweden and The Netherlands, one from Iceland, Italy, Norway and Portugal. A majority of the panellists, namely 26 were male, and 6 were female.

The evaluation proceeded through three stages:

1. Registration
2. Submission of evaluation materials in two steps
3. External peer review.

As the evaluation involved international experts, the participants have been asked to submit all evaluation materials in English. The preliminary instructions to form the RCs were given in autumn, 2012 and public discussions were organised in faculties during September – October, 2012. Final guidelines were modified according to the feedback given by researchers and published in October, 2012. Forty-nine RCs registered for the RAE2013 evaluation in December, 2012. These included a total of about 2,000 researchers and other members across department and faculty boundaries.

The panellists were nominated by the Rector of the University of Oulu in June – September, 2013. For each RC, the evaluation material consisted of a 6-page research plan and description of activities, CVs (max. 4 pages) of the principal investigators (PIs) and a list of selected 20 publications from each PI and jointly for the RC. The panellists were asked to give a written feedback on the RCs' strengths and weaknesses, provide other remarks, and give their recommendations. The panels met in Oulu on 16-17 October, 2013. The panellists had joint meetings, panel-specific meetings and open discussion forums, where the panellists could meet the representatives of the RCs. After the meeting, each panel ranked its own applications, separately in each participation category Veni – Vidi – Vici. Thereafter, the panels discussed the RC proposals together in order to carry out the final ranking for each of the three categories across the panels' scientific boundaries. For this purpose, a separate consensus meeting was organised on 7- 8 November, 2013, in the Hilton Copenhagen Airport hotel. The panels provided their written feedback in November, 2013, and the final report was published in January, 2014.

The scoring and ranking of the RCs was given by the expert reviewers in the three panels, according to the three participation categories: veni, vidi and vici. The scoring scale ranged from 1 to 6, 6 being the best possible scoring. Thirteen RCs were recognised as *outstanding (ranking A)* and nine RCs as *excellent (ranking B)*, as listed in the Table below for the veni, vidi and vici categories:

In addition to RC-specific evaluation **the panels provided general conclusions and recommendations** to be considered by the University:

- Recruiting foreign scientists is vital for international competitiveness, and requires a generous start-up package and other incentives. The initiative for this should come from the top, as a strategic action.
- International recognition requires Research Communities to bring a global perspective to their scholarship. The faculty, researchers, post-docs and Ph.D.'s at the University of Oulu should be more mobile. The University should expand efforts to attract international Visiting Professors. The University could increase participation in the Finland Distinguished Professor (FiDiPro) funding programme to enhance long-term international cooperation in scientifically significant and strategically key fields and to strengthen the internationally competitive research and innovation of the university. Increasing the number of open tenure track faculty positions and international recruitment for those positions would foster faculty development and growth at Oulu.
- The most successful RCs should be given maximum support, whilst those providing only a credible research environment for masters-level training should be more modestly funded, creating room for financing new (and inter- and multidisciplinary) initiatives, and topics of strategic interest to the university and region.
- The university's strategy and focus areas are currently defined too generically. An 'internationally strong scientific profile' is a worthy goal, but to achieve it, University of Oulu should define more precisely its strategic priority areas, based on the RAE outcome.
- In the absence of a dedicated national agency to support inward mobility, University of Oulu, together with the city and local high-tech companies, should establish a service to provide practical assistance for relocation, especially addressing family issues (employment / professional training of spouses, children's multilingual education, pension and tax issues, real estate etc.).

**Table.** The scoring and ranking of RCs given by the expert reviewers in the three panels, according to the three participation categories: veni, vidi and vici. The scoring scale ranged from 1 to 6, 6 being the best possible scoring. Thirteen RCs were recognised as outstanding (ranking A) and nine RCs as excellent (ranking B).

CATEGORY VENI					
RC ACRONYM	RC HEAD	RC NAME	PANEL	SCORES	RANKING
AgeAds	Heikkinen Hannu I	The age of adjustments? Critical and historical perspectives on governing citizens, wellbeing and environment	HS	6	A
PopStatGen	Savolainen Outi	Population and statistical ecology	H&B	5,6	A
GlobalHealth	Jaakkola Jouni K	Global change, geography, environment and public health research	H&B, T&NS	5,5	A
INSPIRIES	Huotari Maija-Leena	Institutions and practices of new literacies	HS	5	B
OSSI	Oivo Markku	Oulu software and systems initiative	T&NS	5	B
PSH	Oinas-Kukkonen Harri	Persuasive systems for health	T&NS	5	B
CATEGORY VIDDI					
RC ACRONYM	RC HEAD	RC NAME	PANEL	SCORES	RANKING
BARC	Niskanen Markku	RC in bioarchaeological research	HS	6	A
MOMA	Laitinen Risto	Molecular materials	T&NS	6	A
MtM	Kordas Krisztian	More than Moore	T&NS	6	A
CLRC	Kunnari Sari	Child language research center	HS	5,5	A
Proteus	Ruddock Lloyd	Protein structure and function research community	H&B	5,5	A
iUBI	Ojala Timo	UBIquitous interactions	T&NS	5	B
Living Stories	Syrjälä Leena	Narratives in education - living stories in theory and practice	HS	5	B
NorBE	Niinimäki Jouko	Northern bioeconomy	T&NS	5	B
ProChemE	Keiski Riitta	Sustainable solutions for production processes and environmental applications	T&NS	5	B
CATEGORY VICI					
RC ACRONYM	RC HEAD	RC NAME	PANEL	SCORES	RANKING
CMV	Pietikäinen Matti	Center for machine vision research	T&NS	6	A
CVR-Co	Huikuri Heikki	Cardiovascular research community	H&B	6	A
MA	Järvenpää Esa	Mathematical analysis	T&NS	6	A
RELATE-OULU	Paasi Anssi	Crossing borders: the relational and territorial politics of bordering, identities and transnationalisation	HS	6	A
Tissue Homeostasis	Myllyharju Johanna	Tissue development, homeostasis and malignancy	H&B	5,9	A
LET	Järvelä Sanna	Learning and educational technology research unit	HS	5,5	B
SPARC	Usoskin Ilya	Space physics and astronomy RC	T&NS	5,5	B

- HS = Human Sciences; H&B = Health and Biosciences; T&NS = Technology and Natural Sciences

- The university should work hard to internationally promote the excellence of its groups in key Arctic research fields, to support the international recruitment of world stars, new researchers and enhanced international funding. The establishment of a new Graduate School in this area would be very welcome and should be a priority activity.
- There are a number of key strategic research areas, specific for northern Finland and for the University of Oulu in areas such as metallurgy, mining, ICT, northern hydrology, climate change and environmental biogeochemistry which need support in all possible ways to use the potential that exists to ensure long term growth and the promotion and development of excellence. This will involve supporting entrepreneurship, facilities, industrial relationships and knowledge exchange.
- It is strongly recommended that the University increases the level of support to research communities for preparing large and complex funding applications such as to the EU. Such support may take the form of dedicated high level administrative support staff that are experienced at dealing with EU proposal paperwork or could be outsourced to specialist organisations to support bid preparation.
- RCs should be encouraged to develop key performance indicators or some 'measures of success' that are specific to their own subject domains and RC needs. This would enable the RCs to determine milestones, develop clear strategies for achieving them and to determine whether they are achieving their goals. Such a process would also enable the University to examine progress over time. This scheme would also facilitate any evaluations in 2019/2020 as the panels could look at how the RCs are delivering against their objectives. Note that performance indicators can be different between RCs and disciplines and so these will necessarily need to be sector specific.
- Infrastructure and core facilities require continuous, dedicated investment to ensure access to the latest technologies. Maintaining, updating and revamping core facilities is costly, both in equipment costs and in employing skilled senior technical staff that can effectively interface bench scientists with high-end core equipment. Maintenance and development of core facilities should be a strategic priority for University of Oulu.

## 1. INTRODUCTION

The University of Oulu is an international science university which creates innovation for the future, well-being, and knowledge through multidisciplinary research and education. It was founded in 1958, its research and education community is 16 000 students and 3000 employees strong, and it is one of the biggest and the most multidisciplinary universities in Finland. The University of Oulu researches people and culture in a changing living environment, as well as opportunities that new technology provides for improving the well-being of people and the environment. The University is a multidisciplinary expert in Northerness.

The faculties and the specialized research units of the University create the foundation for multiscientific research, innovation and training of experts for demanding professional tasks. Open-mindedly combining technical sciences, natural sciences and human sciences creates a unique foundation for new multidisciplinary research knowledge, innovation and education. The research areas of strength include four focus areas; Biosciences and health, Cultural identity and interaction, Environment, natural resources and materials, and Information technology, and four development areas; Business and economy, Steel research, Research-based teacher education, and Mining and mineral field. The research organizations of the focus and development areas are typically multidisciplinary, and they encourage researchers to make new scientific initiatives and discoveries. The University of Oulu conducts research in close cooperation with sector research institutions and corporations. Acting in the international scientific network is the foundation of renewal.

Scientific work is subject to continuous evaluation. In the best practices of evaluating good science, an evaluation consists of a review process involving scientific peers from multiple institutions and different countries. Publications and grant support are good indicators for success in academic institutions and easy to recognise, whereas achievements in education and community service are more difficult to evaluate. The decision makers, funding agencies, universities and scientists have a collective task to consider how to share knowledge through publications and how to promote the scientific careers from graduate students to post docs and beyond. The evaluation of scientific success and rewarding processes at the level of large institutions are difficult to achieve and the research assessment exercise processes are a central tool in this effort. The University of Oulu has carried out one evaluation of scientific activity, RAE2007 and that had great impact on the strategic planning of the university. Now the second research assessment exercise RAE is on-going. The planning and



monitoring of the second RAE is the responsibility of a specific steering group, appointed by Rector Lauri Lajunen and guided by the University Board, the Rector and the Research Council. The feedback from researchers during information and discussion sessions was also valuable in terms of the modification of final guidelines.

The mission of the University of Oulu is to further advance the level of internationally high ranking research, education and culture, to strengthen skills that increase well-being, and to secure the availability of highly educated labour and research personnel in its region. The University of Oulu aims to distinguish itself as an internationally regarded high-level science university, whose research is developed to reach an ever higher level of quality and international esteem. The University operates systematically in order to enhance the international cooperation of research and innovation universities, and aspires to a leading position in such activities.

The operational asset in promoting research and research administration at the University of Oulu is the Research Council with Research Rector/Provost as a chair person and representatives of faculties, research centres and Ph.D. students as members. According to the by-laws of the university, the Research Council supports the Board of Directors and President/Rector in promoting scientific activities and science policy discussions, makes initiatives on the research policy and organises evaluations of scientific performance and quality.

The Board of Directors has decided to carry out the research assessment exercise every 6<sup>th</sup> year. The previous assessment took place in 2007 and hence, the Board of Directors has given to the Research Council the task to initiate the second RAE. The Research Council discussed the matter in meetings and also with the representatives of other Finnish Universities and decided on the meeting on 22 February, 2012, that the next overall Research Assessment at the University of Oulu will take place in 2013, so that researcher-based operational units, Research Communities (RCs) will be the target of evaluation. The results of the assessment will be used in reviewing the research strategy. The President/Rector nominated Steering Committee for the task on 2 March, 2012. The members of the Steering Committee are Research Rector Taina Pihlajaniemi (chair), Education Rector Olli Silven (vice chair), Research Director Sinikka Eskelinen, Professor Raimo Kaasila, Chief Librarian Päivi Kytömäki, Professor Jari Oksanen, Ph.D. student Elina Pernu and Professor Petteri Pietikäinen. Research Coordinator, Dr. Aija Ryyppö served as a general manager of the process. The Steering Committee has had 23 meetings.

The Steering Committee has set the aims for the second RAE as follows: to stimulate the use of multidisciplinary and interdisciplinary research approaches for the purpose of building larger, innovative and internationally significant, researcher-driven, functional entities. The outcome of RAE will strongly influence the scientific profile of the University of Oulu as the focus areas of research and future developmental directions will be identified based on the evaluation report. The strongest-performing units in the second RAE evaluation will receive long-term strategic financing.

In order to take into account the different phase or maturity of the RCs, the evaluation was to be done in three different categories:

1. Veni –New research vistas/openings: The research of the participating RC represents an innovative new opening.
2. Vidi – On the threshold of international breakthrough/recognition: The research of the participating RC is of high quality, but the community has yet to achieve strong international recognition and scientific breakthrough in their field.
3. Vici – World class research: The research of the participating RC represents the international cutting edge in its field.

The evaluation was conducted by three panels, “Health and Biosciences”, “Human Sciences” and “Technology and Natural Sciences”, formed primarily according to the special research focus areas of the University of Oulu, and including 10 - 12 members in each panel. The panel members were national and international experts who based their evaluation on the materials submitted by the participating Research Communities and on bibliometric analyses of their scientific productivity.

The evaluation proceeded through three stages: 1) registration, 2) submission of evaluation materials in two steps, and 3) external peer review. As the evaluation involved international experts, the participants have been asked to submit all evaluation materials in English. Detailed information on the process at its different phases was given on the RAE2013 website at <http://www.oulu.fi/english/RegistrationRAE2013>

The preliminary instructions to form the RCs were given in autumn 2012, and public discussions were organised in faculties during September – October, 2012. Final guidelines were modified according to the feedback given

by researchers and published in October, 2012. Forty-nine RCs registered for the second RAE evaluation in December, 2012. These included a total of about 2,000 researchers and other members across department and faculty boundaries.

The panellists were nominated by the Rector of the University of Oulu in June – September, 2013. For each RC, the evaluation material consisted of a 6-page research plan and description of activities, CVs (max. 4 pages) of the principal investigators (PIs) and a list of selected 20 publications from each PI and jointly for the RC. The panellists were asked to give a written feedback on the RCs' strengths and weaknesses, provide other remarks, and give their recommendations.

The panels met in Oulu on 16- 17 October, 2013. The panellists had joint meetings, panel – specific meetings and open discussion forums, where the panellists could meet the representatives of RCs. After the meeting, each panel ranked its own applications, separately in each participation category *veni – vidi – vici*. Thereafter, the panels discussed the RC proposals together in order to carry out the final ranking for each of the three categories across the panels' scientific boundaries. For this purpose, a separate consensus meeting was organised on 7- 8 November, 2013, in the Hilton Copenhagen Airport hotel. The panels provided their written feedback in November, 2013, and the final report was published in January, 2014.

The report will be presented to the Rector and the Board of Directors for further actions. In this respect, it will be taken into account that the grading given by the panels is, on the one hand, based upon ranking the quality and, on the other hand, providing an effective stimulus for the weaker ones. The University of Oulu cannot work properly, if the differences between the research groups keep increasing. In order to raise the quality of the whole university, the best groups should get stronger, while the weaker ones should strive to improve themselves. This will eventually lead to a level of high excellence within the university.

## **2. ASSESSMENT METHODOLOGY**

### **2.1 Objectives and criteria of the evaluation**

The purpose of the evaluation is to raise the profile of the University of Oulu as an internationally recognised high-level science university, by recognising its strong areas of research and possibilities for significant new research openings. University of Oulu will use the results of the evaluation to strengthen the international research co-operation with the most recognised institutes in the fields of University of Oulu's focus areas, and to improve the research opportunities of researchers at the early stages of their independent career.

The second RAE will be a constructive, supportive and future-oriented process to strengthen RCs at the university. The evaluation report will strongly influence the scientific profile of the University - research focus areas and future developmental directions will be identified from the report. Furthermore, the evaluation report has a great impact on the use of strategic funding including recruitment, infrastructures and doctoral programs.

The RAE evaluation also offers an opportunity for the RCs to plan how to achieve excellence in their field of research and stimulate the use of multidisciplinary and transdisciplinary research approaches for building innovative and internationally significant RCs. As a result, the RCs can improve their success in applications for competitive external funding, including the Academy of Finland Centre of Excellence program.

The evaluation was conducted by three panels, "Health and Biosciences", "Human Sciences" and "Technology and Natural Sciences", formed primarily according to the special research focus areas of University of Oulu. In the three participation categories (*veni, vidi, vici*; see Chapter 2.2.) the evaluation will focus on the following aspects of the RCs research:

- Scientific quality and innovativeness
- Feasibility of the research plan
- Scientific merits
- Societal impact
- Research environment and collaboration
- Promotion of professional careers in research
- International competitiveness or comparability.

## 2.2. Participation categories veni – vidi – vici

The second RAE was targeted at RCs at University of Oulu (consortium of 15-120 persons, consisting of several research groups) which were formed on the basis of collaboration in research and doctoral training. The participating RC may include researchers across department and faculty boundaries. Thus, the participating RCs did not need the approval of their faculty or an independent institute, even though it was recommended that faculties and independent institutes encourage their researchers to participate.

The RCs could participate in the evaluation under one of the following categories:

**Veni –New research vistas/openings:** The research of the participating RC represents an innovative opening. This can be a new combination of research fields, a new competitive line of research at University of Oulu, or a special social, national or international demand. Even if the RC in its present form has yet to obtain the proof of international success, its members should show convincing evidence of the high scientific level of their previous research. Examples: Young, independent researchers proposing new openings after a successful postdoc period (typically abroad); experienced researchers with significant new vistas/openings. The minimum number of research teams is two (2).

**Vidi – On the threshold of international breakthrough/recognition:** The research of the participating RC is of high quality, but the community has yet to achieve strong international recognition and scientific breakthrough in their field. The RC has strong potential and clear plans on how to improve its international scientific level and impact. This includes determined and systematic methodological development of their research aim and good opportunities to compete successfully for national and international external funding. The minimum number of research teams is three (3).

**Vici – World class research:** The research of the participating RC represents the international cutting edge in its field. The minimum number of research teams is three (3).

Each RC determined in which category (veni – vidi – vici) of evaluation it participated. The panellists could change the evaluation category of the RC, if necessary, but they had to validate their reasons for changing the category. Each RC could be only registered in a single category (veni, vidi or vici).

## 2.3. Construction of the Research Community

The following instructions were given regarding the Research Communities:

**Research Community (RC):** The size of the RC is 15 – 120 persons including the Head of the RC, the other Principal Investigators (PIs: research team leaders), the doctoral students, the postdoctoral and senior researchers, and the technical staff, all currently employed by University of Oulu. If a person is not currently employed (i.e. on 1 December, 2012) by University of Oulu, then the person in question should be an active member of the RC, e.g. by having a personal grant, research grant or other external research funding administered by University of Oulu during 2007-2012 (exceptions are handled on a case-by-case basis). Doctoral students should be members of University of Oulu Graduate School (UniOGS) by 7 January, 2013 at the latest.

**Principal Investigator (PI):** The PI is a research team leader of an RC. The PI is currently employed (i.e. on 1 December, 2012) by the University of Oulu or is a current active member of the University's research community and is affiliated to the university, e.g. by having external funding administered by University of Oulu during 2007-2012 (exceptions are handled on a case-by-case basis). In addition, PI carries out her/his own independent research project and has doctoral students/postdoctoral researchers and/or external funding. Only one PI/research team is accepted here.

**The Head of the RC** is one of the RC's PIs and can be a member only in the RC she/he heads.

**Postdoctoral and senior researchers, as well as other RC personnel,** should be currently employed (i.e. on 1 December, 2012) by University of Oulu or they should be current active members of the University's research community, for example by having a personal grant, research grant or other external research funding administered by University of Oulu during 2007-2012 (exceptions are handled on a case-by-case basis).

**Doctoral students** should be current members of UniOGS (by 7 January, 2013 at the latest).

**Additional instructions:** The Head of the RC, senior researchers, postdocs, doctoral students and other personnel can only participate in one RC. The other PIs from the vidi/vici category can also act as PIs in one RC of the Veni category, provided that they are proven to have a key role in that RC.

**A docentship** (i.e. adjunct professorship) alone does not correspond to a current active member at University of Oulu.

The participating RCs can co-operate with national/international researchers/teams outside of University of Oulu. Such researchers/teams cannot, however, be included in the number of researchers/teams in the participating RC and their publications without an affiliation to the University of Oulu and they cannot be included in the RC's bibliometric analysis.

## 2.4 The project main phases

The evaluation proceeded through three stages: 1) registration, 2) submission of evaluation materials in two steps, and 3) external peer review. As the evaluation will involve international experts, the participants are asked to submit all evaluation materials in English.

### 2.4.1 Registration for the evaluation, 1 December, 2012 – 7 January, 2013

Participating Research Communities had to register for the RAE2013 evaluation between 1 December, 2012 and 7 January, 2013 using the two (2) registration forms available on <http://www oulu.fi/english/RegistrationRAE2013>.

Registration for the evaluation was binding and a prerequisite for participation.

When registering, the RCs were requested to provide basic information about the composition, scientific research field/fields and the participation category. In addition, the RCs were asked to provide a description of the practical motives ('operational basis') for forming the consortium, as well as a public description of the research proposed for evaluation. In addition, the RCs were expected to select the panel and to propose scientific experts for the panels. When making proposals for panellists, the RC must take into consideration the regulations on disqualification of reviewers. Very multidisciplinary RCs may suggest two or even three panels where they wish to be evaluated.

The two (2) registration forms had to be sent to the Registrar's office of University of Oulu ([kirjaamo@oulu.fi](mailto:kirjaamo@oulu.fi)) by e-mail. The deadline for the registration was on 7 January, 2013, at 3 p.m., local time.

The RCs updated the publications from the years 2007-2011 in the "Oulun yliopisto tutkii" (SoleCris) database of University of Oulu by the deadline of 25 January, 2013.

**Acceptance of registration and search for panellists:** The RAE Steering Group accepted the registrations. Research Communities got notifications confirming whether they fulfil the requirements for the second RAE participation by the end of January, 2013. The search for panellists began at the beginning of February, 2013.

### 2.4.2 Submission of additional evaluation material during 1 – 28 February, 2013

The RCs were asked to submit the following information to the Registrar's office of University of Oulu ([kirjaamo@oulu.fi](mailto:kirjaamo@oulu.fi)) by e-mail. The deadline for registration is 28 February, 2013, at 3 p.m., local time.

The information required as additional evaluation material:

- Name of the RC and the Head of the RC as in registration Step 1
- Curriculum vitae (CV, maximum four pages) of the Principal Investigators (PIs and the Head of RC).
- List of selected publications of each PI (max. 20 publications per person with an open timeframe and place of work at that time).
- Top 20 scientific publications of the RC with an open timeframe and place of work at that time (consortium level, not just the publications of PIs).
- Max. five (5) most significant competitive external grants (in total) received by RC members between 1 January, 2007 and 31 December, 2012 (the Academy of Finland, the Finnish Funding Agency for Technology and Innovation TEKES, the EU, foundations, other national funding, other international funding)

The forms and detailed information of the material requested by 28 February, 2013 were available on RAE2013 website <http://www oulu.fi/english/RAE2013> from January, 2013.

### 2.4.3 Submission of research plan for 2014 – 2018, during 1 March – 2 April, 2013

The RCs were asked to submit the research plan to the Registrar's office of the University of Oulu (kirjaamo@oulu.fi) by e-mail. The deadline for registration is 2 April, 2013 at 3 p.m. local time. NO additions/alterations to the forms are allowed after submission.

The RC's five-year research plan for 2014 – 2018 shall be no more than six (6) pages, covering items 1–4 presented below (spacing 1, Times New Roman 12 pt or equivalent):

- Scientific quality and innovativeness
- Scientific merits of researchers
- Research environment
- Position of the RC with regard to the world leaders in the field and the RC's international collaborators/networks. If the RC has a special national character of research, then international comparability of the RC is described.

#### The information required for the Research Community's five-year research plan:

##### 1. Scientific goals and innovativeness:

- Background to research, any previous research related to the topic, research objectives
- Expected results and scientific impact
- Scientific added value expected from the RC activity (justifications for why the implementation of the research plan requires an RC instead of normal research collaboration)
- Expected social impact
- Possible risks on implementation of the research

##### 2. Scientific merits of researchers:

- Describe the merits and scientific expertise of the RC Head insofar as these benefit the RC leadership
- Describe the merits and scientific expertise and supplementary expertise the PIs add to the RC
- Describe the expertise of the research teams that they add to the RC

##### 3. Research environment:

- Describe the infrastructure (including RCs) provided by the research environments
- Describe how the research project will promote creative research environments (e.g. strengthening framework conditions for multidisciplinary, interdisciplinary or transdisciplinary research, promoting national and/or international co-operation and researcher training, proposed structural changes, etc.)

##### 4. Position of the RC with regard to the world leaders in the field:

- Pinpoint the position of the RC with regard to the world leaders in your field/s. If the RC has a *special national character of research*, then pinpoint *international comparability* of the RC. Name 2–3 research units or teams whose research program and research questions are close to your own and that you consider your major reference teams/scientific competitors. Justify your view.
- Name the most important international collaborators/networks of the RC and describe the nature of the co-operation (common funding, consortium/research team, infrastructure, research visits, doctoral education etc.)

The form and detailed instructions for the research plan requested by 2 April, 2013, were available at the RAE2013 info bank [http://www.oulu.fi/english/Info\\_bank](http://www.oulu.fi/english/Info_bank) from February, 2013.

## 2.4.4. RAE evaluation performed by expert panels

There will be three evaluation panels:

- Health and Biosciences
- Human Sciences
- Technology and Natural Sciences

The Rector of the University of Oulu nominated the panel members during June – September, 2013, as requested by the Research Council (Table 1).

**Table 1.** Names, affiliations and gender of the members of the three evaluation panels (Health & Biosciences, Human Sciences, Technology and Natural Sciences).

<b>PANEL: HEALTH &amp; BIOSCIENCES</b>		
<b>Name</b>	<b>Affiliation</b>	<b>Gender</b>
Chairman, Professor Linda Sandell	Washington University, USA	F
Professor Wael Al-Delaimy	University of California, USA	M
Professor Koos (Jacobus) Boomsma	University of Copenhagen, Denmark	M
Professor Mats Björklund	Uppsala University, Sweden	M
Professor Günter Breithardt	University of Muenster, Germany	M
Professor Olli Carpén	University of Turku, Finland	M
Professor Howard T. Jacobs	University of Tampere, Finland	M
Professor Karl E. Kadler	University of Manchester, UK	M
Professor Jonathan A. King	Massachusetts Institute of Technology, USA	M
Professor Ingrid Meulenbelt	Leiden University, The Netherlands	F
<b>PANEL: HUMAN SCIENCES</b>		
<b>Name</b>	<b>Affiliation</b>	<b>Gender</b>
Chairman, Professor Kirsi Tirri	University of Helsinki, Finland	F
Professor Charles Antaki	Loughborough University, UK	M
Professor Li-Rong Lilly Cheng	San Diego State University, USA	F
Professor Bo Edvardsson	Karlstad University, Sweden	M
Professor Guðmundur Heiðar Frímannsson	University of Akureyri, Iceland	M
Professor Marjatta Hietala	University of Tampere, Finland	F
Professor Stephen A. Mrozowski	University of Massachusetts Boston, USA	M
Professor Lars Olson	University of Maryland, USA	M
Professor Kirsten Simonsen	University of Roskilde, Denmark	F
Professor Jan Vermunt	University of Cambridge, UK	M

<b>PANEL: TECHNOLOGY &amp; NATURAL SCIENCES</b>		
<b>Name</b>	<b>Affiliation</b>	<b>Gender</b>
Chairman, Professor Herbert W. Roesky	Göttingen University, Germany	M
Professor Kari Astala	University of Helsinki, Finland	M
Professor Luis M. Correia	Technical University of Lisbon, Portugal	M
Professor Silvano Donati	University of Pavia, Italy	M
Professor Eero Eloranta	Aalto University, Finland	M
Professor Joseph Holden	University of Leeds, UK	M
Professor Ritske S. Huisman	University of Bergen, Norway	M
Professor Hannu Jaakkola	Tampere University of Technology, Finland	M
Professor Jacob A. Moulijn	Delft University of Technology, The Netherlands	M
Professor Erkki Oja	Aalto University, Finland	M
Professor Alexander Ruzmaikin	California State University, USA	M
Professor Panos Tsakirooulos	University of Sheffield, UK	M

Country distribution of the 32 panellists is the following: 8 from Finland, 7 from USA, 5 from U.K., 2 from Denmark, Germany, Sweden and The Netherlands, one from Iceland, Italy, Norway and Portugal. A clear majority, 26 of the panellists, were male and 6 were female.

#### **Evaluation process by the panels:**

Upon registration the RC was asked to select in which panel(s) they are evaluated. The evaluators received all the material that the RC has submitted and the results of bibliometric analysis of the RC's scientific publications in June – July, 2013:

- Registration forms
- CVs of PIs
- 20 selected publications of PIs
- 20 selected publications of RC
- Information on RC's grants
- Research plan of the RC for 2014-2018
- Result of RC's bibliometric analysis done by CWTS/Leiden or University of Oulu Library
- Detailed instructions and forms for the evaluators
- For background information, the guidelines for the participating RCs, general information about the Finnish university system, information on University of Oulu, and the summary report of the previous evaluation RAE2007

The panellists worked with the applications from July to September, 2013. The panel in question was asked to rate the application numerically from six (6) to one (1):

- 6 - Outstanding, stands out for exceptional novelty, innovativeness and scientific significance
- 5 - Excellent, extremely good in international comparison – no significant elements to be improved
- 4 - Very good, contains some elements that could be improved
- 3 - Good, contains elements that could be improved
- 2 - Unsatisfactory, in need of substantial modification or improvement
- 1 - Weak, severe flaws that are intrinsic to the proposed project or the plan.

The panellists are asked to give written feedback on the RCs

- Strengths
- Areas of development
- Other remarks

- Recommendations

In addition, the panels were asked to rank the RCs within each category.

The evaluation form and detailed instructions for evaluators were provided in a separate document "[RAE2013 Evaluation Report – Instructions for Panellists](#)".

**Table 2.** Timetable and division of labour of the RAE evaluation.

MONTH, YEAR	EVALUATION OFFICE	PARTICIPATING RESEARCH COMMUNITY (RC)
March 2012	Rector Lauri Lajunen nominates the RAE Steering Committee on 2 March, 2012.	
September 2012	RAE opening by the Rector (20 September, 2012 at 10:00). Briefing sessions at Faculties begin. Opening of RAE web pages. Publication of the guidelines for participation in the evaluation.	
October 2012	Briefing sessions at Faculties continue on 2 October, 2012.	
December 2012		Registration of the RCs for the evaluation begins on 1 December, 2012.
January 2013	Notifications sent to the Research Communities confirming whether they fulfil the requirements for participation.	Registration for the evaluation ends on January 7, 2013, at 3 p.m., local time.  RCs' scientific articles (2007–2011) updated to Oulun yliopisto tutkii (SoleCris) database by 21 January, 2013.
February 2013	Search for panellists begins.	Submission of the RCs' lists of publications, and PIs' CVs to Steering Committee during 1 – 28 February, 2013.
March – April 2013	University level bibliometric analysis of data from the SoleCris database.	Submission of the RCs' research plans to Steering Committee by 1 March – 2 April, 2013.
May 2013	Nomination of panellists.	
June 2013	Nomination of panellists continues. Evaluation materials to the panellists.	
July-September 2013	Nomination of panellists continues. Evaluation materials to the panellists. Panels at remote work.	
October 2013	Panel meetings in Oulu in 16 – 17 October, 2013. Written feedback from the panellists.	
November 2013	Consensus meeting of the panels in Copenhagen in 7 – 8 November, 2013. Written feedback from the panels.	
January 2014	Official Release and publication of RAE2014 Report on 28 January, 2014.	
February - May 2014	Feedback from RCs and final conclusions by the Steering Committee, Research Council and the Board of Directors.	

During the meetings in Oulu and Copenhagen, each panel ranked its own applications, separately in each participation category *veni – vidi – vici*. After that, the three panels discussed the applications together and carried out the final ranking for each category *veni – vidi – vici* across the panels' scientific borders. The panels gave their written feedback in November, 2013. Based on the RAE2013 evaluation, the best RCs from each of the



three participation categories Veni-Vidi-Vici will receive an extra long-term annual funding. The level of funding received will be scaled according to the RCs' personnel size. Finally, the RC-specific and university level reports were published in January, 2014.

## **2.4.5. Timetable and division of labour**

Table 2 shows the RAE timetable and division of labour.

## **3. BIBLIOMETRIC ANALYSIS**

Bibliometric analysis is one of the standard methods of evaluating academic publishing. Bibliometric evaluation typically measures the output, quality and impact of scientific publishing. The most common measures are publishing activity, the number of citations a publication has had, and the quality of the publications.

In RAE2014 the bibliometric analyses were based on the scientific publications of the RCs from the years 2007-2011 recorded in the publications database *Oulun yliopisto tutkii* of the University of Oulu. The database consists of publications that are either affiliated with the University of Oulu or whose author is employed by the University of Oulu. The bibliometric analyses were carried out at the RC level, not at the individual researcher level.

The bibliometric analyses were carried out by professionals at the Centre for Science and Technology Studies (CWTS), Leiden University, the Netherlands, and at Oulu University Library. The analyses performed by CWTS were based on standard methods using indicators that have been widely tested and approved. Only articles and reviews in journals covered by the Web of Science (WoS) database were included in the CWTS analyses. For those RCs that had a substantial conference proceedings output CWTS performed a separate citation analysis based on WoS Conference Proceedings Citation Indexes. As WoS does not cover all fields of science equally well, it cannot be used for impact analyses for all RCs. For these fields, Oulu University Library has carried out additional analyses to describe both their publishing activity and the quality and impact of the publications.

The bibliometric analyses of the RCs and a detailed description of the bibliometric methods are presented in Annexes.

## **4 KEY FINDINGS FOR EACH RESEARCH COMMUNITY AND RECOMMENDATIONS**

### **4.1. Research Communities**

Altogether 49 RCs were registered for the RAE2014 evaluation (Table 3). The evaluation was done by three scientific panels (Health & Biosciences, Human Sciences, Technology & Natural Sciences) representing the special research focus areas of the University of Oulu, and including 10 - 12 members in each panel. The panel members were national and international experts who based their evaluation on the materials submitted by the participating Research Communities and on the bibliometric analyses of their scientific productivity. The RCs individually selected the panels by which they wished to be evaluated. Four RCs were evaluated by two panels, and one RC was evaluated by three panels.

**Table 3.** The table shows the RCs classified according to evaluation panel (H&B - Health & Biosciences, HS – Human Sciences, T&NS – Technology & Natural Sciences), the category 'veni – vidi – vici', RC acronym, full name of the RC, the name of RC Head and the names of the other principal investigators (PI) belonging to the RC. In addition, the numbers of research groups and personnel in each RC are listed. The number of RCs evaluated by the different panels was 15 by H&B, 16 by HS and 24 by T&NS. Four RCs were evaluated by two panels and one RC was evaluated by three panels.

Panel	Category	Research Community (RC) acronym	RC name	RC Head	Other RC research group leaders (PIs)	Number of research groups	Number RC of personnel
H&B	Veni	GSC	Gastrointestinal Surgical Community	<b>Jyrki Mäkelä</b> , Faculty of Medicine, Institute of Clinical Medicine	<b>Juha Saarnio</b> , Faculty of Medicine, Institute of Clinical Medicine <b>Vesa Koivukangas</b> , Faculty of Medicine, Institute of Clinical Medicine <b>Tero Rautio</b> , Faculty of Medicine, Institute of Clinical Medicine	4	17
H&B	Veni	OASIS	Oulu Arthritis Consortium - Synergy is Solution	<b>Osmo Tervonen</b> , Faculty of Medicine, Institute of Diagnostics	<b>Roberto Blanco</b> , Faculty of Medicine, Institute of Diagnostics <b>Sohvi Hörkkö</b> , Faculty of Medicine, Institute of Diagnostics <b>Jaro Karppinen</b> , Faculty of medicine, Institute of Clinical Medicine <b>Petri Lehenkari</b> , Faculty of Medicine, Institute of Biomedicine <b>Juhana Leppilahti</b> , Faculty of Medicine, Institute of Clinical Medicine <b>Minna Männikkö</b> , Faculty of Medicine, Institute of Health Sciences <b>Miika Nieminen</b> , Faculty of medicine, Institute of Diagnostics <b>Juha Risteli</b> , Faculty of medicine, Institute of Diagnostics <b>Simo Saarakkala</b> , Faculty of Medicine, Institute of Biomedicine <b>George Sandor</b> , Faculty of Medicine, Institute of Dentistry	11	81
H&B	Veni	OCCI	Oulu Center for Clinical Immunology	<b>Riitta Veijola</b> , Faculty of Medicine, Institute of Clinical Medicine	<b>Petri Kulmala</b> , Faculty of Medicine, Institute of Clinical Medicine and Institute of Diagnostics <b>Paula Vähäsalo</b> , Faculty of Medicine, Institute of Clinical Medicine <b>Virpi Glumoff</b> , Faculty of Medicine, Institute of Diagnostics	4	35
H&B	Veni	Phototransduction	Phototransduction Mechanisms in Mammalian Brain	<b>Markku Timonen</b> , Faculty of Medicine, Institute of Health Sciences	<b>Seppo Saarela</b> , Faculty of Science, Department of Biology <b>Vesa Kiviniemi</b> , Faculty of Medicine, Institute of Diagnostics	3	15

H&B	Veni	PopStatGen	Population and statistical ecology	<b>Outi Savolainen</b> , Faculty of Science, Department of Biology	<b>Jouni Aspi</b> , Faculty of Science, Department of Biology <b>Mikko Sillanpää</b> , Faculty of Science, Department of Biology, Biocenter Oulu <b>Marko Mutanen</b> , Faculty of Science, Department of Biology <b>Gonghong Wei</b> , Faculty of Medicine, Institute of Biomedicine, Biocenter Oulu	5	27
H&B	Vidi	COMET	Carcinogenesis: Origin, Mechanisms and Treatment	<b>Tuomo Karttunen</b> , Faculty of Medicine, Institute of Diagnostics	<b>Arja Jukkola-Vuorinen</b> , Oulu University Hospital, Unit of Oncology and Radiotherapy <b>Peeter Karihtala</b> , Faculty of Medicine, Institute of Clinical Medicine <b>Petri Koivunen</b> , Faculty of Medicine, Institute of Clinical Medicine, Oulu University Hospital <b>Ulla Puistola</b> , Faculty of Medicine, Institute of Clinical Medicine <b>Tuula Salo</b> , Faculty of Medicine, Institute of Dentistry <b>Taina Turpeenniemi-Hujanen</b> , Faculty of Medicine, Institute of Clinical Medicine <b>Markku Vaarala</b> , Faculty of Medicine, Institute of Clinical Medicine	8	61
H&B	Vidi	GPC-DEDE	Genetic, Physiological and Clinical Aspects of Development and Degeneration - From the Newborn to the Oldest of the Old	<b>Kari Majamaa</b> , Faculty of Medicine, Institute of Clinical Medicine	<b>Johanna Uusimaa</b> , Faculty of Medicine, Institute of Clinical Medicine <b>Sami Tetri</b> , Faculty of Medicine, Institute of Clinical Medicine <b>Vesa Kiviniemi</b> , Faculty of Medicine, Institute of Diagnostics	4	48
H&B	Vidi	Proteus	Protein Structure and Function Research Community	<b>Lloyd Ruddock</b> , Faculty of Science, Department of Biochemistry, Biocenter Oulu	<b>Anthony M. Heape</b> , Faculty of Medicine, Institute of Biomedicine <b>Kalervo J. Hiltunen</b> , Faculty of Science, Department of Biochemistry, Biocenter Oulu <b>Veli-Pekka Jaakola</b> , Faculty of Science, Department of Biochemistry, Biocenter Oulu <b>André Juffer</b> , Faculty of Science, Department of Biochemistry, Biocenter Oulu <b>Alexander Kastaniotis</b> , Faculty of Science, Department of Biochemistry, Biocenter Oulu <b>Sakari Kellokumpu</b> , Faculty of Science, Department of Biochemistry	13	83

					<p><b>Thomas Kietzmann</b>, Faculty of Science, Department of Biochemistry, Biocenter Oulu</p> <p><b>Inari Kursula</b>, Faculty of Science, Department of Biochemistry</p> <p><b>Lari Lehtiö</b>, Faculty of Science, Department of Biochemistry, Biocenter Oulu</p> <p><b>Steffen Ohlmeier</b>, Faculty of Science, Department of Biochemistry, Biocenter Oulu</p> <p><b>Ulla Petäjä-Repo</b>, Faculty of Medicine, Institute of Biomedicine</p> <p><b>Rick Wierenga</b>, Faculty of Science, Department of Biochemistry, Biocenter Oulu</p>		
H&B	Vici	CVR-Co	Cardiovascular Research Community	<b>Heikki Huikuri</b> , Faculty of Medicine, Department of Internal Medicine	<p><b>Heikki Ruskoaho</b>, Faculty of Medicine, Institute of Biomedicine</p> <p><b>Antero Y. Kesäniemi</b>, Faculty of Medicine, Institute of Internal Medicine</p> <p><b>Tapio Seppänen</b>, Faculty of Technology, Department of Computer Science and Engineering</p> <p><b>Tatu Juvonen</b>, Oulu University Hospital, Institute of Clinical Medicine</p>	5	83
H&B	Vici	DynaHEALTH	Dynamics and Determinants of Life Course Health and Well-being	<b>Sirkka Keinänen-Kiukaanniemi</b> , Faculty of Medicine, Institute of Health Sciences	<p><b>Anja Taanila</b>, Faculty of Medicine, Institute of Health Sciences</p> <p><b>Hanna Ebeling</b>, Faculty of Medicine, Institute of Clinical Medicine</p> <p><b>Karl-Heinz Herzig</b>, Faculty of Medicine, Institute of Biomedicine and Biocenter Oulu</p> <p><b>Jaro Karppinen</b>, Faculty of Medicine, Institute of Clinical Medicine</p> <p><b>Raija Korpelainen</b>, Faculty of Medicine, Institute of Health Sciences</p> <p><b>Minna Männikkö</b>, Faculty of Medicine, Institute of Health Sciences</p> <p><b>Seppo Saarela</b>, Faculty of Science, Department of Biology</p> <p><b>Jukka Hakkola</b>, Faculty of Medicine, Institute of Biomedicine</p> <p><b>Markku Savolainen</b>, Faculty of Medicine, Institute of Clinical Medicine</p> <p><b>Juha Tapanainen</b>, Oulu University Hospital, Department of Obstetrics and Gynecology</p> <p><b>Juha Veijola</b>, Faculty of Medicine, Institute of Clinical Medicine</p>	14	120

					<p><b>Jorma Virtanen</b>, Faculty of Medicine, Institute of Dentistry</p> <p><b>Marjo-Riitta Järvelin</b>, Faculty of Medicine, Institute of Clinical Medicine</p>		
H&B	Vici	Tissue Homeostasis	Tissue development, homeostasis and malignancy	<b>Johanna Myllyharju</b> , Biocenter Oulu and Faculty of Medicine, Institute of Biomedicine	<p><b>Taina Pihlajaniemi</b>, Biocenter Oulu and Faculty of Medicine, Institute of Biomedicine</p> <p><b>Seppo Vainio</b>, Biocenter Oulu and Faculty of Medicine, Institute of Biomedicine</p> <p><b>Robert Winqvist</b>, Biocenter Oulu and Faculty of Medicine, Institute of Clinical Medicine</p> <p><b>Aki Manninen</b>, Biocenter Oulu and Faculty of Medicine, Institute of Biomedicine</p> <p><b>Lauri Eklund</b>, Biocenter Oulu and Faculty of Medicine, Institute of Biomedicine</p> <p><b>Peppi Karppinen</b>, Biocenter Oulu and Faculty of Medicine, Institute of Biomedicine</p> <p><b>Raija Soinen</b>, Biocenter Oulu and Faculty of Medicine, Institute of Biomedicine</p> <p><b>Gonghong Wei</b>, Biocenter Oulu and Faculty of Medicine, Institute of Biomedicine</p> <p><b>Kaisa Tasanen-Määttä</b>, Faculty of Medicine, Institute of Clinical Medicine</p> <p><b>Susan Quaggin</b>, Biocenter Oulu and Faculty of Medicine, Institute of Biomedicine</p>	11	94
HS	Veni	AgeAds	The age of adjustments? Critical and historical perspectives on governing citizens, wellbeing and environment	<b>Hannu I. Heikkinen</b> , Faculty of Humanities, Major Subject Cultural Anthropology	<p><b>Petteri Pietikäinen</b>, Faculty of Humanities, Major Subject History of Science and Ideas</p> <p><b>Heini Hakosalo</b>, Faculty of Humanities, Major Subject History of Science and Ideas</p> <p><b>Kari Väyrynen</b>, Faculty of Humanities, Minor Subject Philosophy</p> <p><b>Jarkko Saarinen</b>, Faculty of Science, Department of Geography</p>	5	39
HS	Veni	CREMA	Community of Research in Education Music and Arts	<b>Juha Ojala</b> , Faculty of Education, Department of Educational Sciences and Teacher Education	<b>Hannu Heikkinen</b> , Faculty of Education, Department of Educational Sciences and Teacher Education	2	18
HS	Veni	INSPIRIES	Institutions and Practices of New Literacies	<b>Maija-Leena Huotari</b> , Faculty of Humanities, Major Subject Information	<b>Erkki Karvonen</b> , Faculty of Humanities, Major Subject Information Studies	4	23

				Studies	<b>Riitta-Liisa Korkeamäki</b> , Faculty of Education, Department of Educational Sciences and Teacher Education <b>Jukka Rieki</b> , Faculty of Technology, Department of Computer Science and Engineering		
HS	Vidi	ACG	Accounting Decisions and Corporate Governance	<b>Juha-Pekka Kallunki</b> , Oulu Business School, Department of Accounting	<b>Petri Sahlström</b> , Oulu Business School, Department of Accounting <b>Janne Järvinen</b> , Oulu Business School, Department of Accounting	3	19
HS	Vidi	BARC	RC in Bioarchaeological Research	<b>Markku Niskanen</b> , Faculty of Humanities, Major Subject Archaeology	<b>Jouni Aspi</b> , Faculty of Science, Department of Biology <b>Timo Ylimaunu</b> , Faculty of Humanities, Major Subject Archaeology <b>Juha Tuukkanen</b> , Faculty of Medicine, Institute of Biomedicine	4	29
HS	Vidi	CLRC	Child language research center	<b>Sari Kunnari</b> , Faculty of Humanities, Major Subject Logopedics	<b>Anneli Yliherva</b> , Faculty of Humanities, Major Subject Logopedics <b>Taina Välimaa</b> , Faculty of Humanities, Major Subject Logopedics <b>Soile Loukusa</b> , Faculty of Humanities, Major Subject Logopedics	4	29
HS	Vidi	COMPANION	The Complexities of Organizational Activities	<b>Tuija Mainela</b> , Oulu Business School, Department of Management and International Business	<b>Jaana Tähtinen</b> , Oulu Business School, Department of Marketing <b>Pia Hurmelinna-Laukkanen</b> , Oulu Business School, Department of Management and International Business <b>Pauliina Ulkuniemi</b> , Oulu Business School, Department of Marketing	4	64
HS	Vidi	EduPhil	Educational Theory and Philosophy	<b>Pauli Siljander</b> , Faculty of Education, Department of Educational Sciences and Teacher Education	<b>Vanessa Oliveira</b> , Faculty of Education, Department of Educational Sciences and Teacher Education <b>Kari Väyrynen</b> , Faculty of Humanities	3	26
HS	Vidi	HEAT	Heterogeneity in Economic Applications and Theory	<b>Rauli Svento</b> , Oulu Business School, Department of Economics	<b>Artti Juutinen</b> , Oulu Business School, Department of Economics <b>Jaakko Simonen</b> , Oulu Business School, Department of Economics <b>Mikko Puhakka</b> , Oulu Business School, Department of Economics	4	25
HS	Vidi	Living Stories	Narratives in Education - Living Stories in Theory and Practice	<b>Leena Syrjälä</b> , Faculty of Education, Department of Educational Sciences and Teacher Education	<b>Ella Estola</b> , Faculty of Education, Department of Educational Sciences and Teacher Education <b>Raimo Kaasila</b> , Faculty of Education, Department of Educational Sciences and Teacher Education	3	26

HS	Vidi	TE	Transcultural Encounters	<b>Veli-Pekka Lehtola</b> , Faculty of Humanities, Major Subject Saami Culture, Giellagas Institute	<b>Kari Alenius</b> , Faculty of Humanities, Main Subject History <b>Olavi Fält</b> , Faculty of Humanities, Main Subject History <b>Pekka Kuusisto</b> , Faculty of Humanities, Main Subject Literature <b>Veli-Pekka Lehtola</b> , Faculty of Humanities, Giellagas Institute <b>Harri Mantila</b> , Faculty of Humanities, Main Subject Finnish Language <b>Henry Oinas-Kukkonen</b> , Faculty of Humanities, Main Subject History <b>Maija Kallinen</b> , Faculty of Humanities, Main Subject History of Science and Ideas <b>Matti Enbuske</b> , Faculty of Humanities, Main Subject History	9	64
HS	Vici	COACT	Complexity of (inter)action: Towards an Understanding of Skilled Multimodal Participation	<b>Elise Kärkkäinen</b> , Faculty of Humanities, Major Subject of English Philology	<b>Leena Kuure</b> , Faculty of Humanities, Major Subject of English Philology <b>Pentti Haddington</b> , Faculty of Humanities, Major Subject of English Philology	3	12
HS	Vici	LET	Learning and Educational Technology Research Unit	<b>Sanna Järvelä</b> , Faculty of Education, Department of Educational Sciences and Teacher Education	<b>Hanna Järvenoja</b> , Faculty of Education, Department of Educational Sciences and Teacher Education <b>Pirkko Hyvönen</b> , Faculty of Education, Department of Educational Sciences and Teacher Education	3	22
HS	Vici	RELATE-OULU	Crossing Borders: The Relational and Territorial Politics of Bordering, Identities and Transnationalisation	<b>Anssi Paasi</b> , Faculty of Science, Department of Geography	<b>Sami Moisio</b> , Faculty of Science, Department of Geography <b>Jarkko Saarinen</b> , Faculty of Science, Department of Geography	3	17
T&NS	Veni	BIGS	Biomimetics and Intelligent Systems	<b>Juha Röning</b> , Faculty of Technology, Department of Computer Science and Engineering	<b>Seppo Vainio</b> , Biocenter Oulu and Faculty of Medicine, Institute of Biomedicine	2	26
T&NS	Veni	Multi-ScaleTest	Multi-Scale Testing and Trans-scale Modelling of High-Performance Materials	<b>Ivan Argatov</b> , Faculty of Technology, Department of Mechanical Engineering	<b>David Porter</b> , Faculty of Technology, Department of Mechanical Engineering <b>Yrjö Louhisalmi</b> , Faculty of Technology, Department of Mechanical Engineering <b>Erkki Laitinen</b> , Faculty of Science, Department of Mathematical Sciences	4	20

T&NS	Veni	OSSI	Oulu Software and Systems Initiative	<b>Markku Oivo</b> , Faculty of Science, Department of Information Processing Science	<b>Veikko Seppänen</b> , Faculty of Science, Department of Information Processing Science <b>Harri Haapasalo</b> , Faculty of Technology, Department of Industrial Engineering and Management	3	22
T&NS	Veni	PSH	Persuasive Systems for Health	<b>Harri Oinas-Kukkonen</b> , Faculty of Science, Department of Information Processing Science	<b>Petri Pulli</b> , Faculty of Science, Department of Information Processing Science <b>Timo Jämsä</b> , Faculty of Medicine, Institute of Biomedicine <b>Raija Korpelainen</b> , Faculty of Medicine, Institute of Health Sciences <b>Markku Savolainen</b> , Faculty of Medicine, Institute of Clinical Medicine	5	35
T&NS	Veni	SusBen	Sustainable Beneficiation	<b>Hannu Kuopaniemi</b> , Faculty of Technology, Department of Process and Environmental Engineering, Oulu Mining School	<b>Eero Hanski</b> , Faculty of Science, Department of Geology <b>Kauko Kujala</b> , Faculty of Technology, Department of Process and Environmental Engineering	3	15
T&NS	Vidi	CASR	Centre for Advanced Steels Research	<b>Timo Fabritius</b> , Faculty of Technology, Department of Process and Environmental Engineering	<b>David Porter</b> , Faculty of Technology, Department of Mechanical Engineering <b>Kauko Leiviskä</b> , Faculty of Technology, Department of Process and Environmental Engineering	3	42
T&NS	Vidi	IEM	Industrial Engineering and Management	<b>Jaakko Kujala</b> , Faculty of Technology, Department of Industrial Engineering and Management	<b>Harri Haapasalo</b> , Faculty of Technology, Department of Industrial Engineering and Management <b>Seppo Väyrynen</b> , Faculty of Technology, Department of Industrial Engineering and Management <b>Pekka Kess</b> , Faculty of Technology, Department of Industrial Engineering and Management	4	50
T&NS	Vidi	iUBI	UBIquitous Interactions	<b>Timo Ojala</b> , Faculty of Technology, Department of Computer Science and Engineering	<b>Jukka Riekkö</b> , Faculty of Technology, Department of Computer Science and Engineering <b>Kari Kuutti</b> , Faculty of Science, Department of Information Processing Science <b>Vasileios Kostakos</b> , Faculty of Technology, Department of Computer Science and Engineering	4	47
T&NS	Vidi	MOMA	Molecular Materials	<b>Risto Laitinen</b> , Faculty of Science, Department of Chemistry	<b>Marko Huttula</b> , Faculty of Science, Department of Physics <b>Petri Kursula</b> , Faculty of Science, Department of Biochemistry <b>Jyrki Lappalainen</b> , Faculty of Tech-	6	89



					nology, Department of Electrical Engineering <b>Juha Vaara</b> , Faculty of Science, Department of Physics <b>Matti Wekström</b> , Faculty of Science, Department of Physics		
T&NS	Vidi	MtM	More-than-Moore	<b>Krisztian Kordas</b> , Faculty of Technology, Department of Electrical Engineering	<b>Tapio Fabritius</b> , Faculty of Technology, Department of Electrical Engineering <b>Matti Kinnunen</b> , Faculty of Technology, Department of Electrical Engineering <b>Jari Juuti</b> , Faculty of Technology, Department of Electrical Engineering <b>Mika Huuhtanen</b> , Faculty of Technology, Department of Process and Environmental Engineering <b>Heli Jantunen</b> , Faculty of Technology, Department of Electrical Engineering <b>Valery Tuchin</b> , Faculty of Technology, Department of Electrical Engineering <b>Anita Lloyd Spetz</b> , Faculty of Technology, Department of Electrical Engineering <b>Risto Myllylä</b> , Faculty of Technology, Department of Electrical Engineering	9	56
T&NS	Vidi	NorBE	Northern Bioeconomy	<b>Jouko Niinimäki</b> , Faculty of Technology, Department of Process and Environmental Engineering	<b>Juha Tanskanen</b> , Faculty of Technology, Department of Process and Environmental Engineering <b>Sanna Taskila</b> , Faculty of Technology, Department of Process and Environmental Engineering <b>Osmo Hormi</b> , Faculty of Science, Department of Chemistry <b>Ulla Lassi</b> , Faculty of Science, Department of Chemistry <b>Sampo Mattila</b> , Faculty of Science, Department of Chemistry <b>Hely Häggman</b> , Faculty of Science, Department of Biology	7	104
T&NS	Vidi	NRNE	Natural Resources of Northern Eurasia	<b>Wolfgang Maier</b> , Faculty of Science, Department of Geology	<b>Elena Kozlovskaya</b> , Sodankylä Geophysical Observatory <b>Toivo Korja</b> , Faculty of Science, Department of Physics <b>Eero Hanski</b> , Faculty of Science, Department of Geology	4	35

T&NS	Vici	ProChemE	Sustainable Solutions for Production Processes and Environmental Applications	<b>Riitta Keiski</b> , Faculty of Technology, Department of Process and Environmental Engineering	<b>Paavo Perämäki</b> , Faculty of Science, Department of Chemistry <b>Marja Lajunen</b> , Faculty of Science, Department of Chemistry <b>Esa Muurinen</b> , Faculty of Technology, Department of Process and Environmental Engineering	4	50
T&NS	Vici	AMASS	Applied Mathematics and Statistics	<b>Lasse Holmström</b> , Faculty of Science, Department of Mathematical Sciences	<b>Marko Huhtanen</b> , Faculty of Technology, Department of Electrical Engineering <b>Markku Lehtinen</b> , Sodankylä Geophysical Observatory <b>Valery Serov</b> , Faculty of Science, Department of Mathematical Sciences <b>Mikko Sillanpää</b> , Faculty of Science, Department of Biology	5	29
T&NS	Vici	CAS	Circuits and Systems Group	<b>Juha Kostamovaara</b> , Faculty of Technology, Department of Electrical Engineering	<b>Timo Rahkonen</b> , Faculty of Technology, Department of Electrical Engineering <b>Juha Häkkinen</b> , Faculty of Technology, Department of Electrical Engineering	3	25
T&NS	Vici	CMV	Center for Machine Vision Research	<b>Matti Pietikäinen</b> , Faculty of Technology, Department of Computer Science and Engineering	<b>Guoying Zhao</b> , Faculty of Technology, Department of Computer Science and Engineering <b>Janne Heikkilä</b> , Faculty of Technology, Department of Computer Science and Engineering <b>Olli Silven</b> , Faculty of Technology, Department of Computer Science and Engineering	4	41
T&NS	Vici	DCE	Department of Communications Engineering	<b>Matti Latva-aho</b> , Faculty of Technology, Department of Communications Engineering	<b>Markku Juntti</b> , Faculty of Technology, Department of Communications Engineering <b>Savo Glisic</b> , Faculty of Technology, Department of Communications Engineering <b>Harri Posti</b> , Faculty of Technology, Department of Communications Engineering	4	103
T&NS	Vici	MA	Mathematical Analysis	<b>Esa Järvenpää</b> , Faculty of Science, Department of Mathematical Sciences	<b>Mahmoud Filali</b> , Faculty of Science, Department of Mathematical Sciences <b>Peter Hästö</b> , Faculty of Science, Department of Mathematical Sciences <b>Mikael Lindström</b> , Faculty of Science, Department of Mathematical Sciences	4	24

T&NS	Vici	SPARC	Space Physics and Astronomy RC	<b>Ilya Usoskin</b> , Sodankylä Geophysical Observatory and Faculty of Science, Department of Physics	<b>Timo Enqvist</b> , Faculty of Science, Department of Physics <b>Heikki Salo</b> , Faculty of Science, Department of Physics <b>Kalevi Mursula</b> , Faculty of Science, Department of Physics <b>Juri Poutanen</b> , Faculty of Science, Department of Physics <b>Esa Turunen</b> , Sodankylä Geophysical Observatory	6	51
H&B, T&NS	Veni	GlobalHealth (panels H&B, T&NS)	Global Change, Geography, Environment and Public Health Research	<b>Jouni K. Jaakkola</b> , Center for Environmental and Respiratory Health Research and Faculty of Medicine, Institute of Health Sciences	<b>Maritta Jaakkola</b> , Faculty of Medicine, Institute of Clinical Medicine and Center for Environmental and Respiratory Health Research <b>Tiina Ikäheimo</b> , Faculty of Medicine, Institute of Health Sciences <b>Olli Vainio</b> , Faculty of Medicine, Institute of Diagnostics <b>Jarmo Rusanen</b> , Faculty of Science, Department of Geography <b>Jan Hjort</b> , Faculty of Science, Department of Geography <b>Vasileios Kostakos</b> , Faculty of Technology, Department of Computer science and Engineering	7	44
H&B, HS, T&NS	Veni	LUMINOUS (panels H&B, HS, T&NS)	Sustainable Northern Communities: Integrating Smart Systems, Structures and Change	<b>Eva Pongrácz</b> , Thule Institute	<b>Arja Rautio</b> , Thule Institute, Centre for Arctic Medicine <b>Vappu Sunnari</b> , Faculty of Education, Department of Educational Sciences and Teacher Education <b>Seija Jalagin</b> , Faculty of Humanities, Main Subject History <b>Maria-Liisa Järvelä</b> , Faculty of Education, Department of Educational Sciences and Teacher Education <b>Helka-Liisa Hentilä</b> , Faculty of Technology, Department of Architecture <b>Aulikki Herneoja</b> , Faculty of Technology, Department of Architecture <b>Anri Kivimäki</b> , Faculty of Technology, Department of Communications Engineering <b>Enso Ikonen</b> , Faculty of Technology, Department of Process and Environmental Engineering <b>Kauko Leiviskä</b> , Faculty of Technology, Department of Process and Environmental Engineering <b>Jaakko Rämö</b> , Thule Institute <b>Andreotti De Oliveira</b> , Faculty of	16	120

					<p>Education, Department of Educational Sciences and Teacher Education</p> <p><b>Timo P. Karjalainen</b>, Thule Institute</p> <p><b>Elena Kozlovskaya</b>, Sodankylä Geophysical Observatory</p> <p><b>Esa Muurinen</b>, Faculty of Technology, Department of Process and Environmental Engineering</p> <p><b>Anne Tolvanen</b>, Thule Institute</p>		
HS, T&NS	Veni	MAD-2C (panels T&NS) HS,	Multimodal Analysis of Dynamic Cooperative Communication	<b>Seppo J. Laukka</b> , Faculty of Education, Department of Educational Sciences and Teacher Education	<p><b>Hannu Soini</b>, Faculty of Education, Department of Educational Sciences and Teacher Education</p> <p><b>Marjatta Takala</b>, Faculty of Education, Department of Educational Sciences and Teacher Education</p> <p><b>Tapio Seppänen</b>, Faculty of Technology, Department of Computer Science and Engineering</p> <p><b>Matti Lehtihalmes</b>, Faculty of Education, Department of Educational Sciences and Teacher Education</p>	5	18
H&B, T&NS	Vidi	iPoB (panels H&B, T&NS)	Integrative Population Biology	<b>Juha Tuomi</b> , Faculty of Science, Department of Biology	<p><b>Markku Orell</b>, Faculty of Science, Department of Biology</p> <p><b>Jukka Forsman</b>, Faculty of Science, Department of Biology</p> <p><b>Marko Mutanen</b>, Faculty of Science, Department of Biology</p>	4	42
H&B, T&NS	Vidi	NEBES (panels H&B, T&NS)	Northern Environment, Biodiversity and Ecosystem Services Research	<b>Bjørn Kløve</b> , Faculty of Technology, Department of Process and Environmental Engineering	<p><b>Jani Heino</b>, Faculty of Science, Department of Biology</p> <p><b>Risto Virtanen</b>, Faculty of Science, Department of Biology</p> <p><b>Anne Tolvanen</b>, Thule Institute Research Centre (and Finnish Forest Research Institute)</p> <p><b>Timo Muotka</b>, Faculty of Science, Department of Biology</p> <p><b>Timo P. Karjalainen</b>, Thule Institute Research Centre</p> <p><b>Jan Hjort</b>, Faculty of Science, Department of Geography</p> <p><b>Heikki Mykrä</b>, Thule Institute Research Centre</p> <p><b>Jari Oksanen</b>, Faculty of Science, Department of Biology</p>	9	49

## 4.2. Research Community (RC) specific evaluation

The results of the RC-specific evaluation are presented by evaluation panel as follows:

- A. RCs evaluated by the Panel of Health and Biosciences (H&B)
- B. RCs evaluated by the Panel of Human Sciences (HS)
- C. RCs evaluated by the Panel of Technology and Natural Sciences (T&NS)
- D. RCs evaluated by two or three panels

The results are presented by category (Veni, Vidi and Vici) inside each panel, and in alphabetical order inside the category. The RCs evaluated by two to three panels (D.) are shown accordingly.

### A. Health & Biosciences (H&B)

#### CATEGORY: VENI

##### A.1. RC GSC - Gastrointestinal Surgical Community; RC Head Jyrki Mäkelä

###### A.1.1. Scientific quality and innovativeness of the research plan

While the individual topics to be studied may be of importance, this application lacks coherence and seems to be simply a collection of mainly doctoral projects which, by their own, may be of certain significance and value (or even important) but do not show any aspects of networking and of striving for synergies that should be aimed at in such an RC. Planned activities are poorly described and do not provide the necessary information. There is the lack of a common theme and hypothesis driven research.

As there are no hypotheses presented, it is difficult to determine whether there would be any scientific breakthroughs. There does not seem to be any ground-breaking research plans that could yield important results. There is lack of multidisciplinary approaches, including experimental surgery.

There is no plan for collaboration in these projects, of sharing resources and methods. Therefore, the application fails to develop synergies.

###### A.1.2. Feasibility of the research plan

There is a lack of overall consideration regarding vital issues such as potential pitfalls, problems of methodology, potential solutions, etc. No research methods have been described.

It is not indicated whether or not the planned resources (personnel, financial and other material resources) are adequate for the implementation of the planned RC activities.

The RC is comprised of four research groups with Jyrki Mäkelä, the Head of the RC. The other members are: Docent Juha Saarnio, Head of General and Gastroenterological Unit of the Oulu University Hospital and Research Team Leader - Upper GI surgery, general surgery (four students and a senior researcher); Docent Vesa Koivukangas, Consultant Surgeon in the Surgical Intensive CareUnit, Research Team leader - Upper GI surgery, obesity surgery (student and 1 other laboratory member); Tero Rautio, Head of Lower GI surgery, Research Team Leader - colorectal surgery, pelvic surgery, infections, laparoscopic surgery (7 students and senior researchers). The following RC members are senior researchers: Heikki Takala, Gastrointestinal surgery, senior researcher in esophageal cancer, colorectal surgery, pelvic surgery, etc. Thesis on Biomarkers in esophageal cancer in 2012; Kai Klintrup, Gastrointestinal surgery, senior researcher - colorectal cancer, surgery, etc Thesis on Inflammation and invasive front in colorectal cancer in 2012; Sanna Meriläinen, Gastrointestinal surgeon, senior researcher in pancreatitis, obesity surgery. Thesis on Experimental pancreatitis in 2/2013. In addition, 10 doctoral students and one clinical teacher are listed. One does not get an idea about how this RC wants to organise itself. The network is mainly limited to surgeons, and the other disciplines are only listed as Collaborators.

No Materials management plan has been shown. There are ethical issues involved, and it can only be assumed that these issues will be taken into account.

### **A.1.3. Competence of the RC and research teams**

There is an inhomogeneous presentation of separate research projects which may be an indication that leadership is missing. Leadership is also not evident elsewhere, e.g. by having collected experiences in other scientific networks, large projects, etc.

The overall publication record of the RC is weak. The publication record of the director is adequate, however, not strong and he has only one selected last-author publication within last five years. The overall quality of the publication records of the PIs seems to be average. The merits and scientific expertise of PIs is not evident. The publication records of the teams are weak.

It is not apparent from the application whether the PIs bring complementary expertise to the RC project. Accordingly, it is not apparent whether or not the division of labour between the various research teams/sub projects of the consortia is appropriate. It is feasible that both the upper GI and lower GI could be complementary, and there must be a solid, scientific basis, but it is not discussed.

### **A.1.4. Research environment and collaboration**

Besides scientific added value, there is no added apparent value of working as an RC.

Section 4 of the application, while intended to cover significant national research collaborations, does not address this. There are no known, major international collaborations that could contribute to the work of the RC.

### **A.1.5. Significance of the RC for the researcher training and promotion of professional careers in research**

Doctoral students are the backbone of this RC but no plans for a systematic process of qualification are presented. There appears to be great potential here, but this has not been displayed. No information is available, but it must be assumed these doctoral students will become surgeons. It is unfortunate, though, that they will not be supported with proper research.

### **A.1.6. Societal impact**

Positive results in the individual projects could have some impact on management of patients with various entities but no major societal breakthrough is expected.

### **A.1.7. International competitiveness or international comparability**

The RC does not compete with international research although individual aspects of the expected results might be of interest internationally. Some aims may improve patient treatment, at least locally. For international impact, concerted action is needed.

### **A.1.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

This is an incomplete application that may have been put together by a secretary who is not trained in providing relevant content. It is incomplete and probably should not pass administrative review. There is no science to review.

To quote from the instructions below, I would say "There is no ambition to develop the community". Overall, an application that does not meet the requirements for integrated research in an RC. This is unfortunate because they appear to have a great deal of resources and interested young people – and importantly, they are in an academic medical center, where research could be at the cutting edge. The current leaders of this program appear to be uninterested, but they are missing a potentially wonderful opportunity.

### **A.1.9. Final rating (1 – 6): 1,5 (weak - unsatisfactory)**

## **A.2. RC OASIS – Oulu Arthritis Consortium – Synergy is Solution; RC Head Osmo Tervonen**

### **A.2.1. Scientific quality and innovativeness of the research plan**

Osteoarthritis (OA) being a multifactorial complex disease, it is innovative to combine expertise of various research fields such as biomarkers, pathogenesis and therapy in the study of osteoarthritis. However, the aims in

the RC are broad and cover the entire field of OA. As such, they would appear to be exceedingly ambitious for the relatively inexperienced RC in the OASIS research field to undertake.

The aims are (too) broad and ambitious, since this RC is trying to cover the entire field of OA. More explicitly, the RC aims to identify DNA variants (mutations?), new image techniques and biomarkers without the availability of a clear described patient population. Numerous experienced groups in OA research around the world (in academia and industry) with many OA patients groups are working on these impediments already for years. The lack of a specific view point on which type of OA will be studied (patient populations are not available yet) reveals their relative inexperience.

There is a great need for multidisciplinary approaches in OA so it will be a large scientific added value when working as a research community. However, a prerequisite is that there will be phenotypically well characterised patient population in a follow up design with focus on one or few OA subtypes in which various disciplines could learn and benefit from each other. Given that a large part of the RC members are specialists in the spine, it would have been more logical to expand this specific and relevant OA phenotype rather than trying to tackle the whole of OA with respect to genetics, imaging and biomarkers.

#### **A.2.2. Feasibility of the research plan**

Except for the early genetic studies of intervertebral disc degenerations, it appears as though the RC does not have sufficient expertise in the broad problem area of articular joint OA. Relevant patient populations need to be collected and characterised, preferably in a follow up design. The groups are, individually, well funded, but not for projects related to the RC. As mentioned above, the structure, organisation and interaction between the disciplines that will accomplish the necessary synergy of the multidisciplinary design are not well described. Will there be focus on degeneration of discs across the disciplines?

No information about the Materials management plan is provided. Accordingly, no information is provided on ethical issues which exist as far as studies in humans are concerned.

#### **A.2.3. Competence of the RC and research teams**

RC head Tervonen has a broad base of medical and research experience and administration, which is essential for bringing together the kind of diverse team assembled for this RC. Furthermore, the individual participants have good publication records. However, in this RC there is no primary expert or recent publication record in the OA field that may be crucial to tackle the important issues of biomarker, imaging, molecular and genetic mechanisms of OA. PIs and overall RC have good publication records in the specialised areas but not appropriate for tackling musculoskeletal OA pathology. Indeed, the RC will combine complementary expertise and the division of labour between them seems well distributed.

#### **A.2.4. Research environment and collaboration**

Since this is a newly developed RC, and many of the PIs have not participated in cooperative research with each other, the value from their proposed interaction is unclear. However their joining of forces is certainly a step forward in this important but difficult area.

The compatibility of the research with the strategy of the host institution appears good. Since the RC will be located in both the Medical Campus of Oulu University and the Oulu University Hospital, they have access to all Biocenter Oulu/University of Oulu infrastructure (especially imaging) facilities for their studies. There is no specific University support mentioned and these facilities should be available to all faculties, which may be necessary to establish a well-defined OA patient population with available biological specimen. The RC has access to the facilities on the University of Oulu and Oulu University Hospital campuses.

Actually the RC needs international collaboration with established OA research groups in the specific fields of biomarkers, genetics and imaging (possibly high field MRI).

#### **A.2.5. Significance of the RC for the researcher training and promotion of professional careers in research**

The multidisciplinary approach will be suitable for doctoral students to integrate activities into larger frameworks. A coherent OA doctoral program remains to be developed. The objectives and resources of the RC to support postdoctoral research careers and promote researcher mobility seems to be adequately thought of.

#### **A.2.6. Societal impact**

If the project delivers on its aims then the societal impact of the RC will be very large since osteoarthritis is a frequent and disabling disease with large economic burden due to lack of effective therapy.

#### **A.2.7. International competitiveness or international comparability**

In all areas, the outside scientists are ahead of this group, except maybe for the groups working on the genetics of spine disease (Dr. Männikkö).

#### **A.2.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

As stated in the project the study of OA requires a multidisciplinary approach but also focus on specific OA subtypes due to the large phenotypic heterogeneity to obtain new scientific breakthroughs in OA disease management and to allow the necessary synergy. The current proposal aims to approach the enigma of OA from three important directions; pathogenesis, diagnostics and therapy. There is a risk that successful outcome is hampered by the lack of experience in the OA field, research focus and no consensus on the OA subtype under study nor the availability of a large (prospective) patient population at present.

#### **A.2.9. Final rating (1 – 6): 3,5 (good – very good)**

### **A.3. RC OCCI – Oulu Center for Clinical Immunology; RC Head Riitta Veijola**

#### **A.3.1. Scientific quality and innovativeness of the research plan**

The OCCI RC is a group of clinical immunologists working in a number of different areas related to immunological diseases of the childhood. The RC plans to develop immunological laboratory methods, particularly characterization of immunological cells and their function, to use shared laboratory personnel and equipment and to utilise specific expertise within each research group, to collect common patient and sample material and to apply comprehensive long-term funding for OCCI. Much of the plan relates to common infrastructure, while the overall research goals are not that well stated. For example, it was not made clear in the grant what innovative research was being done to develop new tools to characterise immune cells.

As part of common activities, the RC has established an excellent Flow Cytometry Core Facility, which also serves as a core facility for the entire faculty. Also, the RC has a well-established biobank for HLA-conferred T1D and individuals at risk, and is still recruiting samples. These elements lay a basis for potentially significant research quality.

The excellent prospectively collected clinical material (especially for T1D studies) together with the clinical expertise of the PIs is a major asset. The availability of additional methods and the intellectual focus on the commonalities between the pathobiology of these diseases could lead to new discoveries. The risk lies in the exact questions that will be asked regarding the clinical samples that will be obtained and have been obtained in their long term prospective studies on type I diabetes. It is not clear, whether similar samples from other diseases can be obtained. As all of the members of the RC are clinical scientists, the addition of more strength in the basic science area (biochemistry, and molecular and cell biology) would be needed to drive innovative research at a competitive pace.

Individually, the projects are not dependent on the funding and implementation of each other, but will certainly benefit from synergy and potential common funding. The added value is that the technologies used to study these diseases will have a great deal in common both methodologically and intellectually. In addition, the RC may provide improved access to cells and patient material. It is, however, not quite clear, whether all groups will similarly benefit from the flow cytometry techniques, proliferation tests and PBMC analysis (cytokine profiles and T cell suppression assay) that are a key element of this proposal. The RC intends to have regular brain storming sessions and meetings to improve communication and student training, which is certainly encouraged. However, with only 4 PIs and a clinical-focus to the PIs, these brain storming sessions could become inward looking. Students (and PIs) would benefit from interactions with other RCs at Oulu.

#### **A.3.2. Feasibility of the research plan**

One particular strength of the RC (related to T1D) is the availability of biological samples from individuals in the prediabetic phase and all through the seroconversion to multiple islet autoantibodies and clinical disease. They



plan to analyse the immune system in various phases of T1D by PBMC subpopulation analysis, in vitro T-cell proliferation assays for specific antigens (e.g. various wheat-based antigens), measurement of cytokine responses produced during in vitro T-cell stimulation and in vitro suppression tests. While each PI expresses the desire to find pathobiological mechanisms that manifest immune response in the diseases, it is not clear that the tests developed for T1D will be appropriate for the analysis of other subprojects. Also, there will be a great deal of disease-specific parameters with the specimens collected, the important area of accurate diagnosis and staging and the preparation of the cells, mRNAs or proteins for analysis - this was not addressed. Overall, the methodologies proposed by the RC are rather limited; therefore, successful research requires major collaboration outside the RC. This is only described for the T1D part of the proposal.

While the flow cytometry unit and common sample collection and storing will be a useful addition to the planned resources, the RC would need several other technologies and areas of expertise to be able to implement their plan. Stronger critical mass and basic science skills would be needed to drive innovative research beyond classification and diagnostics.

Dr. Veijola is the leader of the group and Dr. Glumoff is the head of the Flow Cytometry Facility. The roles of the other members of the RC are not indicated except that they will participate in meetings and continue their current research programs.

The track record in prospective and high quality material collection as part of the national network is a major achievement. It is understood that this activity will continue. As for the ethical issues involved, it is assumed that all of the clinical studies comply with the University and University Hospital policies.

#### **A.3.3. Competence of the RC and research teams**

The RC director Riitta Veijola is a specialist in pediatrics and pediatric endocrinology. Her research background is in genetics and in pathomechanisms and natural course of type I diabetes. The publication record of Riitta Veijola is very good and primarily clinical in nature. However, it should be noted that the highest ranking publications are of collaborative nature, with other groups at the leading position. The leadership skills of the RC director are excellent as she has had leading roles in many clinical studies and within the University. She is responsible for the cross-national prospective Type I Diabetes Prediction and Prevention (DIPP) study. There are a number of high quality publications, but only very few of these have the RC PIs as a last author.

While these RCs are certainly translational groups, all of the scientists are essentially clinical investigators. The scientific design of laboratory experiments may require more collaboration with strong immunologists.

#### **A.3.4. Research environment and collaboration**

All of the groups appear to have the same approach to their diseases. While there is realisation that these diseases have an underlying immunological component, this combination of groups may have only limited added value. To become real leaders in their field (instead of being a collaborative group to others) the RC should rethink their real expertise and link with basic science groups to initiate a paradigm shift in their work. For research training, the RC students should be encouraged to participate in group meetings and seminar series across the faculty, as the research focus and methodological approach otherwise remain limited.

Clinical medical research is strong in Oulu, and this project provides additional strength to this field. The networking is very important as the size of the catchment population of Oulu University Hospital is limited. In some areas (especially T1D) there is marked and important ongoing national collaboration.

International collaborations are planned with the strategy that they will invite former and current collaborators to visit University of Oulu and send current young researchers abroad to expand their training. All members of the OCCI with the exception of Dr. Glumoff and Dr. Veijola, were trained at the University of Oulu with some experience in Helsinki. Therefore there is limited international education experience in the RC. On research side, there is some important international collaboration (e.g. TEDDY project).

#### **A.3.5. Significance of the RC for the researcher training and promotion of professional careers in research**

There are currently nine doctoral students in the OCCI RC. The panel feels that the RC is rather small and technologically too narrow to offer an optimal environment to discuss and form collaborations for the students. Compared to other RCs, OCCI PIs do not have a major track record in supervised PhDs (3 altogether). There is no mention of post-doctoral training.

### **A.3.6. Societal impact**

The RC addresses major chronic diseases, and therefore has potential for major societal impact. However, the RC is still small and in its infancy. Thus, it is rather difficult to foresee the societal impact at this time. When the RC grows, diversifies the PI community (more PhD basic science researchers) and forms links with other RCs, it will begin to have a greater impact.

### **A.3.7. International competitiveness or international comparability**

Some aspects of the RC (e.g. cohorts) are of excellent quality, but as a whole, the research profile needs to be more clear. The Finnish research project DIPP (including Dr. Veijola) has been collecting samples since the 1990's and is the largest biobank and databank in the world of children with increased HLA-conferred risk for T1D. Dr. Veijola is very involved at the international level having an NIH funded grant with Dr. Jeffrey Krischer. In the area of T1D, this laboratory plays a role internationally. The food allergy group is recently established and does not (yet) have an international reputation. For the other diseases, there are a few laboratories internationally that are cited as having similar interests.

### **A.3.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

The panel sees OCCI as an important RC with a clinically oriented focus. Among its strengths is the unique specimen collection (primarily for T1D) and expertise in flow cytometry, which is dispersed as a core service also for other RCs. The research and administrative record of the PI, Dr. Veijola, is excellent as is her funding. The panel felt that tackling with relevant and focused research questions could lead to new discoveries. Biobank is an excellent source of specimens both for internal and external collaborative research. The RC was established a year ago and has just begun to interact. It is laudable and reasonable that when the related topics are being put together into a research community, eventually new knowledge should be applicable to all.

OCCI has only 4 members and therefore the critical mass for achieving long term research objectives may be inadequate. The composition of the RC is biased towards clinical diagnostics, which is highly valuable, but needs a research arm in order to achieve an international status. As the approaches of each RC group are similar, it is not clear if the tests planned to be performed together will relate to all of the diseases. Also, as the groups are similar in interests, new information will have to come from the outside and a clear plan to get new information and keep up with the advances in immune disease internationally are lacking.

The panel feels that OCCI would benefit from recruiting new PIs with expertise in animal models of T1D and other autoimmune disorders, on which to build strength in genetics, molecular biology and cell biochemistry. A possibility is that this RC joins with another RC which has additional core support in cell biology and molecular biochemistry. The students in OCCI would benefit from access to more, and differently skilled, PIs. At an appropriate time, the OCCI can then establish independence.

### **A.3.9. Final rating (1 – 6): 3,0 (good)**

## **A.4. RC Phototransduction – Phototransduction Mechanisms in Mammalian Brain; RC Head Markku Timonen**

### **A.4.1. Scientific quality and innovativeness of the research plan**

This is an interesting and large, still quite unexplored field of research which is especially pertinent for a site in a Northern country like Finland. The submission outlines a very specific research project rather than the broad, collective research of a community of scientists. Furthermore, it is unclear if the project represents more than a part of the ongoing research of the named PIs.

It appears that the research project challenges a generally accepted paradigm, and, thus, is both intrinsically innovative but also risky. Present results are promising although often very preliminary. Recent work from members of the RC is mentioned but not referenced which makes assessment of the data and conclusions somewhat difficult. The question of its quality may be judged only in regard to the validity of the preliminary findings, which are mentioned but not presented. The findings that outside light can reach the brain seem to be quite old and should have been confirmed in the meanwhile supported by a reference. At least, some of the data from clinical examinations are supporting this effect. Since the project has not yet been funded, based on

expert peer-review, and the RC director does not report any currently active external funding relevant to the project, its quality cannot be considered favourably at this time.

The chances of success can only be properly judged after the project has been evaluated by expert peer-review for an appropriate funding agency. The project addresses a novel paradigm but besides a preliminary test of the hypothesis, it seems to be largely descriptive and to lack development. Its outcome with regard to wide clinical application is uncertain with respect to the present still early stage of research. This is, however, not an argument against performing this type of research at a place like Oulu with its Northern location.

The formation of an RC will strengthen this unique field but this research while being needed, might also be performed in a smaller research environment. The project as set out clearly requires expertise from different scientific disciplines.

#### **A.4.2. Feasibility of the research plan**

No timetable is given and the methods are sketched out in insufficient detail to be able to judge how far they are appropriate. The above point regarding peer-review is reiterated. Ethical permission for a study on human subjects is mentioned, but how this study addresses the main hypothesis of opsin involvement is not clear. No alternative approaches are considered, and the possibility of the main hypothesis being false has not been taken into account.

The qualification of the individual researchers appears good to very good. However, at this time, the project does not have any obvious source of granted funding, although the main infrastructure for the work appears to be in place. The submission refers to a number of PhD students who will be recruited, but the set of experiments as proposed here does not obviously constitute material for more than one high-impact publication, let alone the 8-10 envisaged ones.

The RC includes the necessary fields but still may need inclusion of trialists and statisticians. The management structure of the project is not very clear. It is stated to form the subject of an ERC consolidator grant application, but the identity of the applicant is unstated.

No Materials management plan is presented: however, its relevance isn't obvious. Ethical approval for a study in human subjects has been obtained. However, the type of study is not detailed.

#### **A.4.3. Competence of the RC and research teams**

The leader of the RC has a creditable track record in clinical research, mainly addressing physiological correlates of depression and diabetes. His publications are mostly in well-respected clinical or healthcare journals, with one review article in BMJ. Apart from reviewer and editorial tasks, he holds only one international position of trust (relevant to teaching rather than research). Since he has held an independent academic post for 10 years, most of this time spent at professorial level, but has published only one significant, original paper relevant to the application (in a specialised physiology journal, plus a hypothesis paper), it is debatable whether "Veni" status is appropriate. Despite evidence of success in academic leadership and documented management skills, it is also unclear whether Prof Timonen has sufficient experience of experimental neuroscience such as would be required to steer a project of the type proposed.

Two other PIs also do not fit clearly into the category 'Veni', although the project is clearly a new departure for them. Dr. Saarela has held an academic post for 35 years, and has been head of department for over a decade. He holds substantial research funding for an apparently unrelated project, but none of his selected publications is more recent than 2005, and most of them are from the 1980s. They are mainly in solid physiology and zoology journals, in the field of thermoregulation, rather than photobiology. Dr. Räsänen has been Professor of Psychiatry in Oulu for over 12 years. However, she does not list any publications after 2003, although prior to that had published in leading clinical journals. Pubmed searches do reveal, however, that she continues to publish writings in specialised clinical, psychiatric and health science journals. However, few of her papers seem to be thematically related to the project outlined here. Dr. Kiviniemi is a younger investigator, holding an independent position since 2007, with significant external funding and senior author publications in good journals of his field (radiology), with a middle authorship on a PNAS paper having >60 authors.

The listed publications of RC Phototransduction are again mostly from prior to 2005, and few are in any obvious way relevant to the project outlined. Taken as a whole, the listed publications of the RC do not identify it as a dynamic and coherent scientific community on the verge of a significant breakthrough in neurobiology.

The envisaged collaboration in an RC attempts to bring together different expertise. The four PIs come from completely different fields (radiology, animal physiology, psychiatry and clinical epidemiology), but there is no clear explanation of how each will be involved. The proposal to profile effects of visible light on opsin expression in the brain and on brain electrical activity (as visualised radiologically), should use the expertise of Saarela and Kiviniemi, respectively. The roles of the other PIs are less clear. To stand a good chance of success, the project should ideally involve also molecular cell biologists, experts in transgenic animals and behavioural geneticists.

#### **A.4.4. Research environment and collaboration**

The project itself is inter-disciplinary in nature. However, any integration of activity beyond the specific scientific project is not outlined in the submission. The host institution prioritises inter-disciplinary research; this project fits the description well.

The research topic has a unique position within the country and as such stands alone. This may explain that no such collaborations are described in the submission. International collaboration with researchers in Magdeburg, Germany, is indicated, but exactly how this contributes to the project is unclear. An international network is also referred to, regarding doctoral education, although no details are given. In this topic area, they might reach an internationally leading position if their research resulted in major findings which based on the present proposal does not seem very probable.

#### **A.4.5. Significance of the RC for the researcher training and promotion of professional careers in research**

The doctoral training to be received under the project will be guided by the university's graduate school, to whose principles it adheres. The importance of international training is also emphasised. No involvement of the long established structures in place in the Biocenter Oulu doctoral programme is mentioned, however. One concern is the absence of postdocs in the research teams, who would normally take a major role in PhD student training. Nor is it clear who the primary supervisor of the PhD students will be.

Researchers from Magdeburg will be hosted in the RC, as indicated above, although a more systematic aspiration to promotion of postdoctoral careers and mobility is missing.

#### **A.4.6. Societal impact**

The project addresses a topic of societal concern. The research team is already involved with the manufacturer of a device for bright light therapy of seasonal depression. If successful in the longer term, the project could have a positive impact on the health of the local community in northern Finland. Thus, any positive results of this research might have an important societal impact.

#### **A.4.7. International competitiveness or international comparability**

The RC claims to represent a unique constellation of researchers. In the neurosciences community more widely, it is less obvious that these scientists have a high standing. With positive results, they would reach an important position, internationally. Yet, the opposite will happen, should their underlying hypothesis remain unconfirmed.

#### **A.4.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

An interesting but also challenging field of research which may give the RC an excellent position internationally and may have an important influence on the management of seasonal depression in the country.

The RC is very small and proposes to work on a highly focused, inter-disciplinary, high-risk project. Due to the relatively narrow focus of this RC, the work could also be done separately in a small research network, provided that adequate funding would be available from other sources. The results may help to obtain a better understanding of the mechanisms and the potential of bright light therapy.

Whilst this may produce a significant advance in knowledge, the other research of the groups of the RC is not documented here, making it hard to judge the overall status of the research environment. Before the present project can be considered a viable activity of the RC, it needs to be properly validated and funded, based on expert peer-review, which is clearly beyond the scope of the RAE. Preferably, the RC should present a wider portfolio of activities, commensurate with the real career stage of its members.

#### **A.4.9. Final rating (1 – 6): 2,0 (unsatisfactory)**

## **A.5. RC PopStatGen – Population and Statistical Genomics; RC Head Outi Savolainen**

### **A.5.1. Scientific quality and innovativeness of the research plan**

It is highly important to develop new bioinformatic and statistical skills to analyse e.g. next generation sequencing data. Here the synergy and interaction between the groups is well taken care of.

The field of population and statistical genomics has entered a new era with the access to genome level data in practically any species due to new sequencing technology producing vast amounts of data such that classical questions on genetics can now be addressed such as the genetic basis of adaptive variation, and new questions can be posed, such as the finding of the genomic patterns of transcription factor binding or genomic distribution of natural selection. This RC is a forward looking combination of traditional population genetics combining the broad areas of plant genetics (local climatic adaptation in perennial plants), Conservation Genetics, conservation in the context of endangered taxa, particularly large carnivores, Insect Genetics (phylogenetics of Lepidoptera and evolution of immune defences), with the computational approach of Statistical Genetics (developing statistical variable selection methods) and the group of Gonghong Wei using genomic approaches to annotate single nucleotide polymorphisms. This is a powerful group that will tie genome-wide association studies and other methods of identifying gene variants that could contribute to specific traits, with the statistical methods required to annotate and analyse the massive amounts of data obtained.

This is solid population biology throughout, but it is difficult to find the innovative aspects, as the descriptions mostly refer to traditions of doing specific kinds of research. Director and PIs publish in good journals, but where is this RC going to make a difference internationally? How this work stands out from what other population biology departments do? The idea is to combine excellent empirical work groups with a high-class analytical group and that will result in a group of excellent quality. The RC as such is not innovative.

This RC has a high likelihood of success. Given the experience of the leading group, this RC will produce significant new research without doubt. Each group is outstanding and the combination of interests appears to be easily complementary. Efficient analyses of large molecular datasets will eventually lead to scientific breakthroughs and thus the progress of science in the every field. This RC plans to move forward with multiple foci, which are all likely to make fundamental contributions and some have clear innovative excellence potential.

There do not appear to be risks as long as the plan is executed as stated. Potential risks that could threaten the project are the large collaborative efforts across the world that work on these problems in centers that have ample availability on real datasets such as, for example, ENCODE.

High scientific added value of working as an RC will directly come from the interaction of experience between classic population genetics, conservation and plant genetics to the application of the new era of molecular methods for genome wide analyses. It would have been interesting to know which shared publication this RC had in mind. The groups have been working together for a few years and they all clearly fit under a joint population biology umbrella, but it remains unclear what the significant synergy effects have been, and how interdisciplinary approaches will lead to further advances.

### **A.5.2. Feasibility of the research plan**

The research approach is very sound and the methods proposed are in the frontline of research: population and evolutionary genetics are at the point where genome-wide approaches are required. In addition patterns of gene expression, epigenetic or patterns of transcription factor binding are also being investigated. These groups form a natural community because of many common shared methodologies. Advancing the RC with shared methodologies are groups that can add the larger picture of population and evolutionary genetics. Finally, the focus on expertise in bioinformatics allows the scientists with the detailed specialty knowledge to collaborate with molecular geneticists to synthesize and understand the huge amount of data that will be generated.

As far as the text becomes concrete, plans appear feasible, but no in depth research foci have been made explicit and neither have we been given details on how field data, experiments and theory play together in a synergistic mix. The timeline is somewhat developed in individual lab descriptions, but not how they will interact as a group. Potential alternative approaches are not considered.

Each group of this RC is fairly well funded and support seems adequate and external funding OK, but not outstanding. There appears to be a large body of experience including the necessary super power computing resources via the Center of Scientific Computing.

There is strong background in addressing population or evolutionary genetics issues with the most advanced genomic tools available. The RC consists of five laboratories: Outi Savolainen (the PI), Mikko Sillanpaa, Jouni Aspi, Marko Mutanen and Gonghong Wei. Savolainen is an evolutionary and population geneticist also working in applied aspects of the field. She studies the genetic basis of adaptation to climatic conditions. She has extensive research leadership with international projects and students. She is supported by the Academy of Finland. Permanent members of her group are Kuittinen, in genetic mapping and gene expression, Pyhäjärvi in genome-wide population genetics of complex genomes (UC Davis), and Leinonen in field experiments for adaptations studies. Sillanpaa is an expert in statistics, having developed Bayesian methods for linkage mapping and association mapping and analysis of sequence variation. Nuortio is a post doc in the lab and is a mathematician. Aspi is an expert in conservation genetics using computational tools for demography of threatened populations and gene expression (Esparza-Salas). Mutanen heads an insect genetics group. Viljakainen is a bioinformatics expert and recently did a post doc at Cornell University. Wei is an expert in transcriptional regulation of gene expression on a genome-wide scale focusing on ETS transcription factors. He has collaborations with Dr. Sillanpaa. The groups will meet monthly and have a two day annual meeting. Students will be trained in individual labs with interactions with the other labs.

The Materials management plan does not seem to be explicitly relevant for this RC. There appears to be super power computing resources available that will be beneficial to all research groups.

#### **A.5.3. Competence of the RC and research teams**

The director, Dr. Savolainen has extensive leadership experience and international exposure and is head of the national population genetics doctoral program. She has been the Dean of the University of Oulu Graduate School (2011-2013), Chair of the Biology Dept Research committee, vice chair of the Department of Genetics and member of Biocenter Oulu executive group. She has an extensive funding history and current funding. She is an associate editor of Genetics and Evolutionary Applications and Theoretical and Applied Genetics. Her scientific impact is very high with 300 citations in 2012. Her publication record is outstanding, averaging 4 publications a year, since 1994. Furthermore, the other team leaders are all outstanding. Please see the above description for scientific expertise. All PIs have a high number of international collaborations (Bibliometric analysis) and they were rated highest MNCS in all areas including international. Each RC team leader is a world renowned expert in his or her respective field, and the publication record in human statistical genetics of Gonghong Wei stands out. The other merits listed for Director and 3 PIs merely lists areas of expertise, but no achievements.

The quality of the publication record of PopStatGen as an RC is mixed with three excellent groups and two less experienced group leaders. Overall, due to the three main groups the publication record is excellent but it is hard to see developments towards higher international impact.

The team leaders have different background and thus enhance the complementarity of the RC. They come from different statistical genetics and bioinformatic fields that will enlarge the synergy and their expertise is complementary as each is an expert in a different but related area.

#### **A.5.4. Research environment and collaboration**

Merging different fields of statistically, computer science and bioinformatically trained people will create an innovative research environment necessary to make progress beyond the current state of the art. The added value of the RC derives from research collaborations between groups and shared doctoral and postdoctoral training in the national population genetics doctoral program. The RC has regular joint seminars and infrastructure in terms of basic molecular tools and will develop sequencing capacity at the University. In addition, the RC has taken initiatives to coordinate PhD training in a broad interdisciplinary context but, as before, the innovation aspects are not made explicit.

The University has a strategic plan to increase bioinformatics at the university. This RC will use informatics extensively and have great depth of expertise. This project is aligned with the strategic aims of the University of Oulu to provide more availability and training in the area of applied bioinformatics. Host institution has made available Biocenter Oulu. The national center for scientific computing will provide IT. A resource within or out-

side the university that allows for a grid based structure allowing parallel analyses may be useful. In that respect shared computer time at CSC may be prerequisite.

The RC Director and PIs have solid Finnish/Nordic networks, but it is unclear how and why some of the international cooperations make a difference. The publication list for the entire RC has very few non-Nordic names, and quite some papers on which none of the PIs is an author. If international is taken to mean outside Finland and Sweden there is not too much in recent years that seems to make a difference. The RC should liaise with large international (human) initiatives such as Charge, ENCODE or 1000 genomes project.

#### **A.5.5. Significance of the RC for the researcher training and promotion of professional careers in research**

There is an active national population genetics doctoral program that the groups of this RC participate in. All of the groups appear to have good international interactions so that post-docs and students would have opportunities to study abroad. These items are not specifically addressed, except that the RC will continue to integrate PhD education better. They have EU funding, but Marie Curie bottom-up excellence initiatives are not mentioned.

National and international collaborations with large project will provide a very good postdoctoral research environment and it appears that postdoctoral training is an important part of the program for each investigator. All groups host at least some postdocs in addition to graduate students, but essentially all names of postdocs and graduate students are Finnish.

#### **A.5.6. Societal impact**

When efficient methods are being developed common need for better statistical / bio-informatic tools will be met. The societal impact is likely to be high as this RC directly engages in research on basic population approaches, the need to understand the joint effect of history and natural selection on current genetic variation, experimental methods and bioinformatics, and statistical analysis of the genome wide data. The methods that can be developed can be used in more applied areas. Having a well-integrated population biology RC in Oulu is important for Finnish Society at large and some of the applied work listed by the RC is directly relevant, but very little on how and why this is so has been explained in concrete terms.

#### **A.5.7. International competitiveness or international comparability**

There is quite a gap towards the international top in population biology, and it is hard to see how the PIs aim to narrow this gap in the coming years. As indicated, collaboration and integration from various bio-informatic and statistical modelling will allow a unique synergy to occur. The implementation of such teamwork may, in the near future, allow interaction with the international top. This approach will provide knowledge worldwide as can be attested to by the highly cited publications of the group.

#### **A.5.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

Three of the groups are high-class groups and they alone will make the RC a success. The strength of this RC lies in the strengths of the individual groups and their common interest in genome wide approaches that require a new era of sequencing of DNA, RNA, and other genome wide approaches that demand extensive computational analyses. The strength also is the combination of empirical work and new statistical methods.

The reviewers think that there is a need for more interaction between the bio-informatically and statistically trained people. When they strive to obtain true interaction between the disciplines a gap is filled and synergy will allow and research field improved.

#### **A.5.9. Final rating (1 – 6): 5,6 (excellent - outstanding)**

### **CATEGORY VID1**

## **A.6. RC COMET – Carcinogenesis: Origin, Mechanisms and Treatment; RC Head Tuomo Karttunen**

#### **A.6.1. Scientific quality and innovativeness of the research plan**

This RC is focused on early diagnosis, prognosis and predictive assessment of carcinomas. This is a particularly timely topic at the emerging era of personalised medicine. The RC is formed from groups in the Faculty of

Medicine and in Oulu University Hospital. There is a common interest in cancer with specialties in diagnostics, surgical and oncological treatment of cancer. The research groups have analysed epidemiology, risk factors, prognostic and predictive factors of various cancers including breast, gynecological, urological, gastrointestinal, as well as head and neck cancer. Some members of the RC have clinical commitments combined with a strong desire to improve patient health and outcome by carrying out top-flight research. This is a well written report with honest expectations and a modest action plan.

The research is solid, but a clear research direction was lacking. There was a consensus that COMET should develop a clear road map. This was explored at interview but it was unclear to the Panel what major discoveries COMET might expect to deliver during the coming 2-3 years. The desire to improve patient health is highly commendable and is the strength of this RC, who should be encouraged to continue as an RC. The Panel has specific suggestions that they hope COMET will find useful as they develop.

COMET has the potential to become a world-leading cancer centre but needs to develop strong basic science approaches. In particular, the Panel suggests that COMET considers building strengths in basic science. This might be achieved by attracting basic science PhD students and externally funded research fellows. Though new therapies may not emerge, there is reason to believe that the increased cooperation and collaboration among skilled clinical practitioners will lead to advances in diagnosis and assessment for classes of carcinomas that are most frequently seen at Oulu hospital.

The Biobank adds scientific and collaborative value. To maximise the usefulness of the Biobank, COMET needs to use validated methods of storing samples (tissue, blood and data) and making this information available to its users. A web-based interface could be useful.

#### **A.6.2. Feasibility of the research plan**

An aim was to improve flow of information, access to tumour and tissue samples, and mobilisation of new methodologies. Less developed is an actual research plan for tackling the carcinoma problem. Its complexity is recognised, as is the need for higher integration of local scientific resources, but a vision of scientific progress is limited. One aim was to focus on genomics, proteomics, systems biology and disease modelling and new treatments, but the aims did not materialise in the research plan. We were unclear how new therapies might emerge.

On the one hand there are plans afoot for development of a Comprehensive Cancer Center, but on the other hand research funds are limited.

There is the potential to have an excellent balance between clinical and basic science. However, the aims of the RC are focused primarily on the collection, validation and characterisation of clinical samples without a clear plan for how to use these samples to generate innovative insights into the cause, detection, prognostication and treatment of cancer.

The need to develop interaction and synergy among groups is very well described, with plans for better communication, better collection and distribution of patient and sample data, and adoption of some common advanced methods in proteomics and metabolomics. Each team seems to have more or less independent agenda, rather little proposed synergy.

Considerations of the Material management plan are difficult to assess from the research plan. COMET has plans to use and establish a biobank of patient samples. Although the Panel supports this wish, it was unclear what and how the samples would be banked (tissue, cells, blood, frozen, as sections, for RNA). Also, unclear was how the samples would be made available to researchers and healthcare professionals. Issues concerning patient anonymity should also be considered. Issues concerning the ethics of collection, storage, and use of samples in the biobank will need to be addressed.

#### **A.6.3. Competence of the RC and research teams**

Prof. Karttunen, Head of the Institute of Diagnostics and Chairman of the Department of Pathology, has an excellent track record, and has a strong medical and scientific background. Overall, the track records of the PIs are very good. In particular, Drs. Karttunen and Mäkinen have solid publication records. The strength of the RC can be seen in diverse areas of cancer research, as well as surgical and other treatments. The RC's quality of publications is good, but with few top publications, it is still unclear where the RC would have a leading role. The basic quality of work, as judged by impact factors in the field in which they work, is also good.



COMET PIs' expertise ranges from direct surgical intervention, to novel treatments of CNS lymphoma, to mechanisms of invasion and metastasis. The approaches to different cancers were similar, which can be perceived as a weakness because of the lack of breadth of experimental approaches (see comment regarding basic science).

#### **A.6.4. Research environment and collaboration**

The establishment of cancer-focused RC fits well within the strategic aims of the University of Oulu. The organisation of COMET as an RC should significantly broaden and improve training of the next generation of cancer physicians/scientists and clinician academics. This is not well described in the proposal. Although many of the RC members have established collaborations with other national and regional institutions, the network of collaborations within the RC is not extensive. The RC members have some important national collaboration, mainly on clinical cohorts and trials. COMET appears to have a good national standing.

Prof Salo has large international collaborative networks; otherwise the international collaboration is limited. It is unclear how this RC competes internationally.

#### **A.6.5. Significance of the RC for the researcher training and promotion of professional careers in research**

The objectives and resources of the RC to supervise doctoral students and integration of these activities into larger frameworks as doctoral programmes and Marie Curie networks, promotion of researcher mobility and to support postdoctoral research careers are difficult to judge from the application.

#### **A.6.6. Societal impact**

The work of this RC is likely to improve diagnostics and treatment of the carcinoma patient population in Northern Finland. However, we suspect that greater impact is being made by other cancer groups overseas. The panel couldn't see a 'niche' being exploited by COMET.

#### **A.6.7. International competitiveness or international comparability**

This RC could develop into a leading center for diagnostics, treatment and therapy of a subset of carcinomas for example laryngeal, lymphoma, gastro-intestinal and urinary tract. However, new openings in basic bioscience are needed to reach high international level.

#### **A.6.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

This RC has potential to grow and develop but greater emphasis should be placed on basic biomedical research, establishing a rigorous vision for how the biobank will be setup and used, and establishing a niche i.e. COMET has to do research or diagnostics that is unique to them.

**A.5.6. Final rating (1 – 6): 3,5 (good – very good)**

## **A.7. RC GPC-DEDE – Genetic, Physiological and Clinical Aspects of Development and Degeneration – from the Newborn to the Oldest of Old; RC Head Kari Majamaa**

### **A.7.1. Scientific quality and innovativeness of the research plan**

The scientific quality of the RC is high and greatly focused on the mitochondrial DNA aspects of neurologic diseases. Their innovative approach is in making use of the genetic aspects of rare diseases that are available in Northern Finland as well as the clinically well-defined cohort of patients available for the purpose of this RC and the universal access to health care and services in the same population. They will use different techniques in exome sequencing, RT-PCR, immunohistochemistry, microarrays, proteomics, bioinformatics and mitochondrial measurements to address human development and degeneration at different stages of life. This multi-level approach at different ages, but targeting common neurological diseases, is unique.

The applicants present several large topics that they are planning to address. These projects are based on large patient cohorts that, according to the specific application, are largely available in Finland. The RC aims at studying the entire life span of humans, from the period of brain maturation, right through the organ's development and up to its ultimate degeneration, by addressing genetic causes and pathomechanisms, as well as epidemiological aspects. While this seems to be very ambitious, the previous work performed by the applicants makes this achievable.

The submission presents the past and ongoing research of the different groups in some detail, whereas future plans are condensed into a brief and rather generic summary, with few specifics. The links between the groups in the RC are not obvious, even though their individual research programmes show promise. It is thus difficult to judge the overall quality of the plan, even though the track record is clear. In terms of innovation, the groups are clearly applying a range of epidemiological data and functional assays to aid in the discovery of novel genes and factors in disease. The more clinical aspects are diverse, but rather standard. On balance, the research programme seems to be far too diffuse for a relatively small community. It would be better served focusing more clearly on a few of its strengths, and marshalling the expertise of different members on a more integrated research programme.

While it is always difficult to predict whether significant new outcomes will emerge, it is quite certain that the RC is well positioned to come to important results. They possess the necessary methodologies as well as the necessary patient cohorts which are essential to come to results. The results will improve our understanding of the processes of maturation and degeneration and might lead to novel clinical concepts.

The significant new outcomes from the research can include identification of drugs that target mitochondrial mechanisms of diseases, the prevention of brain degenerative diseases, early imaging detection of neuro-developmental diseases, effect of treatments on long term outcomes from febrile seizures; temporal lobe epilepsy; intracerebral hemorrhage and traumatic brain injury, and development of predictive biomarkers through neuronal signal analytics to improve epileptogenic focus in epilepsy.

Based on past performance, there is clear potential for the Uusimaa and Majamaa groups to contribute significant findings on pathological mechanisms in mitochondrial disease. The aim to understand the mechanistic interactions between specific drugs and mitochondrial genotype offers the promise of an important clinical advance: however, it is unclear how the RC will actually achieve this. Similar arguments apply to the objective of defining the neuronal signaling defects in epilepsy. The main risk to the achievement of such goals is clearly the heterogeneity of the RC and its structure, wherein many members are focused on their own project (plus clinical duties), rather than on a common goal. This means that the RC's resources are rather dissipated and the chances of achieving a breakthrough of major significance correspondingly small.

The RC investigators state there is no possible risks of methods and that there is access to all samples of patients. There is the issue of whether there is enough large samples to detect associations for rare genetic diseases or GWAS, neuronal signaling and the other aims of the project. The feasibility to achieve the goals and their impact is therefore in question.

The RC offers significant probability of identifying new genes influencing mitochondrial function, prematurity, frailty among the aged, and drug toxicity to mitochondria. The realistic research plans could well yield results of broad impact.

With respect to risk, many of the conditions under study affect small patient populations locally, and often have difficulty securing funding needed for penetrating biomedical research (as opposed to patient care). The RC is aiming to establish novel collaborative research projects and make it possible to carry out several scientific projects with innovative objectives such as the collaboration between mitochondrial and perinatal research and rare genetic diseases by employing genomic and epigenomic methods and other techniques. Most valuable is connecting up distinct patient populations with scientists who can investigate underlying mechanisms of pathologies, as in this RC. Monitoring the cellular responses at the functional, translational, and protein level in different conditions will be addressed by combination of modern techniques. Novel genes identified will provide new tools for clinical diagnostics which can be utilised in prenatal diagnosis and in genetic counselling.

#### **A.7.2. Feasibility of the research plan**

The RC has in its hands the necessary methods, has a sound research plan, and the right people to perform the tasks. There is a good understanding of the potential problems involved in this research and possible solutions.

The methods appropriate to the different projects do seem to be in place, but the actual experiments to be conducted are not elaborated, and no timeline is indicated. The research methods are generally feasible since they have secured the samples and study participants needed to carry out the proposed research. as for the genetic and epidemiology of neuro-degeneration, these will depend on the universal health care in Finland and 1080 early Parkinsons Disease patients, Vantaa85 study of 535 subjects aged 85 years, 500 subjects born in 1935 through the Oulu35 study, and the ARHI-Oulu study of 839 subjects. For mitochondrial diseases among

children, 202 children with such diseases are already available and DNA was prospectively collected from high-risk populations in Northern Finland and children with febrile seizures, epilepsy or survivors of brain tumours have all been recruited. For intracerebral hemorrhage and traumatic brain injury 1000 patients with Intracerebral hemorrhage have been recruited and, for traumatic brain injury, 827 patients have been ascertained. For the neuronal signaling from single channels to neuronal networks of the brain, more than 1500 subjects have scanned MRI.

The RC states they have no methodological problems and no alternative approaches are considered, which is rather uncommon to not have methodological problems or alternative approaches for such problems. The power to detect associations in these studies and rare genetic diseases is not addressed. There is no schedule planned.

The infrastructure in place, plus the links to Biocenter Oulu, seems adequate for the implementation of the planned RC activities. The 5 M of recent funding would seem to augur well, although the most significant grants appear to be gained the emeritus professor whose project is not the major topic of future research as outlined. It is not clear how the rather large number of seniors and postdocs are supported financially. If, like some of the PIs, they draw half or more of their salaries for clinical duties, this may handicap the implementation of an ambitious research programme. Once again, the lack of detail, and the explicit mention of the 'availability of funding' as a significant risk to the research make it hard to evaluate whether the research programme can be effectively implemented with the available resources.

The personnel are heavily weighted towards the clinical aspects of child development where 23 researcher and student are part of that group to study encephalomyopathies in children and susceptibility of preterm birth and chronic neurological conditions, on the other hand, only 4 researchers, and 6 researchers are allocated to the brain trauma and neurosignal analyses groups. The genetics and epidemiology of neurodegeneration is a large 17 researcher group. This does suggest that the two research groups of brain injury and neuronal signalling will have a much smaller role than the other two groups. This is not discussed in the proposal of the RC and how these smaller groups will be expanded or made comparable to the larger two groups to fulfill the purpose of the RC beyond a study with one or two research aims. No other financial data is provided.

A fundamental uncertainty in a number of the research projects is the issue of the heterogeneity of the etiologies. If one major pathway is defective, small patient sample sizes will be adequate. If the aetiologies or mechanistic defects are more heterogeneous, the sample sizes available to the RC sub-groups may be too small, or the funds available for larger samples, inadequate.

The overall organisation of the RC seems diffuse for its size, in terms of the heterogeneity of the research groups and the lack of clear coherence between them. The structure of the RC is based on 4 research groups, of which two are substantial and well developed and two are not. The connection between them is briefly described but not on the basis of the research goals and how they will support each other for the general theme of the RC. The RC comes across as two major areas of genetics and neurodevelopment. The three PIs other than the director seem to be relatively junior with limited publication history.

Given the centralised laboratory facilities at the clinical research center, and nearby, Biocenter Oulu, likelihood of interaction among the RC groups are good. On the other hand, as is generally the case with clinical research, the time of many of the RC members is likely to remain centered in their clinical departments. Mechanisms for dealing with this were not addressed.

No Materials management plan is made available but material management is addressed through the proposed sharing of the different facilities within the clinical research center at the Oulu university hospital that houses the RC. The facilities include tissue culture and molecular biology laboratories and biocomputing, bioinformatics, microbial bioprocessing, gene analysis, tissue imaging, proteomics and other molecular biology labs. They also have access to clinical and epidemiologic cohorts and study groups.

Ethical issues in regard to patients and data privacy are not discussed, although there is no reason to believe that the RC's procedures are not in keeping with Finnish medical standards.

### **A.7.3. Competence of the RC and research teams**

The RC Head is an eminent and highly respected leader in the field who has been in research for over 30 years, so might more properly be considered in the *Vici* category. His academic leadership has mainly been at the local or national level. He has a good record of publication in highly respected human genetics and neurology journals, collectively representing an important contribution to the genetic epidemiology of mitochondrial

disorders. He has established and profited from a range of international collaborations with leaders of the field, and has successfully built a multi-skilled research group. As current Dean of the Medical School, there is some question of whether he can give sufficient time and attention to the RC.

Other than Majamaa, the PIs are publishing mainly in specialized, although respected journals in their fields (radiology, clinical neurology) or as middle authors in more significant collaborative papers. The PIs may be handicapped in research by having clinical or teaching duties to perform.

Indeed, the team leaders are complementary and will enable many synergies in the RC. This is not always so apparent from the application but seems natural. There is clearly expertise in different areas of clinical neurology. Experience acquired in strong laboratories abroad is also a plus. However, few senior members of the RC have extensive training in basic science, and most seem to have clinical duties. The research projects of the RC are relatively coherent in that all belong to clinical neurology, though there is little evidence of real integration.

#### **A.7.4. Research environment and collaboration**

The RC is well positioned to achieve interdisciplinary research. The promotion of doctoral students is mentioned as one of the aims and will be done on an international level.

The grouping provides a structure for translating findings to the clinic, maintaining access to state of the art diagnostics for patients in Northern Finland. The critical mass of the group and its affinities with Biocenter Oulu enable access to infrastructures. RC leader Majamaa's breadth of international connections and research expertise is of significant potential value to the other groups.

RC GPC-DEDE seems to fit very well into the research environment of Oulu University, though clinical neurology and genetic epidemiology are not declared priority research topics for the university. Serving the people of the Northern Finland region - in particular with regards to health and well-being, is a part of the university's strategy, and this unit takes this aspect of its vocation seriously.

The University of Oulu does provide infrastructure and support by housing the RC at the Clinical Research Center and the RC director is the Dean of the Medical Faculty which is likely to help the RC. The Biocenter Oulu is also near the RC and the Institute for Molecular Medicine Finland provides genotyping. They also have collaboration with department of pharmacology and toxicology, Biochemistry, and Health Sciences.

The RC is well embedded in several national projects and has received major funding. There is collaboration with University of Eastern Finland, University of Helsinki, and Aalto University. These will provide expertise in neurodegeneration, epidemiology of brain hemorrhage and natural stimuli development and analyses of developmental disorders. Explicit collaborations with other Finnish teams on late-onset Parkinson's, neurodegeneration on aging, and epidemiology of brain development will be useful. The research will, of course, benefit from national facilities, for example in computing and genome sequencing. However many of the RC studies are unique in Finland, and not dependent on national networks.

Existing international links are abundant and will contribute to the success of the RC. Majamaa and Uusimaa collaborate internationally with many leading groups in mitochondrial disease, adding significantly to the RC's profile and chances of achieving breakthroughs. Collaborations of the other groups are less clear, beyond their own postdoctoral training abroad. There is much international collaboration through the connection with past researchers. These include Oxford, Montreal, Singapore, Bethesda, and Gothenburg.

#### **A.7.5. Significance of the RC for the researcher training and promotion of professional careers in research**

The training of doctoral students and further qualification of post-doctoral personnel is mentioned several times both on the local as well as the international level. No specific programmes are designed.

The senior PIs have a good track record in doctoral training. However, they present no details of how this training is integrated with the wider bioscience community in Oulu or internationally, apart from examples of training visits. Researcher mobility and international exchange are clearly supported, even though there is no specific structure in place to facilitate this. The core projects represent a strong tradition, notably with regards to the centrality of mitochondria in neurological disease, which creates a visible esprit de corps of the community, starting at student level. But links to broader communities are less evident. The RC organises weekly seminars for training purposes of 22 doctoral students graduating and allows student site visits to international collaborative sites.

The RC provides a home for a large number of postdoctoral researchers, many of them also MD, to continue in research. Some of them are quite senior in terms of years, and are best considered as career clinical researchers rather than trainees en route to becoming PIs with their own independent academic positions. Also listed are emeritus professors and other seniors who really maintain their own research programmes. Almost all of the postdocs in the RC are locally trained, or have returned to Oulu after rather short postdoctoral traineeships abroad. However, there are few if any postdoctoral recruits from abroad, and only a small minority from elsewhere in Finland, implying that the RC is not succeeding well in promoting inward mobility. There are no plans outlined on how to engage and help promote their careers within the RC.

#### **A.7.6. Societal impact**

Positive results as soon as applicable to patients will have an important societal impact if results can be transferred to the level of patient care. There is a clear relevance to clinical medicine, and many of the projects are likely to bring benefits in terms of diagnosis, management and therapy in the longer term.

Identifying the toxic side-effects of some drugs on mitochondria could have an immediate public health benefit, without fully understanding the mechanism.

#### **A.7.7. International competitiveness or international comparability**

The research is internationally competitive. Majamaa and Uusimaa are recognised as significant contributors to mitochondrial disease research in Europe, notably in the genetic epidemiology thereof. Kiviniemi and Tetri, being more junior PIs, have yet to gain major recognition, but are publishing in respected international journals in their fields, and could achieve more visibility in future. The key point is that it is likely – due to the patient population – that the RC will discover genes and factors that will not emerge from larger, better funded efforts elsewhere because they lack access to the Finnish patient pool.

#### **A.7.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

This is a very good application that aims at elucidating underlying mechanisms of development and degeneration with a focus on neuroscience. It has international standing and will lead to important results which may change patient care in the long-term run if relevant findings emerge.

The core programme of the Majamaa and Uusimaa groups represents a coherent strength that should be developed and supported. However, some of the other parts of the RC's activity do not fit well to this theme. The RC should aim at greater or more meaningful internationalisation, given the links already established. For a grouping in the Vidi category, a stronger and more integrated vision of the future research directions is appropriate.

The proposed RC will be a magnet and point of reference in North Finland for research on selected neurological disorders. There is some weakness in the structure and planning of the different groups that do not come across as cohesive and collaborating as they should be.

#### **A.7.9. Final rating (1 – 6): 4,0 (very good)**

### **A.8. RC Proteus – Protein Structure and Function Research Community; RC Head Lloyd Ruddock**

#### **A.8.1. Scientific quality and innovativeness of the research plan**

This is a real and highly interactive community, which uses a common set of tools and approaches to address a host of biological and biomedical questions. Although these are not described in detail, the panel appreciated the fact that the representatives of the RC were able to provide, in the course of discussion, a cogent indication of the key questions that they would address in the coming years. The research plan emphasises the importance of *in silico* and *in vivo* approaches in making functional sense of the inferences from structural analysis. To maintain competitiveness in structural biology, the group should ideally aim to build strengths in NMR and fluorescence methods to examine dynamic protein interactions, high throughput methodology for recombinant protein expression, and robotics for crystallisation.

The potential for scientific breakthrough is difficult to evaluate, given the scarcity of detail about the scientific objectives. The proteins under study, for example in the mitochondria and Golgi apparatus, are physiologically critical, and desperately in need of further characterization. This RC has all the tools and organisation to make

significant progress. The major risk, identified by the RC itself, is of dislocations and under-resourcing resulting from a planned reorganisation. This should be carefully tracked together with the host institution, in order to make sure that the unit, with undoubtedly significant potential, is able to maintain its competitiveness and achieve the cutting-edge status to which it aspires.

This is a genuine research community that shares a wide portfolio of technical and scientific expertise, and operates an efficient internal network for interactions and communication. Many (though not all) members of the community have jointly authored publications, confirming their potential to combine this skill-set productively.

#### **A.8.2. Feasibility of the research plan**

This is an integrated and interdisciplinary grouping, with access to most of the currently needed tools and methodologies. However, it needs to keep abreast of developments in the field, implementing the latest technical advances.

Major instrumentation is available through the University and Biocenter Oulu, which is independently supported. The track record of the RC itself in obtaining external funding is impressive, and this applies both to the senior and junior members, and to infrastructure support. On the other hand, considering that this resourcing is spread amongst 13 research teams, and that the largest grants are held by rather few individuals, funding will need to be maintained or even enhanced in future, to support an ambitious research programme. To justify major future funding, the RC needs to develop a vision based on clearer scientific goals.

Although led by excellent and highly experienced scientists, and clearly operating in a commendably interactive manner, the RC would benefit from stronger guidance and direction.

The grouping shares core facilities and methods rather than 'research materials'. The aspiration to use these resources collectively is to be applauded. Ethical issues involved in regard to transgenic animals, for which Oulu has an excellent track record.

#### **A.8.3. Competence of the RC and research teams**

RC Head Ruddock has made significant contributions to the field, with a steady stream of senior-author publications in highly respected biochemistry/molecular biology journals, in his focused research area (protein disulfide isomerases). He has broad experience in developing and supervising doctoral education, which is absolutely a key in the RC's area of activity.

The Proteus PIs cover a very wide range of seniority and quality: some nearing retirement, some so junior that they still lack independent publications. Overall the group has high productivity, with an above-average publication record. Some of the major papers are now quite old (>10 years), whilst some others are works that the PIs authored elsewhere, reflecting the heterogeneity of the grouping in terms of seniority. The RC combines an excellent mix of expertise in biocomputing, hardcore structural biology, functional enzymology and cell biology. The publication record shows evidence of established collaborations and interactions.

#### **A.8.4. Research environment and collaboration**

In the arena of modern structural biochemistry, cooperative interdisciplinary approaches are essential. The technological platforms which the RC collectively maintains are a national resource. The RC also serves a local, national and even international role by providing training courses in structural biology, contributing significantly to the profile of Finnish bioscience.

Biocenter Oulu and parts of Biocenter Finland provides critical research resources both locally and nationally. The host institution favours interdisciplinary approaches and internationalisation, which this grouping embodies.

The main groups of the RC are important members of the Biocenter Finland network, which has contributed to the maintenance of the excellent infrastructure on which they depend. This includes structural biology, bioinformatics, proteomics and protein characterization. They also contribute to national graduate schools in structural biology and glycoscience. Since the individual research groups have rather specific research topics, they participate more appropriately in international thematic networks.

This is a strongly international grouping. Some individual research teams are partners in EU and Nordic consortia, as well as international networks that enable access to major infrastructure. The RC groups have published dozens of notable papers with different international collaborators, in over 20 countries.

#### **A.8.5. Significance of the RC for the researcher training and promotion of professional careers in research**

The RC clearly provides a strong environment for PhD training, notably via its connections to national and European networks. Six members of the faculty participate in Finnish national doctoral research programmes, and the core groups of the RC are major partners in the one operated at Biocenter Oulu, providing an excellent framework for technical training, mentoring and quality assurance. The RC's individual research groups are not top-heavy with PhD students, i.e. there is an emphasis on quality over quantity. The majority of the PIs were themselves recruited from abroad (others completed some of their own training overseas), and this fosters links that encourage mobility as well as adoption of best international practice. About half of all PhD students are from outside Finland, and the RC also encourages training visits abroad as a normal part of PhD education. The Biocenter Oulu programme has been influential in guiding and structuring doctoral education at the university level, based on its own well established practices.

There appears to be good infrastructure, but this could be strengthened by showing that these techniques are 'joined up' to provide a comprehensive training environment. Most of the RC's research teams contain post-docs recruited from abroad. However, no data is provided on the destinations and career outcomes of its own doctoral graduates.

#### **A.8.6. Societal impact**

The main emphasis is on basic science, but the RC has recently had some success in developing links with industry, notably via innovations arising from its research. All the proteins under study are important for human health and their elucidation will open up deeper understanding of pathologies, and roads to therapeutic development.

#### **A.8.7. International competitiveness or international comparability**

The RC has international visibility and some of the work it is undertaking is unique to Oulu, even though the RC is relatively small compared with other structural biology centres in Europe.

#### **A.8.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

The RC has clear strengths in protein structure and functional analysis and has well-established internal communication and collaboration networks. It also has a visibly international profile. However, there are significant gaps in technology, such as NMR, high-resolution EM, and fluorescence methods. The RC should preferably have a high-throughput mechanism for expressing recombinant proteins and analyses by robotic methods for crystallisation. Although most of its junior PIs have some external funding, the RC should also put some effort into securing their future resourcing and independence. Above all, the panel felt that the RC needs a clearer scientific vision, focusing on a set of thematically linked problems in protein biology, in order to succeed at the top international level.

#### **A.8.9. Final rating (1 – 6): 5,5 (excellent - outstanding)**

### **CATEGORY VICI**

#### **A.9. RC CVR-Co - Cardiovascular Research Community; RC Head Heikki Huikuri**

##### **A.9.1. Scientific quality and innovativeness of the research plan**

This is a well accomplished cardiovascular research community comprising the full spectrum of seniority from student to professor to clinical expertise. The PIs are leaders in their own fields. They have put together a clear vision of research and appear to be able to fulfil their aims. The large number of senior research fellows, post-docs and students make up what appears to be an interactive and collaborative RC.

The RC addresses several highly important topics in cardiovascular medicine. Cardiovascular diseases affect one third of the global population, which is evidence of the importance of the topic of this RC. The quality of the science of the RC is high and from different aspects of Cardiovascular diseases.

There is a strong opening paragraph that summarizes the size and scope of the RC as well as clear statements of intent to increase the depth of research opportunities by combining strengths in clinical and basic science. This RC sees itself competing in the "VICI" category.

The innovation is focused on genetic aspects of sudden cardiac death, analyses of ECG signals by characterising QRS complexes and T waves and EEG for studying the brain injury after global cerebral ischemia, the genetic and molecular aspects of heart failure, molecular animal and human studies on the development of metabolic syndrome, and a new method of remote ischemic preconditioning to help surgeons avoid neurologic sequelae from cardiovascular surgery. These are all innovative research methods in cardiovascular disease combined together in a comprehensive RC with top experts in the field.

The excellent plan has a good mix of groups with different backgrounds and approaches. Multidisciplinarity is an extra-plus. The research plan is sound and well thought of, utilising existing research and databases to carry out these different projects. There is no overall goal and focus of the RC in terms of what it would like to achieve as a theme in break-through science that brings together all the different components in a meaningful and focused way. It would have greatly helped to present the main achievement the RC will aim at, beyond bringing together experts already working in their respective research fields. The RC has strong objectives that are likely to produce very interesting and novel finding that should be attractive to clinical and bioscience journals including NEJM and Lancet.

Research questions in more detail:

1. Prediction and prevention of sudden cardiac death (led by Prof. Huikuri).

- ECG risk markers + general risk factors to be analysed from national cohorts with 25000 middle aged subjects.
- Measure risk factors of SCD in people with CAD looking at 1000 CAD patients with T2D and 1000 without T2D.
- Combine phenotype and genotype in 4200 people with SCD caused by coronary event.
- Approaches include GWAS and Exome wide association (EWA). SNP analysis.
- Outcome - to gain insight into background to fatal arrhythmic events.

2. Analysis of biosignals in CV disorders (Seppänen)

- Analysis of ECG signals as risk markers for cardiac events.
- Write algorithms for detecting early depolarisation patterns.
- Assessment of brain injury after global cerebral ischemia by looking at EEG analysis.
- Look at upper respiratory work as a risk factor for increase burden on the heart.

3. Mechanisms of MI injury and development after heart failure (Ruskoaho).

- Investigates the molecular mechanisms of cardiac remodelling after MI.
- Protein and gene expression to identify potential targets; development of genetic models (which ones??), identify key signalling molecules. Specifically investigating ERK-Spryl1 in remodelling, using stress-induced cardiac hypertrophy and targets of GSK-3b, which is a S-T kinase with an undefined role in neuronal development and energy metabolism. To examine GATA4 in hypertrophied cardiomyocytes. They want to inhibit GSK-3b and block noggin to treat reperfusion injury.
- A focus is cardiac fibrosis, and this RC appreciates the importance of connective tissue growth factor (CTGF) and ECM formation. They aim to block CTGF in attempts to halt fibrosis. This is a good target. This RC also recognises the damaging effects of hypoxia after myocardial infarction and has this as a focus for research.
- Their research interests in fibrosis, CTGF and hypoxia align well with those of the TISSUE HOMEOSTASIS RC. There are excellent opportunities for collaborative research without losing identity.

4. Atherosclerosis.

- Led by Kesäniemi and Ukkola, this aim is to understand the mechanisms of arteriosclerosis and metabolic syndrome caused by (or at risk because of) obesity. The intent is to use epidemiology and animal experiments. As part of their epidemiology study they recruited 1000 people in the age range 40-60 and have followed them for 19 yrs.
- Now in their 60-80 years, the OPERA study will measure glucose, lipids, BP, heart rate and cardiac sounds. This will be done in collaboration with Huikuri's group (good RC collaboration).



- In a parallel study they intend to study new obesity-related peptides (not described in detail here) in animal models of obesity and atherosclerosis. This new research will learn more about the role of obesity and GI peptide hormones in metabolic syndrome and CV morbidities. This is being done with National Institute for Health and Welfare (US??) aimed at clarifying the role of resisting on metabolic syndrome.

#### 5. Protecting the brain in cardiac and aortic arch surgery.

- Led by Juvonen, this objective aims to develop methods to reduce neurological consequences of cardiac surgery. Hypoxia is a target, which is a common theme in this RC and could benefit from collaboration with TISSUE HOMEOSTASIS.

The clinical and translational medicine approach has very significant potential. As already in the past, the members of this RC can be expected to come to most relevant and novel findings that will contribute on the long-term to a better management of patients with cardiovascular disease but also to preventive measures. The different research projects described within each of the five research groups, each has an interesting and novel approach to the field of cardiovascular diseases. They are moving the field forward such as the prediction of sudden cardiac death, better interpretation of ECG and EEG leads, and heart failure therapies by understanding genetic mechanisms for cellular cardiac cell damage, how to predict risk factors for metabolic syndrome and obesity from GI peptide hormones, and how to address ischemia during surgery.

These are promising projects and one of them might lead to a breakthrough in the science. It is not expected, however, that these are high risks, rather, each project is making increment changes in the field of cardiovascular research. There is no clear thrust for the collective RC to focus on one area for a major breakthrough. As the answers to the research questions are not yet available, there is some risk of failure. However, this risk is low since they do not start from scratch but can build on a sound basis of prior research. This includes the existence of the necessary patient cohorts and samples from such projects for molecular and genetic analyses. However, one cannot expect that all pillars in this RC will be equally successful.

There is complementary expertise in the RC with the broad range of PIs from up-coming to established senior people who can provide mentoring and guidance. The RC will bring synergies to the various groups from which one would expect much cross-fertilisation. There is no doubt that the scientifically added value of having more than one expert in the field of cardiovascular diseases working together will be enormous. Each group is adding to its own field of work in cardiovascular diseases. The proposal, however, fails to show how these will integrate and complement each other in a systematic way. Other than mentioning that the RC will bring significant insight and a mention that biosignal processing may be useful for medical technology solutions for other groups, there is lack of description how the different teams will benefit from each other.

#### **A.9.2. Feasibility of the research plan**

The research plans appear very feasible and sound. The RC is well aware of the way how to carry out their plans and it appears that they understand how to be flexible in their approaches. It is clear that the individual research groups and their ongoing areas of research are feasible and on the correct track with a history of major achievements. None of the individual research groups acknowledges any difficulties or issues that they might face in their research and how they can overcome them. A specific time schedule in the form of milestones is not provided (as is also not the case in other RCs).

The methods are excellent and represent state-of-the-art technologies but which, with the exception of Matlab, are not very innovative. There can even be some improvement by collaboration *with Tissue Homeostasis*, particularly in areas involving the extracellular matrix.

The resources for the proposal seem adequate but no specific details are provided about finances (as is also not the case in other applications for an RC) but the RC has an excellent track record for funding and equipment suitable for proposed research. There is a large number of collaborators, especially doctoral students. They will provide great support for the research. The necessary major infrastructure exists in the different laboratories and groups including software for biosignal processing, laboratory animals and models and the necessary equipment, the DNA and molecular biology technical expertise, surgical and anesthesia facilities, as well as access to cohort studies and their analyses. The personnel for each research group is adequate and includes a large number of doctoral and post-doc staff to carry out the necessary work.

The structure and organisation of the RC is not presented other than the five research groups although it is clearly apparent that they want to develop a structure that supports common research. How the different groups and projects will interact and work together is not clarified, however.

The Materials management plan is not described but the facilities are described briefly in the different research groups from the existing ongoing research. The available software and clinical equipment, as well as research facilities of animal and molecular studies are available for the RC and its researchers. Ethical issues are not taken into account in this application but since the RC builds on prior and ongoing activities as far as patients are concerned, it can be assumed that ethical issues have been handled before.

### **A.9.3. Competence of the RC and research teams**

In detail, Heikki Huikuri MD PhD is the RC Head. In his team there is three senior research fellows, four post-docs, four students, four nurses, one secretary. He has large number of publications (over 400 as a whole) in top flight journals. Frequent publish in Circulation (IF 15). He is highly cited with a H factor of 57. The quality and track record of the RC director is exceptional with a very high number of publications in peer reviewed journals and book chapters with very high impact. He is indeed among the leading researchers in his field. He has also shown great skills as a leader of various large consortia and groups.

Most team leaders are exceptional researchers with very high achievements and publication records with significant impact factor. The scientific expertise and their leadership of their respective projects are at the international level.

- Heikki Ruskoaho MD PhD - 1 prof, 1 SRF, 5 postdoc, 15 students, + others. Excellent publication output and quality. Frequent publish in Circulation (IF 15).
- Antero Kesäniemi MD PhD - 3 SRF, 1 postdoc, 4 students, 2 techs, 2 nurse, 1 secretary. Good publications in middle ranking IF journals with a few highlights e.g. NEJM and Lancet.
- Tapio Seppänen MD - 1 prof, 1 postdoc, 3 students. Biosignal processing team. Looks at shape of ECG cycle. Collaborates with Huikuri. Good publications in middle ranking IF journals. Some highlights e.g. Circulation in 1993 and in 1996 with high citations.
- Tatu Juvonen MD PhD - 3 SRF, 1 assoc prof, 2 postdocs, 3 students, 3 other. Excellent publications in Circulation, JAMA.

The RC's publication record is exceptional with more than 500 publications (see the RAE 2013 bibliometric analysis based on publications from years 2007-2011) and is the second highest record in the A group that reflects the quality and track record of the RC scientists.

These people obviously work in an excellent research environment. The work of the leaders is complementary to each other since each research group and its leader has a specific expertise in a discipline of clinical, basic science, genetic, biomedical engineering, animal studies and others subspecialties to complement each other in the RC.

In this RC some very senior people, mostly with joint MD and PhD degrees, are joined by new and up-coming people. A large number of senior research fellows who have their own funding is a major asset to this RC. Collective publication power is excellent, led by two very strong and highly cited senior people (Huikuri and Ruskoaho). There are well-funded groups with grants from the Finnish Funding agency (Euro 1.5M expired in 2012 and Academy of Finland expiring 2013).

### **A.9.4. Research environment and collaboration**

It is expected that the added value of working together as an RC and promoting creative research and establish a critical mass of scientists will benefit the RC in terms of achieving a high profile internationally. The RC facilities are diverse and complement each other. However, the RC does not elaborate much on this added value and how research training and creative research will be achieved through this added value. There appear to be excellent opportunities for training in house, nationally and overseas. Basically, the application indicates the willingness of the applicants to develop a structural organisation and a common research strategy that will lead to transdisciplinary research and training in research. The RC should rethink, whether it could have new interdisciplinary openings since now the proposal is more or less a collection of individual projects.

The University of Oulu is a leading center of cardiovascular diseases in Finland (cardiovascular research being one of the three main focus areas of research in the Medical Faculty) and this RC is greatly compatible with this profile and the cluster of cardiovascular diseases in Northern Finland. It is apparent from the application that

the researchers are very well supported by their university and embedded in an appropriate research environment.

The RC seems to be very well placed within Finland with its strong position in cardiovascular research. National level collaborations do not seem a priority for the RC which would not be difficult to achieve given the high profile of the PIs and the directors of the RC. There is less national than international collaboration, especially in clinical consortia.

Much international collaboration exists among the various groups within large trials and consortia, which are of high calibre and profile. Each PI has many respectable connections. These will significantly contribute to the success of the RC, especially with consideration to the fact that the PIs are well known for their publication record.

#### **A.9.5. Significance of the RC for the researcher training and promotion of professional careers in research**

There are 39 doctoral students which demonstrate a major commitment to their training as part of the RC. The intention to integrate the training of doctoral students and aligning the various research programs is mentioned several times but no details are given. Although these aspects are not well described, the PIs have an excellent track record on PhD training. (At the hearing, it was stressed that recent structural developments at the faculty of medicine will enable a transdisciplinary approach to training of fellows).

The resources and expertise available for the RC will be exceptionally helpful for the career of post-docs. The RC has 14 post-docs. There is one particular mention of an aim to target talented post-docs. However, there is no mention of a focus on their training, promotion or research mobility. Thus, there could have been stronger statements concerning mentoring but there is no reason why this should not be in place.

#### **A.9.6. Societal impact**

The societal impact will likely be significant in terms of improving clinical and surgical care of cardiology patients based on the issues of reperfusion-ischemia in surgery, prediction of risk factors for sudden cardiac death, better interpretation of ECG and EEG, potential treatments of heart failure, and prevention of cardiovascular diseases in general. Progress with regard to any of the proposed topics will have an important impact on patient management.

#### **A.9.7. International competitiveness or international comparability**

The research is internationally very competitive and either outstanding or at least excellent. Surely the center is comparable to other well established research centers internationally given the reputation and achievements of its senior researchers with an eminent position with regard to their main topics. At the national level, there is no doubt that it is the top center and group in cardiovascular diseases.

#### **A.9.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

This program is renowned, not only nationally, but also internationally as being excellent and competitive. It is characterised by its significant, world class quality. The RC has exceptional expertise and resources and is likely to be unique in terms of the collective contribution of the different research projects and PIs. They are individually pushing the field forward in their area of research and achieving major scientific advancements. However, one of the main areas of future development needed for the RC is how the different groups will work together beyond just being part of the RC. Only a limited description of the training opportunities exists, although there are many doctoral students and several post-docs as part of the RC.

#### **A.9.9. Final rating (1 – 6): 6,0 (outstanding)**

### **A.10. RC DynaHEALTH – Dynamics and Determinants of Life Course Health and Wellbeing; RC Head Sirkka Keinänen-Kiukaanniemi**

#### **A.10.1. Scientific quality and innovativeness of the research plan**

The research plan mainly aims to maintain the NFBC1966 and NFBC1986 birth cohorts, to exploit these resources further, and to develop molecular measurements (rare DNA variants, epigenetics and metabolomics). These two birth cohorts are unique and have been ongoing for more than 40 years. Internationally, there is no other study capable of delivering similar data and approaches. The RC covers many relevant aspects of epi-

miology, including metabolic, mental, social and translational medicine, and the use of clinical, cell culture and animal models plus system biology. However, the approaches and plans outlined are scientifically not very innovative. The application mostly emphasises track records, but does not provide explicit new ideas for future breakthroughs.

The wealth of data will likely generate significant new outcomes and progress in the field of epidemiology, particularly for metabolic diseases, mental health and biopsychosocial ailments. The potential for significant new outcomes is substantial and has been shown through earlier breakthroughs by the same investigators and groups of the RC. While the interdisciplinarity and large data repository are strengths, and the group will probably keep contributing to high profile international papers, it remains unclear for most PIs how innovation in the form of future senior-authored papers is going to be achieved. Because this is a *VICI* proposal, that aspect is disappointing.

The RC laments that their funding is limited and that it is hard to keep their promising young researchers. This is a serious problem because to run this research program at this scale well, significant external funding will be needed to avoid groups being underfunded for the expensive research (particularly the identification of rare genetic variants and cross validations with other cohorts) that deserves to be done on these unique birth cohorts. The RC's present expertise in cutting edge genetics seems insufficiently senior to ameliorate these challenges in near future.

The RC combines different disciplines focusing on the life course of health, which represents considerable multidisciplinary added value. The sheer number of combined disciplines (genetics, metabolomics, imaging, mathematical epidemiology, social aspects, mental health, brain-function, variables of employment, childhood and lifestyle) is impressive, but also represents a weakness of spreading resources too thinly given the present level of external funding. Right now, the participating groups have little interaction and synergy is merely expected from the need for large amounts of money to keep these studies going.

#### **A.10.2. Feasibility of the research plan**

Research plans are feasible and within reasonable reach if the ambition is to continue ongoing work in the same manner as previously. However, there also seem to be mismatches between some of the goals and the available resources. For example, connecting 1000 brain scans to psychiatric illnesses seems beyond the current capacities of the RC, and also the RC's bioinformatics and statistical capacity to deal with the major datasets that will continue to be generated seem insufficient to address the complex goals of the RC. Identification of rare DNA variants or genome-wide structural variation may also be beyond their capacity if the RC intends to drive this work, as this will require large scale international collaboration for validation in order to be of top international level.

Overall, therefore, feasibility is not easy to judge as the plan seems mostly to do more of the same, which is good but does not develop the potential of these birth cohorts in the outstanding manner that they would deserve.

In several ways the level of personnel committed to this RC and their expertise is quite extraordinary, suggesting that resources are substantial. PIs have obtained significant funding from major international entities, but the PI age distribution requires more younger promising researchers who can lead and increase the international impact of this RC in the coming decade.

The overall structure with four work packages (epidemiology and genetics, metabolic health, mental health, and bio-psychosocial dynamics of health) is sufficiently detailed, but organisation at the research group level is unclear and seems insufficiently prioritised (e.g. why six groups covering metabolic health, two groups covering social determinants of health, and two groups in translational medicine?).

There is no explicit materials management plan, but a description of the different genetic analyses to be done, of imaging facilities and tests to be used, and of animal models and the cohort facilities available. Also the Bio-center of the University, nucleic acid research, functional studies, and other facilities to help the RC are listed, but without much detail.

There is no discussion of ethical issues despite the major human subject engagement in the study. However, it is expected that the RC investigators are well aware of these issues given their history of scholarly work in this same area.

### **A.10.3. Competence of the RC and research teams**

The RC director is well recognised and has a substantial track record of training and mentoring. Some publications are highly cited, but none of these highly cited (>100) papers have been driven primarily by the director. This is possible because her interaction network is mostly Finnish and Nordic orientated.

Publication records are sound and for some PIs very good but there is quite some variation across PIs. The RC has published rather little in the field of molecular epidemiology (no senior or first authorships). More ambitious excellence across the board would seem to be needed to realize the ambitions of this RC at a cutting edge level.

The clinical epidemiology publication record of the RC is good and they generally publish a lot, but the top quality international publications are rarely driven by the Oulu PIs.

The different research fields contribute complementary expertise to the RC with each team being responsible for a single unique area that is relevant for the overall theme of the RC. However, the actual levels of interaction and synergy remain unclear and it seems puzzling that several (e.g. metabolic) groups have very similar names, without clear indications how work will be distributed among them and why.

### **A.10.4. Research environment and collaboration**

The RC combines disciplines from almost every part of medicine under a single umbrella to address the life span of a person, from fetus to a healthy, aging individual, and the mechanisms influencing the process. In any case, making a success of such a vast cooperative effort between multiple disciplines will require an unusually high level of communication. The RC acknowledges that this aspect of the mutual cooperation must be improved, and they plan to have multi-lateral training among the different work packages, internal communication via monthly seminars and journal clubs, biannual Steering Committees to review objectives and adapt research strategies, and thematic scientific paper writing groups to help increase the added value added of collaboration within the RC. Overall, there is no doubt that the combined field of this RC is very important, both fundamentally and applied/clinically. However, there is too little evidence for solid PI-driven cutting edge innovation across the board to quite live up to *VICI* expectations.

The University of Oulu appears to be fully supportive of the RC and the maintenance of its birth cohort data bases via the Institute of Health Science in the Faculty of Medicine that supports the DynaHealth infrastructure, among others with molecular biology lab facilities. The RC also appears to enjoy status as a major research focus in cardiovascular diseases and musculoskeletal disorders. The SWOT table indicates that the RC finds it hard to attract long term structural funding, which should be an area of concern. A coherent strategy would seem to require optimal matching between explicit international ambition, perceived relevance for Oulu University, and long term funding through a combination of structural and external support. This funding should be renewable, but with clear milestone requirements of cutting edge performance.

The Director and PIs have excellent national connectivity, so they can capitalize on national synergy when opportunities to do so arise. However, this is not made very explicit, even though significant funding is provided nationally through the University of Oulu, Academy of Finland, National Institute for Health and Welfare, Thule Institute, and other funding sources from Finland.

The RC enjoys international funding from various sources in Europe, the United States, and other countries, e.g. the EU framework program and large genetic consortia such as EGG, GIANT, MAGIC, DePlan, DECODE) involving researchers from Imperial College London, Oxford, Bristol, Cambridge, Erasmus Rotterdam, and UC Los Angeles. These funding connections produce highly valuable contributions to cutting edge international papers with >100 authors, but almost none of this work is actively driven by the RC.

Another problem is that replication and validation of results, particularly with respect to molecular datasets (rare genetic variants), will require long-term international co-operation with for example CHARGE, but the RC is insufficiently aware of this.

### **A.10.5. Significance of the RC for the researcher training and promotion of professional careers in research**

The RC is funded by the Marie Curie program and involved with the University of Oulu doctoral program by providing local training for graduate students in research, with about 50 graduate students participating. The students in the RC are exposed to a structured curriculum, training courses in both Finnish and English, interna-

tional workshops and conferences, site visits with collaborating centers. The RC thus provides unique opportunities for doctoral students and the need to replicate and validate results with other research teams does promote researcher mobility. However, the SWOT table indicates that it is hard to keep the promising PhD students on their career tracks, in spite of good involvement in international networking and active efforts by the Director and PIs. No solutions for this challenge are proposed.

There are 19 post-docs in the RC, distributed across the different research groups. The RC will likely be a rich and productive working environment for them, but it remains unclear how their careers towards independent excellence are supported.

#### **A.10.6. Societal impact**

It is very important that epidemiological studies are being performed to obtain general insight into healthy and unhealthy aspects of early life environment. The work of this RC directly targets common health problems such as obesity, diabetes, cardiovascular and mental diseases, as well as musculoskeletal, and neurodegenerative disorders and has a unique Oulu. There is thus no doubt about societal relevance, but the RC would deserve a higher international impact than is presently realized, and the application does not really address that issue.

#### **A.10.7. International competitiveness or international comparability**

The NFBC represents the world's largest collection of data from early pregnancy until adult senescence, including almost every aspect of basic, epidemiologic and clinical data that one would think of for this type of lifetime course research. The NFBC was one of the earliest data sets to establish the harmful effects of maternal smoking for fetal development and the influence of maternal health on fetal growth and risk of child disability. They have also participated in high profile international studies to combine genetic, life course and social factors into health risk assessments, contributing to novel insights on the influence of metabolism on type 2 diabetes risk, and on genetic factors predicting obesity being less important than traditional risk factors.

While these unique birth cohorts will remain a highly sought after resource, it is also clear that present modest funding necessitates that next generation sequencing, metabolomic measurements, and MRI's can only be done on a small fraction of the available material, which implies that much of the unique potential of this data base is not realized, or can only be realised when giving the data away to large international consortia in exchange for minor co-authorships. This problem seems related to not enough of the PIs being internationally competitive at the very top level, so that larger scale funding can predictably be obtained. Historically, this is perhaps understandable because of the national programs that the RC is involved in. However, the NFBC repository is sufficiently unique in the World that there is not really an excuse for not being among the international world top that drives research programs rather than just making occasional top contributions to work driven by others.

#### **A.10.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

The field covered by this RC represents one of the top assets of the University of Oulu, in terms of societal relevance and international importance, and it should be a major strategic focus for the University and the Finnish Academy to develop this NFBC-based program as a major international effort of Finnish research excellence. Strategic considerations of this kind are urgently needed, because the overall status of this RC is presently not in the *VICI* category, as that should imply international cutting edge status across the RC. The complementarity of PI-fields that now form this RC is appropriate, but substantial prioritising of research foci would be desirable and there is a need to recruit additional researchers who can lead the RC into new promising directions that are internationally recognizable.

#### **A.10.9. Final rating (1 – 6): 5,0 (excellent)**

### **A.11. RC Tissue Homeostasis – Tissue Development, Homeostasis and Malignancy; RC Head Johanna Myllyharju**

#### **A.11.1. Scientific quality and innovativeness of the research plan**

The ECM research group at the core of the RC has an excellent track record in elucidating the structure and biological roles of the ECM and molecules with which its components interact. The scientific plan is well thought out and well crafted. It explains very clearly the importance of the RC, its achievements and its future goals. The scientific quality of the plan is very high. The RC has excellent experimental models (3D culture

models and mouse models) in place. The RC has a focus on hypoxia as a contributing mechanism. This is innovative and (as stated below), this RC is well placed on the international stage to make valuable contributions in the area.

While aims are of excellent standard, the proposal is a collection of projects by individual teams rather than novel ideas and upcoming scientific breakthroughs as a result of the born of the RC. The RC runs the risk of being 'spread too thin' and in contributing little to these areas instead of making a really significant impact on one or two target tissues or diseases.

As stated above, the proposal is a collection of excellent projects by individual teams rather than build on integrated novel ideas with expected scientific breakthroughs specifically as a result of the formed RC.

#### **A.11.2. Feasibility of the research plan**

Human *in vitro* and animal *in vivo* models seem in place making the project highly feasible, although the RC may not have performed the proper development of novel techniques. For example, there appears to be a lack of live cell imaging.

Each research group has a critical mass of staff with very good numbers of research fellows, postdocs and students. It is pleasing to see a large number of research fellows and postdoctoral researchers who certainly bring valuable experimental expertise and stability to the RC. As a Center of Excellence, and facility heads at Biocenter Oulu, has the resources to carry out their work. The grouping includes a healthy mix of junior and senior group leaders, although their precise inter-relationships and the joint projects they will pursue are not described in detail in the submission.

The teams possess complementary expertise that will be applied to *in vivo* and *in vitro* studies. Materials necessary for imaging, *in vivo* models and *in vitro* models are easily shared and very beneficial to the RC. Animal welfare issues are handled in a professional manner, via the well supported transgenic unit.

#### **A.11.3. Competence of the RC and research teams**

The RC Head Myllyharju has very good publications, though mentor as co-author till 2007. An up-and-coming star, taking the reins of the unit in place of more senior colleague(s) with greater administrative and scientific credentials, but too many other duties. Leadership skills somewhat unproven, though has recently taken the helm at Biocenter Oulu; expert tasks thus far all local or national rather than international, but very wide-ranging.

The overall quality of the publication record of the other RC team leaders reflects the diversity of the team leaders in terms of seniority: commendably ranging from distinguished international scientists with stellar publication record and prestigious awards, to junior group leaders without independent publications to date, and the head of a core facility with good publications but mainly as middle author.

On balance, the RC publishes papers of significance for the field, in high impact international journals. However, they do themselves some injustice by emphasising, in the overall publication record, too many papers conducted by team members elsewhere (e.g. as postdocs in USA), so that the real impact of the work of the RC in Oulu needs to be reconstructed from the individual lists. Nevertheless, the major groups contribute true international excellence. The RC leaders bring a diverse range of expertise. The scope of their accumulated knowledge is nicely complementary, and includes only a moderate amount of overlapping content.

#### **A.11.4. Research environment and collaboration**

The breadths of techniques applied will lead to multidisciplinary approaches and a unique research environment. The different viewpoints lead to complementary expertise. With four members already a Center of Excellence and four others heading units at Biocenter Oulu, this RC is part of biomedical research backbone at Oulu.

The PIs are well networked within the Finnish research community. There appear to be no national research collaborators that would be better suited to do the job. RC Tissue Homeostasis has an extensive collaboration and participation in EU projects, and FiDiPro as a special asset.

#### **A.11.5. Significance of the RC for the researcher training and promotion of professional careers in research**

The PIs have an excellent output of PhD graduates, and the RC is at the heart of the Biocenter Oulu doctoral programme, providing a rich resource for multidisciplinary training, expert guidance and support. It maintains

links with sister programmes abroad, and recruits about a third of its students from outside Finland. With an AF CoE at its core, the RC is well placed to attract the best PhD candidates nationally.

The groups seem to have a good track record for recruiting and training post-docs, and for attracting young PIs. There is a wealth of molecular techniques, knowledge on diseases and models applied will generate an excellent research environment for larger frameworks to postdocs.

#### **A.11.6. Societal impact**

It is difficult to assess without having in place mechanisms to translate the discoveries into patient/people benefit. This is an area for improvement especially with respect to translating mouse model work to the humans.

#### **A.11.7. International competitiveness or international comparability**

In ECM research the RC is at the very top of the field.

#### **A.11.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

This is one of the leading scientific groupings in Finland with a wide range of expertise from senior professors to students and a long standing history of excellence in ECM research which should ensure a bright future.

The overall team and its leadership has potential to continue at the top of the field, but should endeavour to maintain their standard of using “the state of the art technologies” in imaging, cell culture models and explore broader and novel routes to clinical applications.

#### **A.11.9. Final rating (1 – 6): 5,9 (excellent - outstanding)**

## **B. Human Sciences (HS)**

### **CATEGORY VENI**

#### **B.1. RC AgeAds – The Age of Adjustments? Critical and Historical Perspectives on Governing Citizens, Wellbeing and Environment; RC Head Hannu I Heikkinen**

##### **B.1.1. Scientific quality and innovativeness of the research plan**

This research plan belongs to the new field of humanities: Environmental humanities. This is a good attempt to start tightly-knitted interdisciplinary scientific collaboration. The proposal focuses on human adjustment to changing natural and social environments and the consequences of such adjustments to individual and social well-being. This topic of research is unusual and original, especially for the humanities and it promises rich results. The plan is built on the foundation of humanities that specialize in natural science, the history of medicine and environmental humanities. The purpose is to offer complementary, encompassing and contextualised views to the environment, health and social control, and engineering.

AgeAds is a multidisciplinary humanistic group involving cultural anthropology, history, human geography and philosophy characterising their approach as environmental and medical humanities. Their aim is to apply the tools and perspectives from human sciences to the study of problems involving the environment, health and social control.

The general description of the project is made in relatively broad conceptions, having adjustment as its central category and arguing for a contextual approach based in spatial and temporal particularity, and variation. The more particular analyses come in descriptions of each of the five research groups. Each of these sub groups has empirical material of its own. The perspective appears focused and innovative, opening the humanities towards social, environmental and technical sciences.

The potential for new outcomes is great due to the originality of the ideas and the new roads that the RC wants to follow. Of course, since it is a relatively young and newly constituted group together aiming to follow new roads and connections, there might be a risk factor that the key ideas like adjustment or adaptation might not be as fruitful as the authors expect or that the ideas are not defined carefully enough to substantiate significant



results. There is certainly potential for this RC to develop ideas that might lead to progress in this field. The five groups of this community have not collaborated together before. However, the attempt to cooperate is great and this is the first step away from discipline driven research towards to multidisciplinary research. As the authors point out it is also a possible risk that they will not manage to keep the scientists in full time work on this project.

The scientific added value of this RC is the combination of the approaches to the topics of adjustment/adaptation in the context of citizenship, well-being and environment. The multidisciplinary research environment encourages AgeAds research groups to look with new eyes at the methodological tools and theories used by other disciplines. The bringing together of these people most likely can add the understanding of the man-environment relationship. Especially doctoral students and post-docs will profit working at the new research institute for the human sciences institute (Eudaimonia).

#### **B.1.2. Feasibility of the research plan**

The research methods are well articulated and seem to be justified. There are two methodological axes; the first is space and the second is temporal. In this community, historical dimension (temporal) will help the biological, medical and social sciences to understand the long historical developments, and historians and cultural anthropologists would learn new methodology and concepts from those fields.

The authors rightly point out that the temporal or historical dimension is not often considered when discussing about environmental issues or medical issues. Citizenship is probably different in this respect. The research plan is very feasible. The structure of the RC is appropriate for tackling the theoretical issues focused on.

The work of the group does not require much material and equipment. The challenge is human resources, that is, to keep young researchers affiliated to the group. The resources fit the objectives and the needs of the research plan.

The Materials management plan is not considered applicable here. Ethical issues are not discussed in the application but have to be considered at some stage in the research project - e.g. in relation to data on health.

#### **B.1.3. Competence of the RC and research teams**

The RC Head has made his career at the University of Oulu, but he has worked in Barents Environmental Engineering. The list of his publications is good. The most of peer reviewed articles are joint publications. He is relatively young, and does not seem to have much former experience in leadership. However, he has been involved in research projects funded by Tekes and the Finnish Academy.

The RC PIs are qualified researchers. They all have published extensively in peer reviewed international journals and some of them have also published books. Many have both international and national records in German, in English and in Finnish.

The overall quality of AgeAds's publication record seems to be generally all right. The publication list for the group is not long and includes items from the publication lists of the leaders. There are many joint articles in peer-reviewed journals.

The Principal Investigators are bringing complementary expertise to the project. The division of labour seems to be in order. Judging by disciplines and RC issues there seems to be a good synergy in the research community. They all have wide experience in directing scientific research and they are in charge of the parts of the RC where their expertise applies. The Principal Investigators have excellent networks through which the newest know-how is spreading. They also have scientific expert positions in the editorial boards of scientific journals and of publishing houses.

#### **B.1.4. Research environment and collaboration**

The proposal in itself is promoting multidisciplinary research in the humanities, and it also opens the doors towards more technical sciences. The RC has a great emphasis on researcher training and also refers to Eudaimonia. This RC will develop interdisciplinarity within Oulu University. It is also innovative in a larger context, both within Finland and internationally. If it proves successful, it would be an example for others to look for innovative ways to combine different academic disciplines.

The multidisciplinary research and environment will give added value for the RC. Some sub groups like Tourism, Environment and Local Wellbeing have international scholars and doctoral students in their research

group. Both history and geography were evaluated with highest grade during the last evaluation of the University of Oulu in 2007 (RAE 2007).

This type of research requires first of all good surroundings, IT environment, office space and assistance. The faculties of humanities and natural sciences meet the basic research environment and infrastructure needs of the RC. It must be secured that the researchers meet regularly, it is not sufficient for them to interact through email. This RC project is very much in line with the emphasis on innovation at University of Oulu.

The RC states to cooperate with most of the faculties of the University of Oulu as well as with Thule Institute. The collaboration proposed in this RC with University of Jyväskylä and University of Helsinki helps to broaden the basis of this interdisciplinary research and should secure that the interdisciplinarity drives this research along.

RC will cooperate internationally with Rachel Carson Center in Munich and with Royal Institute of Technology. The long term plan of this RC is to develop as one of the leading centres of environmental humanities together with Thule institute and with the help of international cooperation, e.g with the University of Alberta.

#### **B.1.5. Significance of the RC for the researcher training and promotion of professional careers in research**

The RC has great emphasis on researcher training and also refers to Eudaimonia. It also claims to encourage internal relations and mobility of the doctoral students, but no more is specified. This RC should have all the necessary resources to integrate doctoral students into its work. There are Finnish and international doctoral students who are affiliated into sub groups and receive tutoring in seminars and workshops.

The proposal states the importance of keeping the research talents, but also says that it is where they need support and additional funding. Joint publications, seminars and workshops should work for those doing post-doctoral work. Among team leaders there are many who have excellent international networks and they can support postdoctoral research careers.

#### **B.1.6. Societal impact**

The issues of the RC are of great relevance to policy makers, administrators and the general public. The proposal states an aim of communicating via public presentations of different kind. The impact will of course depend of the success of the ambitious goals of the group.

If we assume that this RC project is successful it might have considerable social impact on policy decision in tourism, health and citizenship. RC director and Principal Investigators have introduced their research results in newspapers, in TV and there are many interviews of the RC director and team leaders.

#### **B.1.7. International competitiveness or international comparability**

There is similar research being conducted in other countries but it seems that this special combination of interdisciplinary research might have few rivals. This RC is looking at future. The long term plan of this RC is to develop as one of the leading centers of environmental humanities together with Thule institute and with the help of international cooperation, e.g. with the University of Alberta. Eventually, the kind of thinking involved in this proposal has the potential to attain international influence, but at the current state, it will be a long term strategy.

#### **B.1.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

The main strength of the project is its innovativeness, its interdisciplinary nature and its new combination of research fields. The RC explores important questions about long term as well as current human adjustment to changing natural and social environments. Their approach to environment and health from a humanistic (historical, anthropological, philosophical) perspective is original, and promising for the development of a better connection between human and natural/technical sciences. This RC is a group with a relatively young leadership with good potentials.

The applicants point out that they are starting their collaboration but the fundamental ideas seems to be sound and might lead to very interesting developments in future research. Some of the sub groups have already managed very well in receiving research funds and achieved a very good international reputation.

#### **B.1.9. Final rating (1 – 6): 6 (outstanding)**

## **B.2. RC CREMA – Community of Research in Education, Music, and the Arts; RC Head Juha Ojala**

### **B.2.1. Scientific quality and innovativeness of the research plan**

Unfortunately, the research plan of this project is not clear. There is hardly any effort to use the research that the applicants are already involved in to articulate about the aims and means in terms of research planned during the period of the RC. This does not mean that the applicants do not have ideas, they do and they mention a number of them, but they do not succeed in putting them together into a coherent whole constituting a research plan. The proposal seeks to establish a case for funding students in their doctoral work, and for supporting general scholarly activities and developing a vision about the operation of CREMA towards the end of the period 2014-2018. The plan needs to be more focused and research-oriented, and the contribution to research-based teacher education should have been discussed more.

It is difficult to assess the quality of the research proposed because it is not clear what that is intended to be. There are no possible significant outcomes discussed that might enable an evaluation. The potential of the RC for significant new outcomes lies beyond the period 2014-2018.

The added value as described by the applicants is not quite clear, just the groups proposed in this application working together and representing researchers in music education and in arts education. This RC will certainly strengthen research in music and arts education at Oulu University but that is not a scientific added value. The proposers acknowledge, that the members of the RC will not share a given paradigm of research and that their projects may not integrate well together at the methodological level. Although this means that fruitful collaborations may emerge, the collaboration is not easy at the moment. The members of the RC share a common interest and enthusiasm to develop the research in art and music education beyond the individual enterprise it is until now at the University of Oulu. Working as an RC can definitely help to develop a more focused and shared research programme.

### **B.2.2. Feasibility of the research plan**

Because the research plan is not clear, in addition to the research of the individuals involved, it is difficult to evaluate the feasibility of the plan and the methods proposed. It is clear that the participants use a variety of methods on interesting and important subjects in their fields but they have not succeeded in putting together a plan for this RC. The proposal does not list a research programme plan as such, but rather a pathway of three phases or goals: 1) to establish and secure funding for their postgraduates; 2) to “develop CREMA as a community”, which involves supporting individuals' research in a general way, with possibilities for discussion and shared research and 3) to carry on that momentum. The level of detail is not fine enough to be able with confidence to assess this positively.

The RC's immediate aim is to secure resources for their PhD students and to fund their own research. The material resources should suffice for their immediate aim but the requirements for their research are more difficult to evaluate.

Lacking any research time until now, one of the main aims of the RC is to obtain research time for some of its members. However, the stated aims of the RC may be realised to an important degree by the members of the RC, provided the financial resources become available. Like the RC writes in the research plan they lack senior research personnel and Professor to lead this area of research.

There are two groups; one focusing on music education, the other on arts education. But the structure of the research is really the one in place now, PhD students and their supervisors working on their own research. Only some of these students have secured funding for their PhD work. The nature of this organisation seems to consist in the admirable academic spirit of collegiality and mutual respect, rather than in the infrastructure of management. The RC consists of a mixture of senior staff and doctoral students. The emphasis in the document is not on the structure and organisation of the RC, but on the aims and ambitions.

The Materials management plan is considered and, quite rightly, it is not believed to be expensive or extensive. This kind of research requires IT equipment software and hardware, offices, a good library and access to schools to conduct the research or to performers of music.

There are no ethical issues involved but there might be for some of the research on children's experience mentioned in this application but it is not a part of this application. Ethical issues are discussed explicitly in the document only to a limited degree.

### **B.2.3. Competence of the RC and research teams**

The RC Head has published widely on music, musicality and music education. He has the experience in supervising doctoral dissertations and he has guided a national university project in music. The publication record of the proposed director is not very strong when judged by the visibility standards. Three manuscripts have recently been submitted to international publication fora, but the longer publication history in terms of international publications is not that good.

The other team leader has published articles in various scientific journals and books on drama education. He has experience from national and international projects which he has directed. As with the Director, the Pls' publications are limited in number and in international exposure.

The RC has published a number of articles about various kinds of arts education in peer reviewed journals and in books. But the record is not extensive. The RC Head recognises this problem and states in his document that one of the aims of the RC is to improve the publication of the research in international fora.

The team leaders are capable of directing an RC. The division of labour is between directing the music group and the arts education group. There is no further description, there are no sub-projects and the structure of the RC is underdeveloped.

### **B.2.4. Research environment and collaboration**

What is argued for in this application is the increased researcher training and promotion of creative research in the field of arts education. This is certainly added value but it is questionable if it can be achieved. The nature of the members' talents in performance and its analysis does suggest that there might be useful creative synergy among them. The main value of working as an RC seems to be to develop working as a community. Making this RC work means transforming the research culture of doing individual projects into a culture of working in a shared research programme. The accomplishment of such a feat would be a huge achievement and, undoubtedly, provide a way forward.

This research seems to fit in well with the University of Oulu and its emphasis in research. If the changes planned and described in the application will be executed then research in arts education should increase at the University of Oulu. Arts and music education are important elements of educating young people. The University of Oulu has expressed the desire to teach in a research-based way. The RC is a mean to develop research-based arts and music education, but there is a long way to go.

Cooperation is intended with the University of Jyväskylä. One of the team leaders comes from that university and this cooperation might prove fruitful. It is also stated that there will be cooperation with the University of Helsinki and the University of Arts Helsinki but there are no names in the list of the research groups. In their registration document the leadership of this RC identifies national collaboration opportunities in the Sibelius Academy. Moreover, they also identify an original perspective where they mention the potential role of music and arts in the treatment of learning problems and where they draw attention to the potential relationship between brain function and arts and music education. These new directions open up many collaboration opportunities of an entirely new nature.

There is no international cooperation in this proposal. But it is described how a connection might be established with the Applied Music Research Centre at the University of Roehampton, UK. There is room for more specific international collaboration.

### **B.2.5. Significance of the RC for the researcher training and promotion of professional careers in research**

They already have a number of doctoral students and these students have access to money for travelling. There should be no problems in integrating those students that are the part of this RC into and their activities. Individual projects may attract students, but it is not obvious that the RC as a whole will attract large-scale funds from such agencies as the EU. Due to the tradition of individual doctoral research projects until now, establishing an RC on CREMA can improve the supervision of doctoral students and their integration in relevant national and international research communities considerably. Supervision of doctoral students is still quite limited with one major European project experience.

There is nothing on the objectives and resources of the RC to support postdoctoral careers in particular in the application; except that the applicants point out that the doctoral students have access to travel funds. But this should not be a problem for the RC given that they allow for these expenses. One of the RC's prime aims is to secure funding for its postgraduate students, who are given respectful place in the proposal. The RC offers

potential for the support of postdoctoral research careers as well, although until now the personnel list of the RC does not contain postdoctoral researchers.

#### **B.2.6. Societal impact**

The possible social impact of this RC is likely. It will come through the education of teachers and improve musical education and arts education in general in Finland. It might also broaden research in arts education. Linking arts and music education to the treatment of learning or memory problems may have considerable societal impact. This could also increase wellbeing in the community.

#### **B.2.7. International competitiveness or international comparability**

The research plan is not clear but what can be figured out from the application could establish this RC as a serious contender in the research community on arts in Finland. This is a worthwhile aim. By their own assessment as being in the "*Veni*" category, the proposers acknowledge that they are yet to establish themselves as a distinct or recognised research group. At this moment, the RC is not competitive in an international perspective. The character of the RC is not specifically national either. Publications so far mainly had a national audience.

#### **B.2.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

The main strength of this proposed RC is the number of ideas that are to be found in the application but not a single one of them is spelled out in detail. If the team had decided to work out a research plan and organise the activities proposed around that this application would have been very promising.

#### **B.2.9. Final rating (1 – 6): 3,0 (good)**

### **B.3. RC INSPIRES – Institutions and Practices of New Literacies; RC Head Maija-Leena Huotari**

#### **B.3.1. Scientific quality and innovativeness of the research plan**

The research plan has an interdisciplinary and innovative character. New literacies (literacies that have come into play with the development of computers, multimedia and Internet) are being studied from various disciplinary perspectives and integrative theories are being developed. The ability to read words in a book is complex; the ability to interpret and understand texts, figures and other relevant things in multimedia environments is much more complex. The innovation in this project is to approach this topic from an interdisciplinary point of view and the RC intends to use various new tools for its research.

The group's research is enthusiastically described; there is clearly strong motivation to profit from the Finnish government's 'Joy of Reading' impetus and funding. While it is hard to say how good the quality of the research will be, one may nonetheless argue that if the performed study fulfils its promise, it will be an excellent contribution to educational theory and practice.

The potential for scientific breakthroughs of this research plan is high, not the least because of the innovative interdisciplinary approach chosen. The use of new research devices may lead to new understanding of literacy, at least the more complex kind. There is a potential risk which is to widen the definition of literacy to include whatever it is that enables our understanding in these new contexts. This project does not seem to invite this risk and the proposed research might certainly lead to new understanding. A potential risk is that the RC contains groups whose methods and perhaps theoretical frameworks are difficult to combine: for example there is little common ground between eye-tracking recording and theorising literacy as a democratic right.

The RC unites four different research groups from different disciplinary backgrounds. The interdisciplinary research approach which lies at the heart of the RC is significantly enabled by working as an RC. The added value refers to enabling the understanding of literacy of the more complex kind by approaching it from many viewpoints. As noted above, there are potential splits in the nature of the questions asked in the RC and the methods by which they might be answered; on the other hand, if the group manages truly to integrate what seem to be incommensurate activities that will be a significant achievement.

### **B.3.2. Feasibility of the research plan**

The research questions are well articulated in the research plan, the research activities are well-specified and the foreseen outcomes are described. The methods should lead to results and the research plan is well-feasible and can be achieved. The schedule of the different research activities is carefully worked out in time and order (Table 1 in the research plan). The applicants foresee no particular problems but if and when they encounter them they should not be too difficult to solve on the basis of what is in the plan.

The resources are well taken care of. The leadership of the RC has been highly successful in attracting external funding for its research activities over the past years. A major grant has recently been attracted (The Joy of Reading) which will enable the implementation of the initial research activities of the RC. The RC unites four research groups that together supply the necessary and adequate manpower for the planned activities.

The RC brings together four research groups of different size and from different disciplinary backgrounds: Literacies and Empowered Communities, Health Information Mastering, New Literacies and Future School and Interactive Spaces. This structure should lead to new understandings of literacy in new contexts. The document is not very specific about the way the collaboration between the different groups will be organised. In Section 1, the proposal claims a "novel collaborative structure and related practices for effective outcomes". Figure 1, which is meant to represent this, seems to be a normal cycle of aims, research questions, research projects and expected outcomes, and does not speak to an organisational structure in the sense of lines of management and so on.

The RC will use, among other things, the research facilities of the LEAForum lab, with its innovative devices for data collection. The management of materials is not a major issue in the document but the researchers will have to have access to the new devices and to materials to develop new ones. This does not mean that it is neglected but it could have got a more prominent role.

There is a welcome acknowledgement of ethical issues on p 2 of the free-form document. The ethical guidelines as determined by the Personal Data Act will be followed.

### **B.3.3. Competence of the RC and research teams**

The proposed RC director has an excellent publication record with international exposure and great impact, the scientific expertise seems to be excellent, she shows evidence of an active and well-established academic. Moreover, she is very experienced in academic leadership roles.

The proposed RC director is one of the four proposed RC team leaders as well; see point 9 for an estimate of her record and merits. The other three proposed RC team leaders show a more mixed publication record, but they are all active academics, with some international exposure. One has mainly published in Finnish and in conference proceedings, limiting the international impact of the work. The others show a mixture of publications in Finnish and English. All RC team leaders are experienced in academic leadership roles, and they seem to very well equipped to fulfil their tasks.

RC INSPIRES's overall quality of publications is strong. Undoubtedly, the research has a leading position in its field in Finland. The bibliometric analysis shows a relative high percentage of conference proceedings as an outlet for the research of the RC until now, which limits the impact on and citations of the international scientific community. The list of 20 selected publications however also shows some articles published in international top journals with high impact factors.

The proposed RC team leaders definitely bring complementary expertise to the RC project, evidenced by their different disciplinary backgrounds. They do what they are best at, deal with the appropriate projects. The division of labour is not highly specified in the document, which is in our view not a weak point in this stage of the collaboration.

### **B.3.4. Research environment and collaboration**

Interdisciplinary research approaches, creation of mass for doctoral research training, crossing own boundaries in theories that are used. The RC shows an excellent ambition to develop the community together. This cooperation should create new research and increase cooperation across disciplines. There is significant potential added value, supposing that means can be found to integrate what seem to be at least some incommensurate

research methodologies. But overall, the shared interest in new forms of understanding literacy ought to foment a collaborative experience and aid the wider training of younger members of the RC.

The RC's activities support the strategic agenda of the University of Oulu. The RC seems to be the very type encouraged by The University of Oulu, works across disciplines, is innovative and is supported by the University of Oulu. The theme of literacy should resonate well with the University of Oulu if only as an element of learning and education; besides, it fits well under the heading of Culture and Identity. The University of Oulu supports the RC by offering adequate infrastructures such as the LEAForum lab. Moreover, collaboration has been established with several other groups within the University, such as CSE (Computer Science and Engineering at the University of Oulu), DynaHealth and PSH.

This RC is unusually well placed nationally, as it can benefit from the government 'Joy of Reading' initiative and funding. Collaboration on a national level has been established with research groups from Åbo Akademi University and HIM, and with the University of Tampere and iSpaces.

The international collaboration is extensive and will contribute substantially to the success of this project. The document mentions the important collaboration with CELSTEC from The Netherlands led by visiting professor Kirschner. Moreover, the proposal lists a large number of international connections with researchers in the USA, UK, Japan and France, although inevitably these tend to be specialist links with individual research sub-groups. Some of these are at some distance from the main theme of literacy. One perhaps surprising omission is reference to Lancaster University (UK)'s long-established Literacy Research Centre.

#### **B.3.5. Significance of the RC for the researcher training and promotion of professional careers in research**

Researcher training is a considerable part of the plan. The international significance of the general theme of the research ought to enhance the attraction to students and funders. The RC provides research training for 17 doctoral students and aims to publish increasingly in international peer reviewed journals. The RC has an excellent ambition to establish a community of learning to publish more in international top journals. Researcher mobility will be stimulated by sending doctoral students as visitors to foreign related research groups.

Support of postdoctoral research careers is well articulated. There is welcome acknowledgement of the important role of students and post-doctoral researchers in the life of the RC. To date the personnel list contains few postdoctoral researchers. The aim of the RC is to increase its number of postdoc researchers and to stimulate research mobility by international exchange of its postdoc researchers.

#### **B.3.6. Societal impact**

Although at various points the proposal claims that it will have social impact, the research projects are at the (quite proper) level of fundamental research, and their application is not immediate. It is implausible to claim, for example, that "INSPIRES will improve literacy practices in all kinds of written and oral texts...." when there is no concrete programme of training to do so; indeed it is not easy to imagine what such a programme would entail. That said, the societal impact of the RC can be high. If successful this RC might have considerable social impact through training teachers in understanding the new media and understanding how to develop new user-friendly devices. What may help in contributing to societal impact is the relative high number of newspaper articles that is typical for this RC as an outlet to disseminate its research results.

#### **B.3.7. International competitiveness or international comparability**

The research of the RC is of excellent quality and has a high potential to develop into top international research. The research topics, methods and plans are on a par with other active groups elsewhere in the world. If it proves successful it might develop into an international authority in this area. The publication policy of the RC has changed towards more international publications in high impact journals, and this will certainly help to increase its international impact.

#### **B.3.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

Strong points of the RC are its interdisciplinary research approach, the promise of understanding new literacies that is produced, its ambition to develop as a research community, and its capability to attract considerable external funding. Some of the strands of research mentioned are at some distance from each other, and the

link may be difficult to sustain. On the other hand, the research may benefit from integration and that promise of multidisciplinary work may pay off. A development area also identified by the RC leadership is moving into the direction of more publications in international top journals. As a "Veni" RC it will deserve support.

**B.3.9. Final rating (1 – 6): 5 (excellent)**

## **CATEGORY VIDI**

### **B.4. RC ACG – Accounting Decisions and Corporate Governance; RC Head Juha-Pekka Kallunki**

#### **B.4.1. Scientific quality and innovativeness of the research plan**

The aim of this RC is to examine corporate governance and accounting decisions. This is approached basically from two angles. First, from the angle of how personal characteristics of the insiders influence corporate governance. This question is approached from the point of view of financial decisions and accounting decisions. It seems to be the case that criminal convictions of CEOs for example can have the consequence that businesses manipulate their earnings in order to avoid taxes. The complicated web of public and private businesses is one of the most important areas for decisions in modern economy. The world-wide phenomenon of extremely high earnings of CEOs, bonuses that are independent of how the business is doing, can lead to citizens' intolerance of the free market. So it is important to understand how these decisions are taken and how we can explain them. These decisions are taken by the employees of the firm, never by the firm itself. Second, from the angle of how accounting decisions influence corporate governance: The innovative dimension is concentrated on the individual characteristics of the insiders and the proposed ways of approaching this promises very good research. The research plan addresses clearly real world challenges and contributes with important theoretical development.

This RC has well developed links and relations to both national and international researchers and also to organizations. We suggest this RC to continue and deepen the international research relations.

The three teams in this RC focus on corporate governance from different perspectives: accounting decisions, financial reporting and executive compensation. The value added comes from encouraging collaboration between scholars in these different business fields. This effort is worthwhile. The scholars are already in a good position to form collaborative teams so the value added (above what would normally occur) is difficult to assess. The research might enable knowledge about correlations and even causal connections between individual characteristics and decisions in business governance. This would count as a major progress in this field. It might turn out that there are no significant correlations to be discovered in this field of research but the indications from other research seem to tell another story.

It is unclear whether the available data is rich enough to separate personal attributes of directors from attributes of the firms they direct. The data on personal attributes is from proprietary Finnish and Swedish databases. The extent that there are unique regulations and institutions for corporate governance in these countries has the potential to limit the appeal of the research to the broader scientific community.

The added value in this research is the approach to corporate governance from different points of view. The jury is out on whether it is the personal characteristics or accounting decisions that are basic to understanding corporate governance. This research has clear and convincing scientific goals and the research has the potential to contribute to innovative developments in areas such as executive compensation decisions, financial reporting choices and the government of corporate insiders. New models and theoretical frameworks and concepts will be developed.

#### **B.4.2. Feasibility of the research plan**

The research methods and plan appear feasible. There do not appear to be significant scientific problem areas other than those surrounding the use or proprietary personal information on the attributes of corporate directors. These issues are not addressed in the proposal. There is no time schedule in this proposal.

The RC consists of three Professors, five postdocs, six doctoral students, one senior research fellow, two project researchers and two other project staff. Other required resources, including data, are available in the Oulu Business School. The resources seem to be adequate and sufficient to implement the planned activities and research objectives. There are researchers with a good record when it comes to international publications.



There are three groups, the first investigating financial reporting and corporate governance, the second executive focusing on compensation and corporate governance and the third examining management accounting and corporate governance. This RC seems to be well structured and organised around three complementary fields in business. The complementarities between the three research teams represent strength of the RC.

The staff is the most important issue for this type of research. But it is also important to have access to data and to have good equipment. There is little discussion of data and materials other than to indicate that the data is available in the Oulu Business School. The access to data is not very clear to us; e.g. some data can be hard to get access to. The challenges are not put forward.

Ethical issues are not discussed but they will certainly be highly relevant to the parts of this plan where the idea is to concentrate on individual characteristics and history as issues of privacy will have to be dealt with. The use of proprietary data on personal attributes of corporate directors raises issues related to confidentiality that would typically be subject to protocols for research involving human subjects and confidentiality of personal data. There is no mention of this in the proposal. Presumably the institution has protocols to manage such issues.

#### **B.4.3. Competence of the RC and research teams**

The RC director has a high quality publication record with some publications in the very top accounting journals (Journal of Accounting and Economics, Review of Accounting Studies). These are among the 45 journals spanning all fields in business and economics used in the research ranking of business schools by the Financial Times. Other publications are in good accounting journals.

The publications of the other RC team leaders are a mix of publications in good (but not top) field journals and lower quality outlets. Collaborating with the RC director provides an opportunity to enhance the quality of research by the other RC teams.

The overall publication record of this RC is good. According to the bibliometric analysis the RC has 29 scientific journal articles, with fewer than 25 indexed in WOS. Of the 33 journals and publication series publications 2007-2011, two are in level 3 (top), and ten are in level 2 (leading) outlets. Of the top 20 publications for the RC, the RC director is a co-author on 14.

The overall plan is sound and good and the division of labour appropriate for this research plan. This RC consists of an innovative group/team with well-developed relations with international experts/researchers as well as with organizations' to be studied. The expertise of the team leaders is very complementary and should enhance the productivity of the RC. There is a nice division of labour between teams of the RC and components of the proposed research.

#### **B.4.4. Research environment and collaboration**

The most important value added is the training of researchers and promotion of good research environment. But, there is no interdisciplinary research put forward in this plan. The scholars are all located within the Business School and already in a good position to form collaborative teams. The value added for the promotion of multi/inter/transdisciplinary research is minor. Team leaders for accounting decisions and executive compensation have previous collaborative efforts. The main value added is continuing this creative research environment.

The research of this RC fits under one of the development areas of the university: Business Administration and Economics, under the sub-area of Growth and corporate governance of the firm. Thus, this RC is nicely aligned with the development priorities of the university.

There is established cooperation with the Aalto University, University of Tampere, the University of Jyväskylä, as well as with Stockholm School of Economics. The Business School is a partner with the Finnish National Graduate School of Accounting and the director of the RC is the current Dean of the GSA. This cooperation broadens the research plan.

International collaborations that extend the research beyond Finnish/Swedish firms would have the potential for significant value added but availability of data on personal attributes of corporate directors is a potentially limiting factor.

#### **B.4.5. Significance of the RC for the researcher training and promotion of professional careers in research**

The RC is relatively small. There are three Professors and six doctoral students. This is a reasonable, but not overly ambitious, effort to supervise doctoral students and integrate them into the RC. This RC has a great potential via e.g. the Oulu University Graduate School and well developed relations with leading Business schools and research centers in Europe and the US. The needs of the doctoral students are well integrated into the research plan and the objectives.

The RC involves five postdocs and one senior research fellow. Again, this seems reasonable but not a major effort of the RC. The needs of the post docs are taken care of and their participation in this project should help their careers.

#### **B.4.6. Societal impact**

The research of the RC is designed to help improve our understanding of corporate governance. It may impact the design of institutions to enhance and regulate corporate governance structures. The social impact of this research could be considerable. If successful it will generate new knowledge of corporate governance. This research is most relevant for the government and politicians but also for accounting firms and business in general in this turbulent business and economic times. The link to corporate culture and leadership could have been more clearly developed.

#### **B.4.7. International competitiveness or international comparability**

This RC might develop into an international center of excellence and it has elements that are already of international standing. There are a number of groups with somewhat different approaches. Prior research conducted by scholars in the RC has mainly been published in decent field journals. This RC is among the very best in Europe.

#### **B.4.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

The main strength of this RC is that the basic idea is clear and simple but still has great potential when it comes to future research; publications, external funding and when it comes to address important challenges in society. This RCs research approach has the potential to increase our understanding of corporate governance, economically and socially a very important field to understand. The RC has a well-developed theoretical basis, strong leadership, international relations but somewhat underdeveloped description of the methodology. The research and research plans presented by this RC represents a solid basis to develop to world class research and the proposed research fits well within the development areas of the university.

#### **B.4.9. Final rating (1 – 6): 4,0 (very good)**

### **B.5. RC BARC – RC in Bioarchaeological Research; RC Head Markku Niskanen**

#### **B.5.1. Scientific quality and innovativeness of the research plan**

The RC focuses on Bioarchaeology, the study of neolithization, modernization and geographical patterns of the effects of changes in culture and the environment on the life and health of post-Pleistocene Fennoscandians. The RC combines modern techniques of bone imaging, molecular archaeology, and sampling procedures from modern medicine to study historical material that includes a large database of European skeletal remains. The RC spans multiple disciplines and brings them together in ways that maximise their complementarities such that each discipline enhances the others. The innovativeness and scientific quality of the research plan is outstanding with extremely high potential to generate internationally recognised research.

The RC has the potential to produce internationally significant research findings on the impact of environmental and cultural factors on human evolution and biology, as well as on other mammals. A potential risk for the RC is that bioarchaeology is a relatively new sub-discipline, but this represents an opportunity as well.

There are clear scientific advantages in the way this RC brings together scholars in Science, Medicine and the Humanities to study human evolution. The RC maximizes the complementarities between disparate disciplines in these Faculties to form a strong research organisation focused on new and interesting scientific questions. The RC brings new, modern methods to the field of bioarchaeology utilising the latest techniques in bone scan imaging and molecular archaeology as well as the feasibility to link historical archaeological data with modern

diagnostics of the human, environmental condition. There is clear scientific value added in the long time perspective and in cultural, environmental changes and in new aspects on human-animal relationships. The research has clear potential to be recognised among the world leaders in this area of science.

#### **B.5.2. Feasibility of the research plan**

The research utilises methods at the frontiers of bioarchaeology. The research community is well-planned. Four subthemes by Niskanen, Aspi, Ylimaunu and Tuukkanen have different profiles and the collaboration network appears to be excellent.

The project will utilise a joint imaging laboratory available to archaeology, biology and medicine, along with available GIS facilities. Gene sequencing and DNA labs are also available. The RC cooperates with several international partners and European museums. The RC has received substantial international external funding to support its activities, including funding from the U.S. National Science Foundation, among the most competitive in all of science.

The RC is very well structured and organised to bring together researchers from disciplines that span 3 Faculties. The RC consists of 4 research teams: Post-Pleistocene evolution of human skeleton, Bioarchaeology of human-animal interactions, Material culture and modernization of the north, and Human biology and comparative anatomy. In this RC the leadership is very important to make sure that the groups also cooperate with one another.

There is no materials management plan. The proposal contains no discussion of ethical issues. Presumably there are standard protocols for conducting research on skeletal remains.

#### **B.5.3. Competence of the RC and research teams**

The RC director has very good international research connections. The publication record is good and the research has the potential to generate increasing citations.

The PI's have a strong international publication record. PI Tuukkanen has an excellent publication record that is widely cited and. PI Aspi has a very good publication record with very good citation rates. Pi Ylimaunu is very young but shows evidence of accelerating research productivity.

The overall publication record of the RC is very strong in internationally recognised journals, with notable strengths in the areas of biomedicine and biology. The complementary expertise of the team PIs is exceptional and it represents a major strength of the RC. It is an outstanding and very innovative group/team with a well-planned division of labour between the teams.

#### **B.5.4. Research environment and collaboration**

The RC offers significant value added by promoting interdisciplinary research and training across 3 Faculties in Science, Medicine and the Humanities in a coherent, creative and well-organised way.

The RC aligns with the university focus area of Biosciences and Health: Genes and the environment. The RC encompasses faculty in the Humanities, Science and Medicine, yielding a strong interdisciplinary RC. The focus on Bioarchaeology of Finnish and northern European humans enhances the university's identity as an expert in Northerness.

The RC has very strong national collaborations across all 4 research teams and well developed relations with other research centers.

Research team 1 has had excellent international collaborations with Johns Hopkins Medical School and the University of Massachusetts, and is connected to a significant NSF funded project involving those institutions and one in the Czech Republic. The success of the RC project will be significantly enhanced if all research teams are able to engage in similar international collaborative efforts. The RC plans intensive collaborations with Stockholm University, which has the only other center working on bioarchaeology of Fennoscandian materials.

#### **B.5.5. Significance of the RC for the researcher training and promotion of professional careers in research**

The RC is involved with 4 national graduate schools and a Scandinavian graduate school in osteology is planned with Stockholm and Lund universities. The RC hopes to formally establish bioarchaeology and biological anthropology in Finland.

The RC involves six postdocs or senior researchers. With four research teams it seems possible to provide greater support for postdoctoral careers and there appears to be an opportunity to expand this aspect of the RC. The RC has developed good exchange programs with other universities including the University of Stockholm.

#### **B.5.6. Societal impact**

The research team has published in general, popular outlets and participated in media discussions. The potential impact is substantial and very relevant since human evolution and health is an important societal issue and will continue to be a focus in the future.

#### **B.5.7. International competitiveness or international comparability**

The field of bioarchaeology is new and developing, so there is a real opportunity for this RC to become recognised as a world leader in this area of science. There are no other groups focused on Fennoscandian materials, except Stockholm University, with which this RC collaborates. The research program of this RC seems to be broader than often is the case at other universities.

#### **B.5.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

This is an outstanding RC characterised by innovative research using cutting-edge scientific methods within a strong and truly interdisciplinary research organisation across Science, Medicine and the Humanities that offers many complementarities. The RC aligns with the university focus area of Biosciences and Health: Genes and the environment. The focus on Bioarchaeological studies conducted on early Finnish and northern European populations enhances the university's identity as an expert on "Northernness". The PI's have a demonstrated record of publication in internationally recognised journals and in achieving external funding from the best competitive funding sources in international science. This RC has significant potential to become a recognised world leader within bioarchaeology, provided it receives the support and leadership necessary to maximise its opportunities.

#### **B.5.9. Final rating (1 – 6): 6,0 (outstanding)**

### **B.6. RC CLRC –Child Language Research Center; RC Sari Kunnari**

#### **B.6.1. Scientific quality and innovativeness of the research plan**

This proposal is well-written and presents a well-conceived description of a coherent set of research themes. The proposal reflects a clear understanding of the need for multidisciplinary approach. The participants have strong background to accomplish their goals and are clearly well-versed in the fields of linguistics, especially as applied to various kinds of communicative disorders, and their outline of problems to be researched. Although not ground-breaking, their work is convincing and well informed.

The potential for new findings and to make major contributions in the field is evident. The work is highly labour intensive and release time is needed to accomplish the time-consuming goals. The group already has a good deal to draw on in the acquisition of, and problems in communication, in Finnish; this provides a solid foundation for launching more general work of greater international exposure.

The enthusiasm and integration of the proposal bodes very well for successful collaborations. The team may also like to establish some links with at least some members of the COACT research group at Oulu, where there are points of contact of mutual benefit.

#### **B.6.2. Feasibility of the research plan**

The overall research plan is solid. The schedule is quite ambitious. As stated earlier, data management may present a challenge for time management and resource management. The scope and coverage of the proposal gives one confidence that the researchers are well in control of the methods of the linguistics lab (which can be very demanding) and the various professional issues involved in collecting and managing recordings of language.

Again, the planned provision of resources for the implementation of the envisioned RC activities is an issue. As the proposers say, one great constraint is time away from teaching, but that is of course common to all academic researchers who also have teaching obligations. The resources are commensurate with the goals the group has set out, but the limitations may be time and the ability to meet the schedule they have suggested.

The outline of research questions under 'research objectives' is ambitious, but feasible within the collaborative group, so long as time is found for some of the more uncertain elements of the research process (for example, gaining access to schools, especially schools for vulnerable children where special ethical issues are involved).

The Materials management plan was not considered.

Ethical issues involved that should be taken into account may be gaining permissions to have access to special needs children. See above under the paragraph "The outline of research questions...". One assumes that the researchers are well experienced in access and informed consent, but it would have been welcome to see this more plainly set out.

#### **B.6.3. Competence of the RC and research teams**

The publication record of the director is solid. The number and the Director's publications, and the significance of their outlets, compare favourably with established and active academics.

The overall publication record of the other RC team leaders is adequate.

There is evidence of a group of solid scholars. The overall record is made up of the more internationally familiar publication outlets. As a list it forms a strong record, but it is the product of many hands.

The proposed RC team leaders (Principal Investigators) bring complementary expertise to the RC project and the division of labour between research teams/sub-projects of the consortia is appropriate.

#### **B.6.4. Research environment and collaboration**

The synergy is great. There will be opportunities for cross-fertilisation across the group. The proposal is particularly good at generating a sense of collaborative working and training, and one gets the impression that this is an unusually cohesive group with highly complementary skills.

This RC aims to set an international standard. This will certainly match the University's goal of developing international presence. The teaching loads need to be modified to reflect realistic involvement and participation. This proposal tells a plausible and indeed impressive story as to how that might be achieved. It is a good example for Oulu's developing international presence.

There is ample evidence of strong national collaborations and commitment. Other Finnish groups are not specified.

One question is the cross over benefit beyond Finnish language development. The international connections seem to be both well-established and promising; there are obviously some impressive centers with which members of the Oulu staff already seem to have good working relationships, and that bodes well for the future.

#### **B.6.5. Significance of the RC for the researcher training and promotion of professional careers in research**

The group is strong and the coherence of the framework looks promising as a setting for training, and the nature of the research would be likely to be attractive to a pan-European Marie Curie grant, so long as researchers in other languages could be recruited. Avenues for mobility were not clearly stated.

#### **B.6.6. Societal impact**

The social impact will come with the influence the research may have on practical implications including teaching special needs children. The outcome will have national and international implications. The proposal lists academic dissemination and media exposure, but the real social impact will come with the influence the research may have on practical matters such as the education of children with language impairment. Given the expertise on show here, and the existing track record, that seems to be a feasible ambition.

#### **B.6.7. International competitiveness or international comparability**

The RC has a strong national focus and has demonstrated a strong record. They are not at the top, but the foundations look good for building an international research community.

### **B.6.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

The proposal is well-written, comprehensive. It is well-grounded in current research literature, and built on an existing set of skills and experience among a cohesive set of researchers. The knowledge, skills and track records of the team are impressive.

### **B.6.9. Final rating (1 – 6): 5,5 (excellent - outstanding)**

## **B.7. RC COMPANION – The Complexities of Organizational Activities; RC Head Tuija Mainela**

### **B.7.1. Scientific quality and innovativeness of the research plan**

This RC has a strong leadership with relevant experience and well developed networks both domestic and international. The plan is innovative and the proposers have tried to strike a positive and original note in describing their research into various aspects of business management. The proposal is broad and may be too broad (marketing, management, entrepreneurship, international business, business law, information processing science and education) and addresses real world challenges. To study businesses in a variety of challenging economic settings is very fruitful. However, the research plan could have been clearer on the RC level, beyond the four areas - CRESCO, CHABRE, DICIE and SHARP - when it comes to how the different theoretical fields complement one another in the overall research plan. The overarching theme they promote is 'complexity', which they address from a critical-realist and social-constructivist angle but the research questions themselves could be more clearly defined. However, the panel sees a clear potential to develop this RC and to address important challenges in society.

This RC is doing research with high relevance. There is a clear description within each of the four areas; CRESCO, CHABRE, DICIE and SHARP of the research to be carried out and research questions to be focused on. There is a modest potential for significant breakthroughs as team leaders have produced highly cited papers in the past. The research plan does not identify potential major breakthroughs. Risks are those typical of any academic research endeavour. The main research lines set down per research sub-group seem to be standard questions about business, marketing and organisational studies. The hope of ground-breaking research must be in the extra value of seeing them from a critical realist and social constructive point of view.

This RC has clear, innovative and convincing scientific goals and the research has the potential to contribute to innovative developments in areas such as complexities in individual companies and non-profit organizations and the relations with other units and actors in a wider business and societal network e.g. on the regional and national levels. The focus on the interdependencies between social and economic actions and behaviours is very interesting to study theoretically as well as empirically in order to better understand "the integrated world" which is put forward in this RC. The RC consists of four research groups comprising more than half of the Business School. The research groups focus areas are: Challenging business relationships, Creating spaces for collective opportunities in organizations and networks, Dynamism of innovation, and Sensing and shaping service business relationships. The research group leaders all have their backgrounds in the Department of Marketing, although two of them currently work in the Department of Management and International Business. The proposal indicates that the scientific value added will come from the systematization of existing collaborative practices and information transfers between the research groups. Mechanisms to accomplish this are not outlined in the proposal making it difficult to ascertain the value added above what would normally be expected in the absence of the RC.

### **B.7.2. Feasibility of the research plan**

The research is quite broad and the four subareas - CHABRE, CRESCO, DICIE and SHARP - on the one hand seem to some extent independent from one another, but in the research plan, future cooperation within this RC seems to be much clearer and well developed.

This RC has many researchers with a great publication record, well established international networks and with experience from managing research projects and programs, also with external funding. This is considered a great plan for the coming years.

Four clear subgroups are well established and this is strength for this RC. The RC is structured to enhance historical collaborative efforts within the Business School. The teams are somewhat loosely organised, but well connected by the common backgrounds of the team leaders. The research plan should be developed by describing the organisational structure and how a closer and ongoing cooperation between teams will be established.

The Materials management plan is not emphasised in the proposal, other than regarding the development of a common data-sharing platform. Some data can be hard to access. The challenges are not put forward and discussed, making it difficult to assess them.

No specific ethical issues arose, although their absence is quite unusual in most social science research.

### **B.7.3. Competence of the RC and research teams**

The Director's publications show evidence of an active and well established academic with international exposure. The RC director has good administrative experience and serves on the editorial board of Industrial Marketing Management. Top publications are in good field journals but not leading general business journals.

The PIs' publications are more mixed, but also show the evidence of active and well-established academics with international exposure. One PI (Tähtinen) is on the editorial board of two journals and the editorial advisory board of two others; and has two scientific journal publications with over 100 citations. PI Hurmelinna-Laukkanen also has an article with over 100 citations. Top publications of the PI's are primarily in good field journals but not top general business journals.

The overall quality of the publication record of the RC meets the requirements for the *VIDI* level. According to the bibliometric analysis the RC had 33 WOS publications from 2007-2011. Bibliometric impact measures for COMPANION are below average relative to both external comparisons and to internal comparisons with (2) other HS RC's included in the WOS bibliometric analysis. The RC's best publications are for the most part in good, but not top, journals in the field. The 20 publications selected show the kind of published reports that would be expected from a group of academics working in an area where there was a good deal of international interest.

This is an innovative group/team and with well-developed relations with international experts/researchers. The RC team leaders have a common background in marketing and bring very good complementary expertise to the RC. Group leaders and senior researchers have co-authored together in the past and the RC is designed to facilitate further collaboration.

### **B.7.4. Research environment and collaboration**

The main value added is the promotion/continuation of a creative research environment within marketing and business. The RC aims to develop data-sharing mechanisms to create a common data platform to enable all RC groups to make efficient use of data collected by RC members. The scope for interdisciplinary research is narrowly confined to sub-disciplines within business. The extent to which the RC creates true value added is difficult to assess and will hinge on the development of new collaborative efforts and the success of the data sharing initiative to improve research productivity. The RC provides international networks that expand international career opportunities, including careers in business schools and academia, consulting firms and government agencies.

The RC aligns with the university's development focus area of Business Administration and Economics: Business models, networks and relationships.

The RC participates in the national doctoral school KATAJA and has well developed relations with other business schools and research centers as well as with TEKES and international networks such as the IMP group. A number of connections with other Finnish institutions are listed.

The RC has well-developed subgroups with the potential to develop joint publications within this RC in close cooperation with internationally well-known top researchers. The RC lists a number of active and ongoing international collaborations, although the descriptions are at the level of general programmatic statements, rather than concrete research questions.

### **B.7.5. Significance of the RC for the researcher training and promotion of professional careers in research**

The personnel have a record of supervising doctoral students, and the appeal of this topic area internationally may well enhance applications for funding. The RC supports a large number of doctoral students (34) including

eight international students. COMPANION is involved in the development of doctoral programs related to Eudaimonia and the Business School. Doctoral students participate in international doctoral courses including the Nordic Doctoral School in International Business. The RC supports 11 postdocs and 12 researchers.

#### **B.7.6. Societal impact**

The RC aims to promote a well-equipped workforce and to improve diffusion of research results through industry connections; however, the direct social impact of a critical realist and social constructionist approach to business and management is not transparent.

#### **B.7.7. International competitiveness or international comparability**

There are a number of groups doing research in areas such as relationship between marketing and management, network theories, social construction theory and institutional logics, complexity and system theory to mention some of them. This RC is among the best in Europe. Group leaders have published important and well-cited papers in their fields. To enhance its international recognition the RC should strive to publish in leading general international journals in business, as opposed to leading journals in the sub disciplines. The RC is capable of attracting international doctoral students, as eight of the 34 current doctoral students are international.

#### **B.7.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

This RC has a strong scientific leadership and well established international relations with other research and research groups. The RC has presented a topical theme that builds on an existing set of skills and experience among a cohesive set of researchers. A main strength of the RC is the quality and common background of the group leaders. The RC is designed to promote a continuation of ongoing collaborative efforts, while maintaining research flexibility for individual scholars. Thus, the RC has modest value added over what would normally occur, everything else equal. At worst, the RC will provide a general organisation under which to pursue existing trajectories. However, this RC has presented a plan for future research with potential to develop to world class research.

#### **B.7.9. Final rating (1 – 6): 4 (very good)**

### **B.8. RC EduPhil – Educational Theory and Philosophy; RC Head Pauli Siljander**

#### **B.8.1. Scientific quality and innovativeness of the research plan**

The coverage and style of the report is scholarly and obviously expert. There is a clear attempt to marshal some disparate strands of research together under the common theme of the philosophy as applied to issues of education. This RC adds an explicit connection to critical and post-critical theories in education and expertise in German literature and theory of interpretation. To put together pragmatism and theories of Bildung is itself a good idea, and to add critical and post-critical theories is an innovative approach. In pedagogical context the strengths of these traditions should be combined. There is an orientation towards innovation in the combination between the philosophy of education and 'post-critical' theory, but in the former theme it is not easy to separate out the distinct contributions of "Bildung" by the two sub-groups who both list it as a theoretical issue. This is good and solid research judged by international standards, the innovativeness does not rank as high as the scientific quality but the plan has potential to new openings by combining the German Bildung and the American pragmatism.

The intellectual challenges are exciting, but the distance between the 'post-critical' strand of the research and the other two seems on the face of it hard to bridge. It may also be that the specialist nature of the projects will face some difficulties in finding exposure outside of their immediate audiences.

It is difficult to predict if there will be new outcomes that will prove to be path breaking from this RC. But part of this group has already completed work on Bildung and pragmatism and it is of high quality. It is not spelled out, though, what exactly critical theory and post-critical theory will add to the research on Bildung and American pragmatism. The coming together of these theoreticians might lead to ground-breaking work and they are certainly capable of achieving it. There are not that many risks and not that many significant new outcomes, solid basic research with quite narrow audience. Still, this kind of research is needed to complement educational research. Strong theory and philosophy are needed to keep education and pedagogy on the solid scientific ground. Scientific breakthroughs are rarely achieved in the humanities and when they happen they are



usually not recognised until long afterwards. This RC might affect the development of theoretical discussion within philosophy of education both in Finland and internationally.

There is potential synergy between some members of the group, but this seems likely to be strongest among those with an interest in the concept of Bildung. The added value is the approach of critical and post critical theory to the research on the historical relations between American pragmatism and Bildung. The Deweyan pragmatism being investigated here is one of the most actively discussed subjects in the modern philosophy of education. The Bildung conceptions are connected to critical theory and post-colonial theory in a way that can add value to this research.

#### **B.8.2. Feasibility of the research plan**

The research methods are properly largely textual and analytical, with an excursion into interviews and other qualitative methods. Details of the interviews etc. are not described; nevertheless, their difficulties ought not to be insuperable. The methods proposed for this research are sound and the plan described makes good sense. There is no time schedule for different parts of the plan.

The resources should prove sufficient for the activities planned. The aim is to articulate the fundamental arguments applied in contemporary theoretical discourse on education, this will be achieved through biannual seminars, co-authoring articles of research and a joint doctoral program at two of the institutions involved in this RC.

The structure of the project is basically a list of intellectual questions that will be answered by (mostly) textual analysis and reflection; that seems perfectly proper for an academic exercise, but will in all probability militate against any more practical application of the work. This RC has divided the area of research into three parts as seems natural and divided the researchers and leaders responsible accordingly. Well organised, sound structure.

The Materials management plan is not applicable to this research. There are no ethical issues in this theoretical research that must be considered.

#### **B.8.3. Competence of the RC and research teams**

The publications of the RC leader concentrate on what seems to be a narrow range of issues in a certain corner of the philosophy of education. Professor Siljander is highly respected in his field and he has published widely both in Finnish, English and German. He seems capable of bringing together the different strands of inquiry into a coherent whole. He shows excellent leadership in this field with long mentoring.

The two other leaders provide rather different profiles: Andreotti's is the more accessible to a general readership, while Väyrynen's likely to be familiar to only a more limited audience. They seem to be highly qualified for this research plan. Very good quality compared to other groups with similar interests, books, chapters and articles in major international forums in English and German.

The range of topics covered speaks well for a group of intellectual scholars, with the post-critical work of Andreotti forming an apparently separate branch of activity. The work is not easy to assess, with recognisable outlets and publishers mixed with less familiar ones. But the overall quality is high and the publications are strong. But the impact is weak and very little quoted.

The integration between the philosophy of education and the post-critical strands may prove problematic. Nevertheless, Professor Siljander has a good track record and the plan of this RC should guarantee that it will be a fruitful undertaking.

#### **B.8.4. Research environment and collaboration**

The theme of potential difficulties in integrating the various projects re-emerges here. As it says in the application the tradition within philosophy and in the humanities generally is for individual researchers to work alone rather than in larger groups. This is an attempt to get theoreticians within education and philosophy of education to work together in a way that profits all. The PI already has experience from the former project Educational Theory and Traditions: Integration of Educational Theories of "Bildung" and "Growth" that seems to have worked well. So within the humanities bringing together many researchers is unusual and might lead to new ways in working together. Combining these three groups is a good idea. Doing so will encourage more cooperation among researchers in the field of philosophy, both nationally and internationally.

Not much infrastructure will be needed (apart from standard staff support) for what is essentially text-based scholarship. This fits well with one of the focus areas for research set by the University of Oulu. This RC might have been developed towards research-based teacher education, one of the aims in the research profile of the university.

The contacts mentioned in the proposal seem to be normal academic contacts with a small number of like-minded staff in other universities. The structure of the RC draws on expertise from three other Finnish universities. This will benefit the collaboration in this project.

The teacher exchange and joint seminars are welcome, but comparatively routine; the proposed international doctorate programme is more intriguing, but no prediction is made of how many students it will attract. Those who are working internationally with this RC are prominent in the international theoretical community; the said individuals both can and will contribute significantly to this RC project.

The teacher exchange and joint seminars are welcome, but comparatively routine; the proposed international doctorate programme is more intriguing, but no prediction is made of how many students it will attract. Those who are working internationally with this RC are prominent in the international theoretical community and both can and will contribute significantly to this RC project.

#### **B.8.5. Significance of the RC for the researcher training and promotion of professional careers in research**

The topic and style of research may militate against an international appeal to postgraduate and postdoctoral students. The integration of the doctoral work into the larger framework is well organised and the resources are there. The doctoral supervision in this project seems good.

There are plans for both the cooperation of institutions, conferences and co-authoring of articles. This is well suited to the needs of postdoctoral researchers.

#### **B.8.6. Societal impact**

The proposal speaks of the aim to "offer tools for the development of school and educational practices in concrete school teaching", but we do not think that a strong case has been made for this. The more abstract aim of providing conceptual analysis to guide policy makers seems more attainable, though direct contact with policy makers has not featured in the proposal. This project will in all probability have little social impact because it is a purely theoretical project investigating the foundations of our thinking about education. But if successful its long term impact on theoretical discussions can be significant but the social impact will be limited.

#### **B.8.7. International competitiveness or international comparability**

The two sides of the proposal have different weights here: the educational philosophy may have less currency and impact than the post-critical work. This project compares well with other research in the field of education and philosophy of education. It is examining a field of inquiry, American pragmatism of the Deweyan kind, that many others are investigating but it manages to do this in an innovative context that can prove fruitful and lead to new lines of inquiry. This RC rates high in international context.

#### **B.8.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

The overall feeling one gets from the proposal is of two different strands and styles of work, one engaged in traditional philosophical scholarship with a specialist audience, and the other more outward-looking and conducted in its own frame of reference. The strengths of the former are its resolute adherence to deep scholarship, while among its possible weaknesses is an appeal to only a limited audience. The strengths of the latter are an engagement with a world-wide movement of post-critical thought, but its weakness might be the small number of staff associated with it in the group. Overall the main strength of this project is that it builds on deep similarities between American pragmatism and the Bildung tradition that have not been well explored until now. In addition the project intends to explore these issues in the context of critical and post-critical theory. This RC is doing sound scholarly work in the areas of educational theory and philosophy. Young international scholars are involved with new global approaches. This is promising and might bring some new openings into this field.

Its main limitations are that the principal investigators have not had a great impact with their writings, this line of research is purely theoretical (which is both a strength and a limitation), and the probable lines of inquiry into the connections between idealism and pragmatism are not really indicated.

**B.7.8. Final rating (1 – 6): 4,5 (very good - excellent)**

## **B.9. RC HEAT – Heterogeneity in Economic Applications and Theory; RC Head Rauli Svento**

### **B.9.1. Scientific quality and innovativeness of the research plan**

This RC has a strong and common theoretical and methodological basis in economics. The focus is on heterogeneity, an area at the forefront of recent research in the discipline as a result of new theoretical approaches and advances in computational methods and technology. This RC is clearly positioned at the international research frontier in this area. The four research areas in this application form the basis for an innovative research program. Innovation is often about resource integration in new and smart ways. This application is one example and is emphasising interdisciplinary research topics and approaches. The common ground between various branches of economics and management sciences promoted in the proposal is “heterogeneity.” It would be useful to use this to create a stronger sense of the connections between different teams in the RC. The panel suggests that this is focused on in a strategic research plan for future research.

This RC is doing research with high relevance but the scientific leadership is somewhat weak including how the international research networks will be used in the planned research. Incorporating heterogeneity into economic analysis has the potential to yield significant scientific progress in the discipline as traditional approaches typically do not focus on heterogeneity as a major factor in the analysis of economic issues.

The RC presents a clear, innovative research approach and realistic scientific goals. The members share a background in economics and management science, but the crucial issue is whether the concept of ‘heterogeneity’ is going to inspire them to work together in any more fruitful way than they currently work separately. For such an ambitious plan - it would have to bring together such disparate areas of research as forestry management and what seems to be a genetic theory of economic decision-making. The RC is designed so that PIs of each research group are members of at least one other group in the RC. This embedding PIs in overlapping groups creates significant complementarities between groups and enhances opportunities for cooperative research between groups of the RC. The RC brings together scholars from different fields of economics and business that share a common interest in heterogeneity.

### **B.9.2. Feasibility of the research plan**

The research is quite broad and researchers from a number of academic disciplines are involved. The theoretical platform is clear and meets the requirements for a *VIDI* level quality. The research methods seem to be sound.

For the planned resources, acquisition of data will be necessary. Otherwise planned resources appear adequate for implementation of the planned research activities.

The four research teams are different and the team on “Personality and Economic behaviour” has four full professors, while Macroeconomic dynamics has only two. However, the leader of this RC is a professor with much leadership experience. The organisation of the RC into overlapping teams where PIs participate in more than one team is a good approach to promote collaboration.

There is no materials management plan provided. No ethical issues are discussed.

### **B.9.3. Competence of the RC and research teams**

The Director's listed publications are mostly in leading international field journals (e.g., *Environmental and Resource Economics*, *Energy Economics*), and are of the standard that would be expected of an active researcher.

The PIs' listed publications are mostly in international journals, though with a greater proportion of low-exposure outlets, and are of the standard that would be expected of active researchers. PI Puhakka has two publications in top general journals in economics and business (those used in primary rankings of business

schools and departments of economics). The majority of the other publications by team PIs are in very good international field journals.

This RC application meets the requirements for the *VIDI* level. The bibliometric analysis indicates a total of 77 publications by the RC over the period 2007-2011, with 54 scientific publications. Six of the 31 rated journal and publication series publications are in level 3 (top) outlets. A publication rate of 20% in top outlets is high relative to other RC's in HS. 12 of the 31 rated publications are in level 2 (leading) outlets. However, citations are low considering the overall quality of the publications.

This is an innovative group/team. The leader of this RC is a professor with much leadership experience. He has been vice president, University of Oulu and chairman of department of Economics. The panel finds that a crucial issue is how well the concept of heterogeneity unites the members in a productive way. This aspect of the proposal can be strengthened. The RC team leaders are distributed across senior and junior researchers. There is a good overlap of expertise and the RC embeds PIs in more than one RC to institutionalize the complementarities that exist between PIs.

#### **B.9.4. Research environment and collaboration**

The economic issues are of general interest and may attract competitive research funding. The RC promotes cooperation across fields in economics and business where such cooperation might not normally be expected to occur. The primary value added is in the promotion of a creative research environment and the linking of common interests related to heterogeneity across disparate fields in the discipline. No researchers outside the Business School are involved in the RC.

Economic analysis forms part of Oulu's portfolio of academic Interests. The RC overlaps with the focus area of Environment, Natural Resources and Materials: Environmental issues, natural resources and energy economy; and with the development area of Business Administration and Economics: Sustainable economic development. The research proposal indicates that the university and national and international collaborators will provide the infrastructure for the research. New data acquisitions will be necessary.

National collaborations with the University of Helsinki, the Finnish Doctoral Program in Economics, and the Graduate Program in Finance will contribute to the success of the RC. In addition, the PIs have other good national collaborations, including with the Finnish Forest Research Institute and the Finnish Environment Institute as well as the Universities of Aalto, Jyväskylä and Turku.

PI Puhakka has extensive experience as a visiting professor at some of the leading departments of economics in the world (U. Pennsylvania, Cornell University, UCLA) with numerous other short term international visits. PI Simonen has international collaborations with U. Groningen, U. Waikato, and U. Reading. Other collaborations listed in the proposal include Universities of Hokkaido (Japan), Life Sciences (Norway), Umeå (Sweden), North-Carolina (USA), Imperial College (UK), Erasmus Rotterdam (Netherlands), New York (USA), Drexel (USA), Iowa State (USA) and Virginia Tech (USA). Continuation of such collaborations will greatly enhance the research potential of the RC.

#### **B.9.5. Significance of the RC for the researcher training and promotion of professional careers in research**

The RC involves eight doctoral students spread relatively evenly across the four teams. The RC is linked with the Finnish Doctoral Program in Economics, a program of ten participating universities in Finland, and with the Graduate School in Finance. The economic issues will be attractive to students and the RC can compete for international funding.

The RC involves eight postdocs or senior researchers.

#### **B.9.6. Societal impact**

The societal impact is high and most relevant. Regional development, economic behaviour and complexity all are important and relevant topics for many actors in the modern economy and will be in the future.

#### **B.9.7. International competitiveness or international comparability**

This RC as a whole is not yet internationally recognised, although it contains researchers that have good international visibility. The quality of the research is very good but to achieve greater international recognition, more research needs to be published in top general journals, rather than leading field journals.

### **B.9.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

This RC has presented a rather well developed theoretical and methodological research platform with experienced leadership. The RC involves good integration of research team personnel. The RC has good national and international collaborations. The research focus on heterogeneity allows the RC to bring together disparate fields in economics around a common theme. A challenge will be to keep the RC organised around its central theme of heterogeneity and to benefit from working not only within but also across teams and academic disciplines or research fields. The panel has been well informed by reading this application and how the four areas or subgroups are going to cooperate in the future. The differences in the fields of the research teams is a challenge but might well provide a strong basis for fruitful interdisciplinary research needed to address important challenges in society and also for receiving external funding and to produce high quality research publications. The panel believes that this RC has the potential to develop to produce world class research.

### **B.9.9. Final rating (1 – 6): 4,0 (very good)**

## **B.10. RC Living Stories – Narratives in Education – Living Stories in Theory and Practice; RC Head Leena Syrjälä**

### **B.10.1. Scientific quality and innovativeness of the research plan**

The research community comes primarily from education but supplemented by participants from Economics, History and Human Geography. It has a well written and focused research plan concerning theory, methodology and empirical research. The common framework based on relational links is innovative and place the plan strongly in contemporary discussions within human sciences. One of the aims of the RC is to develop innovative research methodologies from this framework. The result is a combination of a range of methods, mostly of qualitative but also quantitative orientation. The research plan is however less specific in terms of activities to be undertaken.

The research has a potential for developing new understandings of teaching contexts from the relational approach to education. It also seems innovative when it comes to methodological development, emphasised in a specific research group dealing with that issue. Uniting research on children and teachers, as it is proposed in the research plan, is boundary crossing and has potential to contribute to scientific progress in the field. A risk, however, might be that the two thematic research groups are too different to really stimulate one another and that relational links do not make for a sufficient tool to connect the efforts to do so.

The proposers have gone to great lengths to describe a coherent overarching framework for the group, and hopefully links will be established between the researchers, especially as an encouragement to the younger members. The RC unites groups and staff members from a variety of faculties. Collaboration between these groups and individuals would be more difficult to achieve without being an RC.

### **B.10.2. Feasibility of the research plan**

The research community plans to apply a whole range of methods: narrative analyses, discourse analysis, ethnographic methods and statistical analysis. There seems to be strong methodological competence in the group and the methods would give room for a useful triangulation.

In this way, the group has laid great emphasis on qualitative methods, and among these there is a preponderance of comparatively interpretative, data-intensive methodology (narrative and thematic analysis). This is well suited to the overarching relational theme of the research, and the group is already known for their expertise in narrative methods. The dangers might be the time involved in data gathering and analysis.

The document describes the intended outcomes (theoretical understanding, innovative research methodologies, empirical knowledge) of the RC's research but is not very specific in the description of the activities to be undertaken to attain those outcomes, nor in a schedule of proposed research activities.

The RC utilises several funding grants that extend into 2015 to start up the RC's activities. There is a good mixture of personal on different steps in their career in the community. One problem might be the large amount of data-material planned. Will there be resources for integrating and theorising the material? Not much is needed in terms of equipment; the main requirement is time for data collection and analysis.

The document is not very specific about the structure and organisation of the RC project, but the project appears well-organised according to the expertise of the members and their fields of interests.

The RC will make use of the LeaForum of the University of Oulu with its innovative material facilities for data collection. An explicit materials management plan is not included in the proposal.

The RC has considered ethical questions and plan to construct ethical guidelines for their material. They also draw attention to relational ethics, that is, ethics in the encounters with the participants. In this way, ethical issues form an important element of the RC's research intentions.

### **B.10.3. Competence of the RC and research teams**

Based on the CV of the Director she has extensive leadership skills. She appears as strongly capable in methodological questions in educational research. Also, she has a good record of mentoring and obtaining funds for research. The outcome in publications is satisfactory but not impressive seen in relation to the stage in her career.

The other two proposed team leaders also have extensive experience in academic leadership and funding. There is a difference in publication records between the two, but they are still not reaching the level expected at their stage of career.

The list of 20 publications of the entire RC personnel contains many articles in international peer reviewed journals, although not the top journals in terms of impact factor. The bibliometric analysis of Oulu University shows that the majority of the scientific publications of the group are in Finnish. The impact of the publications in terms of citations is modest.

The proposed team leaders do indeed bring complementary expertise to the RC project. There is not much information in the document about the division of labour between research teams or sub-projects, but the descriptions of the research groups are suggestive.

### **B.10.4. Research environment and collaboration**

The cross-disciplinary composition of the team has potentials both in the RC's joint research and to the cross-disciplinary intentions of the university. Working as an RC probably also will increase the number of doctoral students of the group, which may benefit their researcher training. The variety of target groups (children, primary and secondary teachers, university teachers) of the RC may contribute to cross boundaries between fields that are historically known to be rather unconnected.

The team will need research time, personnel, and, to a lesser extent, comparatively cheap audio-visual equipment and computer software. None of these would require any large-scale infrastructure investment on the part of the University. The RC will utilise existing research facilities, such as LeaForum. The RC may contribute to strengthening research-based teacher education at the University of Oulu.

No connections with other Finnish institutions are mentioned in Section III of the proposal, but the team leaders of the RC are well-embedded within national networks of researchers in Finland.

Several important international contacts are mentioned in the document. The visiting professorship of professor Kelchtermans, an internationally recognised top expert in the field, will be an excellent contribution to the work of the RC.

### **B.10.5. Significance of the RC for the researcher training and promotion of professional careers in research**

In the plan (and already now), there is a focus on doctoral and postdoctoral training, including a range of different activities. In this way, the RC aims to increase the focus and efficiency of the research training of doctoral researchers, to stimulate their international orientation through conference attendance and longer visits abroad, and to train them in grant proposal writing to attract funding. The RC's emphasis on qualitative research methodologies may limit the development of the doctoral students' knowledge of quantitative research methods.

The comments above go for the postdoctoral researchers as well, and one could add that there is a fair amount of postdocs in the RC.

#### **B.10.6. Societal impact**

Societal impact is only loosely discussed in the research plan. But that is fair enough, since it must be seen as a secondary effect of the increased understandings aimed at by the RC. It may, however, have considerable societal impact, although the document is not very specific in describing exactly how the RC will attempt to attain it.

#### **B.10.7. International competitiveness or international comparability**

The RC members individually join different international networks. As a whole however it probably has a way to go before reaching strong international impact. But if the relational theorising succeeds, there might be a basis for more collective influence.

The document, however, states the aim to put more effort into publishing in international top journals in the field. If this aim is fulfilled, the RC will potentially grow in international competitiveness.

#### **B.10.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

This RC has innovative ideas to develop both theory and methodology in human sciences by way of multi-sided empirical research. It has provided a coherent and well developed research plan explicating a theoretical and methodological basis for a broad empirical research. Maybe its main strength is at the methodological level where the group, as we see it, contains good qualifications for developing a translation of relational thinking to the methodological level. The challenges might be the coherence of the group and the possible diffusion of the general approach into the different empirical projects.

A major strength is the respectful and holistic qualitative empirical work that the group proposes. It remains to be seen whether this work can successfully deliver findings of international significance, though the motivation and accomplishments of the group members are promising.

The RC has an excellent record in attracting funds to finance its research. The research aims and the intended collaboration between the research teams might be boundary crossing. The personnel of the RC show a good variation in seniority and youth. Recommendations pertain to increase its international visibility and impact through publications in international top journals in the field and through strengthening international collaboration and exchange of personnel.

As a whole, we consider that the group has great potential and deserves to be supported in its innovative aims. It provides a well-argued and solid research plan and has potential to develop research approaching world class.

#### **B.10.9. Final rating (1 – 6): 5,0 (excellent)**

### **B.11. RC TE – Transcultural Encounters; RC Head Veli-Pekka Lehtola**

#### **B.11.1. Scientific quality and innovativeness of the research plan**

This RC focuses on transcultural relationships and interdependencies with an emphasis on cultures in northern Finland and Scandinavia, and on Sami-Finnish trans-cultural encounters. Portions of the RC focus on East Asia and the United States. The proposal admirably strives to find common ground among a range of what seem at first sight to be somewhat separate research topics and traditions. The three sub-groups of "Transnational Encounters", "Cultural memory" and "Representations and Images" are described at a level of abstraction which is high enough to pose very general questions which might be covered by more than one group of researchers, but for that same reason do not specify in enough detail what such collaborative work might actually look like.

The strength of this RC is its potential to enhance knowledge on Finnish, Sami and northern Scandinavian transcultural encounters. The potential for significant new outcomes and scientific breakthroughs exists mainly within this area. The opportunities for discoveries of interest to the broader international scientific community are not as great. There are risks associated with the integration of what seem like very different fields of scholarly endeavour. The publication records suggest that successful integration of the research groups in the RC may require broadening of scholarship beyond narrow areas of specialisation. Moreover the kinds of research

proposed here comprise thoughtful, text and field-based research into cultural phenomena that will produce topic-specific knowledge rather than findings of wide influence.

This is a relatively large RC with nine research teams and over 60 personnel. The research groups and their corresponding disciplines include: Representations of the self and other (History), East Asia and the West, De-familiarisations of literary history (Literature), Legacies and challenges of ethnic belonging (Cultural studies, Ethnomusicology, Cultural anthropology), Finnish and Hungarian meet their limits, Trans-Atlantic impacts (History, English Philology, Cultural Anthropology, History of Science and Ideas), Representations of culture and nature (History of Science and Ideas, Archaeology), Collaboration and dependency (Archaeology, History), and Literary imagination and politics of cultural memory (Literature). For the most part, the research teams are organised around common disciplines. The research proposal does not clearly identify the added value of working as an RC. Regular meetings of the research group leaders are planned to encourage "deeper, more diversified collaboration" than would otherwise occur. It is to be hoped that the very disparate fields of enquiry will profit from the joint framework that this RC proposes. Achieving international collaboration with Alaska, Japan, Costa Rica, etc. is essential for the success of some of the research groups.

#### **B.11.2. Feasibility of the research plan**

The proposal speaks of 60 people in the RC. It would be unfair, as well as unwise, to expect them all to work to the same plan. The RC would be strengthened by a clearer vision of how the anthropological, historical, linguistic, philosophical and literary methods fit together to integrate the different intellectual frameworks in which the researchers operate in a meaningful way.

The RC consists of a large number of personnel. The proposal indicates that an excellent research infrastructure exists within the Faculty of Humanities, and that there are excellent library facilities and good technological support. Resources appear to be adequate. What will be needed is time and personnel, as the proposers argue.

The RC encompasses a large number of research groups working on a wide range of topics related to trans-cultural encounters. The challenge will be to integrate these different groups effectively to maximize the potential complementarities between them. The comparative advantage of the RC lies in the research that focusses on Sami and northern Scandinavian cultures. How to integrate this with other research in the RC will be a challenge.

The proposal briefly describes a management structure of the RC Head and the PIs as an overseeing body, but how they are to meet their ambitions of "emphasis[ing] continuous, close methodical and other collaborations among all nine research groups" is left undefined. The proposal does offer a list of activities or proposed specific collaborations among the members. They are all laudable, but the activities are those which one would expect a group of active researchers to be promoting as a matter of course.

Materials management is not emphasised in the proposal. The various research strands have different ethical issues, and these would be most prominent in the work with informants and others whose identities may need to be anonymised and whose records kept secure.

#### **B.11.3. Competence of the RC and research teams**

The RC director is an expert in Sami culture and his publications are focused in the specialist area of Sami studies. Refereed publications are nearly all in Finnish language journals that are not likely to have much exposure outside Finnish-speaking audiences. Seven of the 20 publications are listed as being in peer-reviewed outlets.

The majority of the other RC team leaders' publications are in Finnish or regional journals or non-refereed outlets. The records of the PIs are variable and primarily specialist publications. In four cases the bulk of the individual's output is in Finnish. In another, there is little activity in the last ten years. For a couple of others the expertise (on French literary issues and science fiction respectively) to the theme of the RC is not obviously close.

According to the bibliometric analysis the RC had 330 publications from 2007-2011, with 111 in scientific journals. Of the 198 journal and publication series publications ranked, only three are in level 3 (top), and 34 are in level 2 (leading) outlets. That is, 1% of the RC's publications are in top scientific journals and approximately 10% are in leading journals. Nearly 60% of publications are in Finnish language publications. This publication record is indicative of the comparative advantage of the RC in the area of northern Scandinavian culture, but also highlights the significant difficulties the RC faces in gaining broader international recognition. The overall quality of the publication record is weaker against the measuring stick of international scientific research and stronger if the research is assessed based on its contribution to national scholarship.



The expertise of the team leaders is primarily in History and Literature. Within these areas there should exist strong complementarities. The proposal would be strengthened by a clearer description of the proposed division of labour among the teams.

#### **B.11.4. Research environment and collaboration**

Transcultural studies and multidisciplinary work within the Humanities are very complementary. The interdisciplinary scope of the RC is limited to the Humanities.

This is an important area of research for the university and the RC is integrated well with the university's focus area of Cultural Identity and Interaction. The proposal indicates the university is planning for a new Master's degree in Intercultural Studies.

There is collaboration with the Giellagas Institute for scholars working on Sami language and culture. The university appears to be a natural center to attract national research collaborations between scholars interested in Sami, Finnish and northern Scandinavian cultures. This could provide a valuable opportunity to enhance scholarship and research on these cultures.

Links with two foreign universities, the Freie University and Wolverhampton University, are noted as significant. There is an effort to expand international collaborations with Japan and the Americas but Asian and trans-Atlantic studies are more loosely integrated into the RC so the payoff from these efforts is not as clear. The greatest opportunities to develop a unique research contribution appear to be regional ones focused on northern Scandinavian cultures.

#### **B.11.5. Significance of the RC for the researcher training and promotion of professional careers in research**

The RC supports a large number of doctoral students (over 30) however, the comparative advantage of the RC works does not lend easily to the promotion of researcher mobility beyond national boundaries. The RC will be integrated with a new international MS program in Intercultural Studies that may improve these opportunities.

The RC supports a large number of postdocs and researchers (approximately 25). As with doctoral students, the comparative advantage in Finnish, Sami and northern Scandinavian transcultural encounters does not easily promote researcher mobility beyond national boundaries, and even more so beyond Scandinavia.

#### **B.11.6. Societal impact**

The RC will enhance Finnish transcultural scholarship and the university's identity as an expert in "Northerness". The study of Sami culture might have additional impacts but these are not clearly defined in the proposal.

#### **B.11.7. International competitiveness or international comparability**

The RC has not yet achieved the recognition of top international research. The emphasis of the RC of publishing largely in Finnish language and non-refereed outlets limits its reach and the potential to achieve international recognition. It is difficult to assess the comparability of the RC to other centers with a similar focus. Certainly, more can be done to enlarge the sphere of influence and the research community itself.

#### **B.11.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

This is a large RC of nine research groups in History and the Humanities. Developing and maintaining coherence between these teams will be a challenge. The RC has a strong comparative advantage in its research on Finnish cultures and this advantage aligns with strategic priorities of the university in the area of cultural identity. The advantage is a double-edged sword: as the RC rarely publishes in top international journals and the majority of its publications are in Finnish language outlets, its potential is limited. In order for the RC to be internationally recognised, it must publish more research in leading international journals. The overall assessment reflects a balance between the positive national focus of the RC, its alignment with the cultural identity interests of the university and the relatively weak publication record in leading international journals. The main strength of the RC is based on national and regional interests. One challenge will be to integrate all research groups in the RC in ways that maximize their complementarities. Transcultural Encounters research is very important as border issues are getting more and more complex. This RC has great potentials to share research data which will im

pact and increase our understanding of peoples and cultures in border areas. In recent years, conflicts in all parts of the world (Sudan, the South China Sea, the US, Mexico, Pakistan, India, etc.) compel us to study more about TE and border issues. This RC has the potential to be a leader in our understanding of ALL border issues.

**B.11.9. Final rating (1 – 6): 4 (very good)**

## **CATEGORY VICI**

### **B.12. RC COACT – Complexity of (Inter)action: Towards an Understanding of Skilled Multimodal Participation; RC Head Elise Kärkkäinen**

#### **B.12.1. Scientific quality and innovativeness of the research plan**

The RC's research is enthusiastically described; there is clearly strong motivation and dynamic leadership in the group. The basic idea, that one might video-record people working together, and with technology of various kinds, is a new and good one, if not wholly original to this group. The group uses a sophisticated method (Conversation Analysis, CA) as its main tool, and the evidence of training and publication shows that the group's members are accomplished experts. Once again, this is not a new use of CA, but nonetheless helps establish it in the community of those who study people interacting with their environment. The quality is very good, and will be a significant contribution to the body of work in the research community.

The potential risks listed do not pose a threat to the project. To ensure successful outcomes require a community of committed researchers who are relentless in this collaborative endeavour. The research joins other groups in the comparatively new area of multi-modal research on everyday human activities. Its specific topics are promising and are quite likely to produce new findings in the area of driving and other complex activities.

The growing importance of this kind of research could result in higher employment opportunities outside Finland. This proposal requires extensive communication and collaboration across a number of disciplines. There are also definite synergies here between the linguistic, interactional and ethnographic strengths of the team.

#### **B.12.2. Feasibility of the research plan**

The research team is very clear indeed about the problems facing the various phases of the research projects they have in mind; as qualitative researchers they are experienced in the vagaries of data access, recording and above all transcribing and analysing. The projects proposed look appropriate and well-organised. One concern is insuring a balance between qualitative and quantitative approaches. The projects proposed look appropriate and well-organised even if their empirical content is not highly developed in the proposal.

The RC may need more financial resources. On the plus side the relationship between the RC and the new Eudaimonia Center should enhance their chances of success.

Since the group is nearly mono-disciplinary, it should avoid any real organisational problems and produce a coherent and consistent research agenda.

The Materials management plan is not considered here.

With interviews and in particular video-recording between the methodological tools there is clearly ethical issues involved, also beyond the problem of informed consent mentioned in the proposal. These can be handled as part of most IRB parameters so the RC should be encouraged to insure that this is critical step in the process of conducting their research.

#### **B.12.3. Competence of the RC and research teams**

The overall quality of the Director's publications is very high and manifests an admirable, long-established expertise in a range of linguistic and interactional domains. She is very clearly well-placed to be leader of the project. She has received solid external funding, and she has been project leader of two projects from the Finnish Academy.

The other team leaders both have good publication records, with Haddington's being the more impressive for its depth and international scope. Their expertise is complementary to the Director's, and together they ought to work well.

Based on the number of publications in well known, peer review journal the overall assessment of the RC's publication record is that it is good.

This proposal requires an enormous amount of coordination and it is very time-consuming and labour intensive. The amount of data that requires analysis is huge. There is considerable overlap between the different members of the RC team. This is both strength and a weakness in that there is clear complementarity, but within a narrow set of parameters.

#### **B.12.4. Research environment and collaboration**

There is a clear thematic relation among the various aspects of the project, although the most active element of it is the specialist techniques of Conversation Analysis. A lot will depend on how well the members of the team come to a common understanding of this approach, and to what degree the approach is permeable to other methods.

The RC has big ambitions in relation to involve doctoral students and provide their researcher training in the program, but also to participate in wider doctoral programmes at the university. The close relationship between the senior RC team leaders and the Eudaimonia Center suggests an exciting and productive work setting that would produce students who would be attractive to universities and agencies in Finland, Europe and beyond.

The RC will need research time, personnel, and, to a lesser extent, comparatively cheap audio-visual equipment and computer software. None of these would require any large-scale infrastructure investment on the part of the University. The RC fits well into the research focus of the university on 'Cultural identity and interaction'. As for resources, the greatest challenge of the project is finding the necessary means to maintain the personnel.

The connections with Finnish colleagues are good, especially with the Helsinki Centre of Excellence in research on Interaction and Intersubjectivity.

The international connections are also good, especially to world-leading centres of activity in UCLA, Loughborough and Basel. This is an impressive part of the proposal. The one question the proposal leaves unanswered is just how close these connections actually are.

#### **B.12.5. Significance of the RC for the researcher training and promotion of professional careers in research**

The research environment is likely to be an active one, judging by the projects proposed and the publications in the teams' record. The doctoral students' contributions to the RC's publications indicate an active and productive milieu for young researchers.

The objectives and resources of the RC to support postdoctoral research careers, including promotion of researcher mobility is very good; the students who move through the RC will receive innovative training that will make them attractive candidates for employment upon graduation.

#### **B.12.6. Societal impact**

The social impact outlined is significant and the overall impact is far reaching, especially in the areas of literacy and learning. The RC has an ambitious statement to make on the matter of social impact. It is, however, put in very general terms. That is understandable since, with an interpretative project such as this one, it is difficult to predict societal impact.

#### **B.12.7. International competitiveness or international comparability**

Although the team is small and much of the international reputation seems to stem primarily from the RC PI, the nature of the research seems to offer great potential for strong collaboration with other scholars in Europe and elsewhere. The results could impact global understandings of the way technologies are affecting more and more people.

#### **B.12.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

The strengths are in the multidisciplinary nature of the proposal. In fact, the extended research communities are impressive. The areas of development to advance wellbeing and to introduce novel ways of participation in different sectors of the society are significant. The multi-modal analysis they proposed offers great potential and could develop into a strong 'brand' for Oulu.

This is a well-conceived proposal that offers great potential and opportunities for the students involved. The sole weakness is a combination of a small number of senior scholars with strong overlap that could limit its research breadth, but this should be mitigated by strong collaborations outside of the RC.

It is recommended that the RC can include more researchers in the BRICS countries and areas.

**B.12.9. Final rating (1 – 6): 5,0 (excellent)**

## **B.13. RC LET – Learning and Educational Technology Research Unit; RC Head Sanna Järvelä**

### **B.13.1. Scientific quality and innovativeness of the research plan**

The research plan is ambitious, innovative and outstanding. It addresses important challenges in the field of self-regulated learning, and socially shared regulation. It has large potential for innovation of methods, theory and practice of collaborative learning in technologically enhanced environments. The proposal is written confidently and is obviously the work of experienced and very active researchers. The ideas are built on the earlier expertise of the PIs. The theme of educational technology is topical and important, and the group's orientation to new ways of teaching is forward-looking and dynamic. Some examples and a timetable of the research might have given more concrete ideas of these innovations in practice and in pedagogical contexts.

The research has great potential for important scientific breakthroughs and progress in the field of technologically enhanced learning processes, both nationally and internationally. Innovations always include risks, but the team is well prepared to meet them and they reflect on the risks in the plan. The research has high relevance as well. The document contains clear descriptions of what research is going to be carried out and research questions to focus on. The description of methodology and methods may be elaborated further. The combinations of experts and the good international relations in the areas of educational psychology, child education and information science provide a very fruitful theoretical platform with the potential to provide innovative results with strong and innovative research contributions, but also results with practical relevance for teaching and learning in general and for schools and teachers, and the education and professional development of teachers in particular. The area of socially shared regulation of learning is particularly promising.

The RC consists of three research groups from different backgrounds. Working together as an RC may strengthen the work of the separate groups and lead to added value that the separate groups could not achieve on their own. The PIs complement each other and already work together well. The proposal is very successful at making links among the research members, and the way the framework is written shows that there is plenty of opportunity for collaboration. The scientific added value is excellent and there are clear and challenging research objectives.

### **B.13.2. Feasibility of the research plan**

The quasi-experimental process-oriented research methods that are proposed in the research plan fit well with the aims of the RC. The research plan is not very specific in terms of a proposed schedule of planned activities. The research methods are described and argued for in broad terms. These areas are to be developed further in due course.

The planned resources (personnel, financial and other material resources) for the implementation of the planned RC activities are fantastic. The Head of the RC has an excellent track record of obtaining competitive research funding for the group, including a recent large grant for the years 2012-2016. The personnel belonging to the RC is well suited to implement the RC activities. The availability of an up-to-date research lab is an important material facility to enable the RC's research activities.

The RC is very well organised and the structure is clearly described. The researchers are clearly highly experienced, and they seem to have a very firm grasp of the overall structure of what they want to do, and how the various elements of it will work together. The RC consists of three groups. The groups are composed of many doctoral students and only a few senior researchers. In this structure, the PI's have to supervise many doctoral students, maybe too many. A better balance between the number of doctoral students and the number of senior researchers may be helpful in the future.

Materials management plan: The RC can use an advanced Learning and Interaction Observation Forum lab with advanced data collection facilities.

The research plan does not mention ethical issues in detail. Video research always includes ethical issues and consents from participants and parents in case of children. The researchers are aware that the video recordings must have an anonymous nature, although they don't mention their protocols for gaining informed consent.

### **B.13.3. Competence of the RC and research teams**

The publication record of the proposed RC director is outstanding and manifests an expertise in a range of educational science domains, with an acceleration of good publications in the last five years. She has published in international top journals in the field of Educational Psychology and related fields, and her expertise in SRL and socially shared regulation in technological enhanced learning environments is recognised by the world leaders in the field. Moreover, she has an excellent record in attracting competitive funding, has served in numerous leadership positions in the international scientific community, and shows evidence of excellent mentoring of young doctoral students.

One of the RC team leaders is also the proposed director of the RC, so for the estimation of her qualities see point 9 above. The second PI is a postdoctoral researcher and less experienced, but she has already some very good publications in international top journals. The third PI started her academic career after having been a teacher for many years and her publications contain relatively many conference proceedings until now.

The publication list of the proposed RC contains excellent and well-cited publications in international high impact journals. Until now the record is quite dependent on the output of the RC director.

The proposed RC team leaders indeed bring complementary expertise to the RC. They work together well and complement each other. The center represents an innovative group with well-established relations with international experts/researchers. The plan does not contain a specific paragraph on division of labour among the teams. The first team is larger than the other two teams, so it seems logical that most work is done by the members of that team.

### **B.13.4. Research environment and collaboration**

An important advantage of this RC is the inter- and multi-disciplinary work that it may bring about, both in content and research methods. Moreover, it creates more mass which is important especially for the two smaller groups. Added value is also present in doctoral research training, the use of the laboratories and data collection facilities. The ambition of the RC to develop their research community is of outstanding quality. The RC aims to create international networks, which may create openings for an international career for the staff and the doctoral students. The research methods of the different groups seem complimentary, which enhances the possibility that new ideas may emerge.

The research of the RC fits very well with the strategic priorities of Oulu University. The University of Oulu encourages this kind of research with new technologies and innovations. The University hosts several other centers that mutually benefit the research of this RC, such as CIE and CWC. The LeaForum lab is an important facility to support the creative and innovative research of the RC. The proposal is admirably clear in its claims here, and has put forward a plausible link to Oulu's strategic commitment to educational research.

The RC has well-established collaborations with several other research groups in Finland. Important collaborations exist with for example prof. Lehtinen's learning research group in Turku, prof. Lonka's and prof. Lindblom-Ylänne's research groups in Helsinki, and prof. Häkkinen's group in Jyväskylä. The RC can also contribute to national doctoral training.

The RC has outstanding collaborations with world leading research-active groups in CSCL, SRL and TEL all over the world. Prominent collaborations exist with Canadian groups (e.g. professors Winne, Perry, Hadwin) and the CELSTEC laboratory led by prof. Kirschner in The Netherlands. Prof. Kirschner is now also working as a visiting professor in the LET team. The co-operation is concrete and consists for example of writing articles and training doctoral students together. How to apply new technologies in strategic and innovative learning is well developed with partners in the UK, Germany and the US.

### **B.13.5. Significance of the RC for the researcher training and promotion of professional careers in research**

This RC is the home base of many doctoral students. In the training of doctoral students both national and international collaboration has been initiated by the RC's leadership. The doctoral students from the RC are for example stimulated and facilitated to participate in European research networks and conferences (e.g. JURE) and international doctoral research training (e.g. ICO). The RC has a great potential via e.g. the Oulu University Graduate School. There is a well-developed infrastructure and leadership including also post-doc research

which is highly important. The supervision of doctoral students is excellent with funding and a plan to apply for Marie Curie Grants. The topicality and social importance of the theme of the RC ought to help attract students and funding.

The objectives and resources of the RC to support postdoctoral research careers, including promotion of researcher mobility are excellent. Postdoctoral support is great, two of them act as PI in this RC, and there are international contacts and networks. The RC aims to promote the exchange of postdoctoral students. A post-doctoral researcher from Spain has recently been appointed at LET, and the RC stimulates their PhD's to spend some time abroad as visiting scholars at foreign universities after their thesis has been completed.

#### **B.13.6. Societal impact**

The societal impact of the RC's research is large. Self-regulated learning and socially shared regulated learning in technologically enhanced learning environments are growing fast as dominant forms of lifelong learning, and the RC's research findings bear an important contribution to the improvement of these modes of learning. Lifelong learning is most important in our society and for the economy, innovation and growth. The innovations likely to result from this RC's research will have societal impact with new learning solutions. Clearly there is great promise in a research centre that sets out to explore problems in modern teaching, especially with the emerging use of distance learning and other technologically-mediated forms of instruction.

#### **B.13.7. International competitiveness or international comparability**

The RC belongs to the top of the international research in SRL, CSCL and TEL. Its cutting-edge research has international impact that attracts great interest worldwide. The group is still small but has potential to grow with further funding and international members in the team.

#### **B.13.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

The RC represents an international top centre for innovative research on self-regulated learning, socially shared regulation and technologically enhanced learning. It departs from a well-developed theoretical base, has identified an important research agenda and plans to use innovative research methods to study its research questions. Educational psychology, child education and information science are integrated into a focused RC and a fruitful, innovative theoretical platform. This RC has wonderful and innovative research objectives that can create new openings in learning in many educational contexts. The ambition to develop the group together is of outstanding quality. The *VICI* category is the right one but it makes the competition harder. The expertise and enthusiasm of the group deserves institutional support, in order to help them to get bigger and sustain and extend their position in the top in the world.

Development of the RC is recommended in terms of the composition of the group, to include more senior researchers with a good track record in international publishing. Development is also recommended in terms of further exploring collaboration with other research groups in the University of Oulu, especially in the Faculties of Technology and Education.

#### **B.13.9. Final rating (1 – 6): 5,5 (excellent - outstanding)**

### **B.14. RC RELATE-OULU – Crossing Borders: The Relational and Territorial Politics of Bordering, Identities and Transnationalisation; RC Head Anssi Paasi**

#### **B.14.1. Scientific quality and innovativeness of the research plan**

The research community has delivered an excellent research plan for which they have as well (with a group from University of Tampere) received a grant as Center of Excellence from the Academy of Finland. The RC consists mostly of geographers with just a few participants with a different social science background. The proposal is well-organised, thematically coherent, original and exciting proposal. The team will explore political and cultural aspects of bordering in the light of current processes of transnationalisation. With their approach aiming to overcome the gap between territorial and relational thinking of space and borders, they position themselves in the front of the international discussions within current human geography. So, their plan is theoretically strongly based, methodologically using complementary approaches and planning to study different but connected problems of borders with the conceptual core in border practices.

This is a well-written proposal that summarises what appears to be a cutting edge approach to the study of relational boundaries and spaces as a whole. The proposal outlines an innovative plan that is situated in a rich research environment that has been shaped in part by some of the team leaders.

There are promising prospects for important advances here. The issue of borders between states and their policing is of great significance within both geography and other social sciences. Both theoretically and empirically the work would have potentials to bring forward the discussions in this field. The issue of borders is urgent and of international significance, so there will be a ready audience for any findings of practical application. Given the scope of the proposal and the quality of the team of the RC there is ample evidence that significant new breakthroughs should be anticipated.

The scientific added value is connected to the status as a Centre of Excellence. Two processes seem to be behind the development of this plan. First, a process of focusing the interests within the geography group will take place in Oulu. Secondly, the development of cooperation with a related group will commence in Tampere. Between them, they have managed to develop a common framework that organises and informs the four research groups involved. Together, this group has a big potential to strengthen Finnish geography and its international position.

There seems to be a firm intention to maximise the various human geography skills among the personnel. Given what already appears to be a good working relationship between the major team leaders, there would be added value primarily in the area of education, where students and post docs will benefit from working within the RC.

#### **B.14.2. Feasibility of the research plan**

The RC plans to use a whole range of different qualitative methods reaching from multi-sited ethnography to discourse analyses of policy documents. The plan consists of conceptual analysis (e.g. reconceptualisation what is border) and empirical analysis. Empirical analysis is based on interviews and discourse analysis of policy documents related to state governmental practices, policy programmes and international organisations. In some sub groups participatory observation as well archival research are used. The different methods are connected reasonably well to the different sub-projects. The schedule is well planned and feasible.

The fact that the members of the RC share a discipline (wide though it is in methods and topics) will be a help in making the research plan feasible. The proposal outlines a very sound and exciting set of research themes that reflect the strengths of the team leaders.

There is not a developed resource plan, but the Center of Excellence funding will probably do its bit of the job. Assuming such funding is made available the RC should be able to fulfil its goals.

The organisation has no detailed description, but the good description and connectedness of the different research groups looks reasonable and also the cooperation between the two involved universities seems well planned. The structure as outlined in the proposal seems very sound and should supply a creative environment that should result in cutting edge research.

The Materials management plan is not considered here. There seem to be no ethical issues that could serve as a barrier to the success of the RC.

#### **B.14.3. Competence of the RC and research teams**

The director's merits and publication record is very good and exemplary including the work that is viewed as highly innovative by his peers inside and outside Finland. His publications show evidence of an active and well established academic with international exposure. He is already well-established figure both in the international and in the national research community of human geography, known for his work on regional identity and borders. He seems to have a highly visible position in both the national and international research community. Also his leadership skills seem good.

The other PIs' publications also show evidence of active and well established academics with international exposure. The PIs are all active and well-established academics with international exposure. The individual team leaders also appear to have strong publication records with numerous publications in strong peer review venues.

The quality of the whole RC's publication record is very good. This is a strong group of scholars whose publications range from good to excellent and they are clearly productive. Some of the younger members appear to be reaching some of the most productive years of their careers.

The division of labour between research teams of the consortia is appropriate. There is indeed a strong complementarity among the group of team leaders and they seem to collaborate on a regular basis.

#### **B.14.4. Research environment and collaboration**

There is a significant added value of working as an RC. It will be very valuable to provide an environment in which researchers and students can profit from a multidisciplinary approach to a topic of social and international importance. With such an exciting and productive group of scholars heading up the RC there seems tremendous potential for the students to gain solid mentoring and scholarly experience.

Oulu seems already to support the projects outlined here, by its partnership with Tampere University, and the theme certainly accords splendidly with the University's profile of supporting research on "Culture and Interaction". There seems to be solid support from the university, but there also seems to be evidence that additional support would improve the productivity of the RC.

This is a very strong proposal in regard of national research collaboration. The proposed collaboration between the two Finnish universities will benefit each institution because of the high quality of the research and publication records of the senior team leaders. The partnership with Tampere, mentioned several times in the report, suggests that there is already experience of working with other Finnish institutions.

The research plan mention close connections to two UK universities, and a number of international resource persons mentioned in relation to each sub-project. The proposal draws on a rich literature that has been reshaping Geography over the past two decades and there is ample evidence of the role of the director in contributing to these innovations.

#### **B.14.5. Significance of the RC for the researcher training and promotion of professional careers in research**

The personnel have a record of supervising doctoral students, and the appeal of this topic area internationally as well as the networks of the leading researchers may well open for participation in greater programs and researcher mobility. Given the quality of the faculty involved and the innovative character of their research the RC should provide an ideal environment for student training. The same qualities also suggest that the students involved working with the RC will be attractive candidates for positions both in Finland and internationally.

There is explicit intention to support the promotion of researchers into academic careers. Again one of the strengths of the RC will be that the students will be attractive to universities and agencies in Finland and Europe as a whole. RC has recruited international post docs and doctoral students.

#### **B.14.6. Societal impact**

No explicit mention is made of societal impact. If there is to be social impact, it will probably be via dissemination and influence in public debate about borders, immigration and so on. The possible impact would be more indirect in form of increasing public publication and understanding of the relationship between borders and social internationalisation. The issues that the RC has engaged are critical to the well-being of a world that is rapidly undergoing momentous change. Their research can aid in the growth of transnational identities.

#### **B.14.7. International competitiveness or international comparability**

The proposed work has the potential to position the group of researchers between the best in the world in the field. The expertise of the RC compares favourably with scholars from around the world. This is, however, a highly theoretical, rapidly changing landscape that will require continued support to maintain the high quality of the RC in the near and long term.

#### **B.14.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

The proposal is well-organised, thematically coherent and original. The team will explore political and cultural aspects of bordering in the light of current processes of transnationalisation. This is outstandingly strong research, also from international perspective. It attracts great international interest with a wide impact, including publications in leading journals and/or monographs published by leading international publishing houses. The



research has world leading qualities in its field of science. The research focus, key research questions, scientific significance, and innovativeness are of outstanding quality.

With their approach aiming to overcome the gap between territorial and relational thinking of space and borders, they position themselves in the front of the international discussions within current human geography. It is a project on a topical theme that builds on an existing set of skills and experiences among a cohesive set of researchers (from two universities). Their results might well contribute to the intellectual development in human geography, in particular political geography.

This is a strong proposal that deserves the rating of *VIC* it proposes, but it will need continuing support and growth to maintain such a position given the competitive nature of the field as a whole.

**B.14.9. Final rating (1 – 6): 6,0 (outstanding)**

## **C. Technology & Natural Sciences (T&NS)**

### **CATEGORY VENI**

#### **C.1. RC BIGS – Biomimetics and Intelligent Systems; RC Head Juha Rönning**

##### **C1.1. Scientific quality and innovativeness of the research plan**

This is a very innovative project. This is a small RC but one which is potentially very exciting. The goals are very clear. There is an excellent ambition, energy and focus portrayed by the RC team. The proposers are aware of what is needed to achieve their goals and the risks involved. The ideas are highly innovative (although one area for a skin based glucose biosensor may soon be out of date).

The potential breakthroughs that could happen through combining the two groups could be very far reaching. While there is a risk that things might not work, if they were to work, then the rewards will be very high. Thus there is a risk regarding success, but good and innovative research does have a risk. Another big risk is that there are two PIs and if Oulu invests the success will depend heavily on retaining both PIs (compared with cases where there are more PIs). To put it simply, this is high level research with potential significant outcome(s).

The added scientific value of working as an RC is very clearly articulated. The combination of the two groups enables completely new and innovative things to happen so the RC becomes much more than the sum of its parts. Great.

##### **C.1.2. Feasibility of the research plan**

There is not a clear schedule, but there are very good research aims and an outline of approaches that will be used to tackle each aim. The plan seems feasible as long as sufficient staff time can be devoted to the work. Quicker progress will come with staff dedicated to working on the project identified. Well structured.

To make this work the applicants need specific staff time to be devoted to the activity. The PIs are aware of this and suggest they will allocate time, but the university will need to invest in new staff members to speed up potential impact and application of the work. The financial resources are limited.

This is a case of joining two fields and two research groups together to deliver a clear set of innovative research challenges. Well organised. The facilities offered by both groups are well explained. Not applicable ethical issues involved?

##### **C.1.3. Competence of the RC and research teams**

The RC Head is very well networked internationally and has undertaken a large range of international duties including review bodies, collaborative grants, and conference and society committees. Publication record is good. There appears to be good vision and leadership offered by the director. Well established.

The other RC PI has a strong publication record; the quality is good and the work is well cited. The expertise is excellent and leadership positions are very evident. The other PI has an excellent international reputation evidenced by the number of international panels that they have been engaged with.

The overall quality of the publication record of the proposed RC is above average.

The two leaders bring very different but complementary expertise for novel and exciting research that could be at the global cutting edge in the future if allowed to proceed. [We are not clear why there is no list of staff within Prof Vainio's group; there is some text that says "First name here Vainio..." which is strange. Is there something missing?]

#### **C.1.4. Research environment and collaboration**

The RC addresses this (added value of working as an RC) well, noting a clear commitment to creativity and career development. In this field the cooperation is a must.

The research aligns well to existing infrastructure, facility structures and labs and the ambition of RAE2013.

The national research collaborations that can significantly contribute to the success of the RC project are strong but should be made more significant.

There are plenty of examples of international collaboration cited, including within sections that describe the research challenges and how they will be addressed. These sections better indicate how the international collaboration will significantly add to the success of the project than the section specifically on international collaboration. The latter explains that there are plans for linking in with existing international networks. Could be increased.

#### **C.1.5. Significance of the RC for the researcher training and promotion of professional careers in research**

Structures are already in place, in which leadership roles of the PIs are evident, to create a successful environment for training. It would have been nice to understand what plans there are for interdisciplinary researcher training and integration in this particular RC.

While the discussion shows that there are exciting processes, structures and cultures that are good, it does not explain how this new RC will support PDRA careers.

#### **C.1.6. Societal impact**

It is difficult to know, but if all of the plans are delivered then the potential is very large indeed. Very very high.

#### **C.1.7. International competitiveness or international comparability**

The RC though new has the potential to become quickly nationally leading and quickly to be world-leading.

#### **C.1.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

This is risky exciting research with potential for world-leading research breakthrough by bringing two excellent PIs together. We would like to know more about the members of the Vainio group that would be involved in this research and what commitment the wider group would have to the RC. It is not clear what resources and time each of the two teams would put into a new RC. Stronger cooperation within Europe should be aimed.

#### **C.1.9. Final rating (1 – 6): 4,5 ( very good - excellent)**

## **C.2. RC Multi-Scale Test – Multi-Scale Testing and Trans-scale Modelling of High-Performance Materials; RC Head Ivan Argatov**

### **C.2.1. Scientific quality and innovativeness of the research plan**

The research plan gives a good overview of the project organisation and the role of every group in the RC. International network is available for collaboration. Goals set are practical and possible to reach. Although the research plan has clear objectives, the process to achieve them is not clear enough.

After the recent recruitment of the leader of the RC new directions have been taken in the materials research, in particular testing. There is a strong grip towards a mathematical modelling approach, which is obviously not so strong among the rest of the group. Whether this will be a bottleneck, remains to be seen. The plan covers novel multidisciplinary work between existing laboratories and is focused in the area important for the future. New outcomes may indeed appear, but the work seems to be partly the follow-up of previous work, in a joint effort with some related disciplines, and hence, will not necessarily provide realistic chances to achieve a major breakthrough.

The project combines approaches from mechanical engineering, material engineering, tribology, mechatronics and mathematical modelling. Combining these different approaches is the source of future added value. The RC is split in four groups, perhaps due to legacy reasons. Each group is small and the number of qualified PhD level researchers is limited. The RC has to ask itself, if it makes sense to split the efforts in so many subgroups. Although interactions in between the teams are identified, the global added value is not apparent.

### **C.2.2. Feasibility of the research plan**

There is a need for some laboratory equipment. International collaboration provides means for knowledge exchange. The role of industry collaboration is not clearly specified. If it would be realised, meaningful added value could be provided. Not much information is given on methods and research plans. Problem areas are identified, but not much information is given on alternatives.

The research plan gives an impression that methodologically, mathematical analysis and simulation are dominating. However, in materials testing the experimental and empirical part is fundamental. No schedule is presented.

Not too much information is given on financial resources, and very little on material ones. Overall, the research groups are small which raises the question of real critical mass. However, The RC seems to have implicitly a realistic understanding of the resources available and needed. Some risks are recognised and analysed. Realisation of the general plan towards practical work packages / research questions is missing.

The plan is strong what comes to leaders Argatov and Porter, and partly Laitinen. Perhaps new, additional recruitments would be of high value.

Collaboration between university laboratories provides new opportunities. Head of RC has a very recent professor position which would be a challenge or opportunity. The organisation is based on collaboration between existing laboratories - also a challenge or an opportunity.

No information is given on the matter of Material management plan in the plan. The RC should pay attention to research material security to protect the participating partner confidentiality issues and rights, including Oulu University itself. A potential ethical issue is identified, and a (not very complete) solution is presented.

### **C.2.3. Competence of the RC and research teams**

The RC Director does have expertise in this area of work, and some broad expertise, covering several areas of the project. The publications record of the RC Director is good. Leadership skills are not reported. He has not exposed very active effort in applying external research funding (according to the CVs).

Team leaders have reported publication relevant to the research area - width and scientific status vary between the teams. Very active efforts in applying external research funding have not been reported. In general, RC Team Leaders don't have a good track record in publications, as well as in project leadership and Ph.D. students' supervision. The h-index varies in between 3 and 8 (with an average of 6.0). Still, there are a few publications that are very much cited. The publication record is based almost solely on 2-3 individuals.

According to the bibliometric analysis the RC has not any high impact in the international scientific community; it is one of the weakest on the list of T&NS projects. Overall, the average number of publications is 42 over RC Team leaders. Journal publications number 13 over the 20 list, which is modest.

The proposed RC team leaders (Principal Investigators) bring complementary expertise to the RC project. They combine the research of four different laboratories in an international collaboration network which is the source for success in the future. The application does not provide meaningful evidence of earlier collaboration, e.g. in the form of joint publications and / or research projects.

There is complementary expertise in between the groups, although all much related to the general area of Mechanical Engineering. Still, the participating groups do have the required complementary know how to achieve the proposed goals. No information is given on the actual split of labour in between the groups.

### **C.2.4. Research environment and collaboration**

The research project needs competences coming from different directions of engineering, which - if well organised - provides opportunities for new openings and high quality results. Concerning infrastructure, the use of own labs and other labs within the university is mentioned. No information is given on previous joint work. Multidisciplinary is basically just within Mechanical Engineering, although a group belongs to Mathematics.

No national and real international collaboration is foreseen. A link with a doctoral program is mentioned, but it does not involve any of the applicants. No information is given on structural changes.

The RC has strong international collaboration network with active partnership and influence. However, clear connection to the surrounding industry is lacking. The project includes innovative elements based on cross-science collaboration. Several research institutes within the University of Oulu are involved, and the initiative is in line with the university strategy.

There is potential to deepen national collaboration, e.g. with Aalto and TUT.

Wide international collaboration network supports the initiative. However, it is not quite clear how these collaborations will work, besides the exchange of researchers.

#### **C.2.5. Significance of the RC for the researcher training and promotion of professional careers in research**

The laboratories have not been PhD production intensive. Argatov has listed three PhD Thesis supervised, Porter one, Louhisalmi none and Laitinen two. Even the researchers of the project seem to have long time since finishing their studies either in MSc or Licentiate level. The average of RC Team Leaders is one Ph.D./Leader, which is quite low. There is no evidence on future progress. A link with a doctoral programme is mentioned, but it does not involve any of the applicants. Researcher mobility is foreseen via the international collaboration.

The plan covers some ideas to improve higher education in the laboratories. Current evidence in publications and PhD production does not seem promising. The support to postdoctoral research careers is not clear. Researchers' mobility may be promoted via the collaboration with foreign universities.

#### **C.2.6. Societal impact**

The societal impact of the proposed research may be large in the future, as potential results have quite a wide application area. On the other hand, results are restricted to models and simulator development, thus, not leading to foreseen contributions with actual industrial impact, at least in the short horizon.

#### **C.2.7. International competitiveness or international comparability**

Given the track record in publications, projects, and Ph.D. supervisions, the RC does not qualify to be at the top of international research. As a newly established RC the reputation can't be high. However, the future credibility lies on the key persons, and there is the potential, indeed.

#### **C.2.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

**Strengths:** New persons in the helm, with ambitious targets and in need to expose their excellence. A multidisciplinary approach is evident in the work and its quality is ensured, in part, by the assistance of a good international collaboration network. Trans-scale sensors are innovative and promising research area. New material testing is very important; Curie fellows could be of value, here.

**Areas of development:** PhD education, researcher training and high impact publications. The RC is not strong in experience and critical mass to achieve the desired results. The RC appears to be set up through one or two leading persons. It will be tough to discover and exploit their real synergies across the associated groups and people.

#### **C.2.9. Final rating (1 – 6): 4,0 (very good)**

### **C.3. RC OSSSI – Oulu Software and Systems Initiative; RC Head Markku Oivo**

#### **C.3.1. Scientific quality and innovativeness of the research plan**

The plan has multidisciplinary approach; it brings together research from software engineering, industrial engineering and management, systems engineering, SE-development methods (applying empirical SE in software and product development) and R&D of industry. In addition the project is focused in change management related to reorganising the activities of the RC institutes (retirement of key persons) and software industry in Oulu area (scaling down the industry because of changes in big companies). The RC covers both academic and industry oriented development activities. The research setting is challenging - it is targeted in big problems; focusing in smaller sub-problems helps to reach scientific goals easier. The details of projects are not clearly specified. One of the main artefacts is the research environment that provides path from laboratory experi-

ments to empirical research with full-scale applications and services. The RC participates in the evaluation on the "VENI" level, but consists of very experienced researchers. The plan reports very unbalanced size of project groups.

The RC has evidence on high productivity in all fields of academic activities (publications, PhD and MSc education, project funding, and industry collaboration, as well as international and national collaboration). The aim is to find means for more effective and systematic work and methods in the future; the main focus is to guarantee successful results even in the future, when there are important structural changes both in the institutes and in the surrounding industry. The project gives special focus to productising and business development within the software industry, which is typically a very engineering oriented business sector. The industrial impact is exceptionally high. A cross-disciplinary approach is a challenging proposition, once academic outcomes are expected.

The project includes method development - empirical software engineering. The aim is to develop industry applicable practices into problems having their source in industry and business. A wide range of expertise and experience is manifest within the teams. This is a matter of great importance from the regional point of view.

### **C.3.2. Feasibility of the research plan**

The project has both academic and practical approach. Close connection to software industry helps first to recognise the real problems in there and then to find suitable benchmarking environment for the tests and the artefacts. The plan is generic and allows freedom to the RC to conduct research in different research topics. On the one hand, it provides an unplanned impression, but on the other hand it provides freedom to focus research activities in the new areas on demand basis.

The RC has long term experience in research and development - however from individual partner point of view. There exists an extensive environment for the work in the form of laboratory facilities, networks and experience to use funding instruments available. The personnel is about OK although there could be even more post-docs and graduate students. The group does not seem to have problems in acquiring finances from external projects. Team sizes are unbalanced in the plan.

OSSI is a multidisciplinary RC of over 30 people. The RC provides excellent structure for the collaboration covering the life cycle of software products from problems having their source in industry to the solutions for industrial needs. Additional aspect comes from research methodology initiated work process development (applications of experimental SE methods in practical work). High level academic connection comes from FiDiPro context.

The Materials management plan is not relevant to this project. More or less, it is question on research result management, publication management etc. that is taken care by the appropriate practices. There are no ethical issues that should be taken into account.

### **C.3.3. Competence of the RC and research teams**

The RC director has shown a high level of productivity, as well as quality, in the research field. The Director is very competent with wide experience in academy, industry and VTT career. Evidence of strong scientific leadership exists. Some of his papers are highly cited. SE as a research topic does not get comparable results in general level impact analysis of publications compared to more traditional sciences; because of that the bibliographic analysis does not give real picture of the importance of the publications of this RC.

The RC PIs have high productivity and good quality in the research field. PI, Prof. Harri Haapasalo, the Dean for research at the Faculty of Technology, has 280 publications. PI, Prof. Veikko Seppänen, the director of the Martti Ahtisaari Institute in the Oulu Business School at the University of Oulu, has 100 publications in software development and business management. FiDiPro professor Natalia Juristo brings international expertise.

Bibliographic analysis of the RC ranks it in the category C -low production and impact. In the CVs of the PIs hundreds of publications are reported. The publications listed in PIs' CVs are relevant in their research field - relevance ranking does not follow the "official" one. The amount and quality of the publication is good.

The research plan lists relevant goals and outcomes for the project. The teams and collaborative organisations supplement each other. The division of work is not clearly specified.

#### **C.3.4. Research environment and collaboration**

The research groups cover the life cycle of a software product. The tradition in software and ICT industry is based on silo oriented work, which lacks interaction between interest groups; especially productising and commercial aspects are often left on the background. Empirical software engineering as a starting point in this activity provides an excellent platform for fast feedback and active collaboration between research partners and industry. The laboratory environment supports the work. The RC is a good platform for multidisciplinary research and researcher training.

The project fills the strategic goals of the university: Internationally strong profile, active partnership and influence, support for creative community and strong economy (in the existing changing situation). Information Systems and Software belongs to the strategic focus areas of the university. Business aspects are enhanced with Oulu Business Kitchen, which provides an environment and path for new businesses and start-ups. Links to the Oulu start-up ecosystem Takomo for new business ideas and products already exist.

The RC has an excellent network in national level for collaboration. The members have been active members of nationwide projects and industry academy collaboration. The RC is participating in key roles in the Strategic Centre for Science, Technology and Innovation. CASS includes top architects and professionals who are mainly former Nokia employees. They have participated in the National ICT SHOK Program.

The RC has a wide international collaboration network. The focus is in industry-driven international projects and consortia, e.g. Artemis, ITEA Program. RC is hosting researchers from Turkey, Serbia, Spain, Italy and Pakistan. They have been active in international scientific forums - e.g. publishing, organising conferences, acting as reviewers, mobility.

#### **C.3.5. Significance of the RC for the researcher training and promotion of professional careers in research**

The RC members have evidence of extensive activities in regard to the supervision of students, who wish to acquire a Doctoral Thesis. The RC staff includes 20 PhD students, and has plans to raise this number to 25. These students shall have an opportunity to graduate during the project. Partners can be found in 20 different countries.

The RC staff has evidence of successful activity in this field. The consortium has specified duties for post-doc researchers. The RC has significant outside funding and has, furthermore, attracted foreign researchers to Oulu.

#### **C.3.6. Societal impact**

The RC addresses on the important societal and business challenges in Oulu area, which suffers of serious downscaling of software industry (mainly Nokia and its subcontractors). The project has goals to find new employment opportunities for software specialists and it also provides means for establishment of new companies in software business - directly to the development itself, services or in related activities.

#### **C.3.7. International competitiveness or international comparability**

The RC is on high level in international comparison. It has had an important role in software process improvement research and also in activating international collaboration forums, like series of conferences. It is an active member of international communities. The OSSI is associated with ISERN, to which most of the world leaders in empirical software engineering belong. Similar research is carried out at the Software Engineering Institute, Massachusetts Institute of Technology (MIT, Lean initiative), and the Lean Construction Institute. The research projects performed by OSSI belong to the European Union's IST framework programs, EUREKA's research programs ITEA and ITEA2, the ARTEMIS Joint Undertaking program, national Digile SHOK research programs, and Academy of Finland research programs, which are highly competitive. In addition to national and international dimensions the OSSI has important role regional level as it reflects in some of the radical recent changes. Industrial relevance is seen as a main motivation factor to conduct the R&D activities in the teams of the RC.

### **C.3.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

**Strengths:** The research represents very good quality. A long time span of experience in the development of SE methodologies is apparent. Excellent industry collaboration has always been a part of the organisations' activities, and such collaboration has also been built into this plan. Support for structural changes in the region and inside the Institutes shall guarantee future success.

**Areas of development:** Visibility in Bibliographic analysis low, which can be explained by the unsuitability of the generally used impact analysis methods in this research area; corrective actions are needed. Transfer from short term industry drive projects to long term academic projects.

### **C.3.9. Final rating (1 – 6): 5 (excellent)**

## **C.4. RC PSH – Persuasive Systems for Health; RC Head Harri Oinas-Kukkonen**

### **C.4.1. Scientific quality and innovativeness of the research plan**

The research plan supports important trends going on in today's information society: encouragement of consumerism (the dominating role of consumers in the development of services, products and processes), ubiquity (dominance of mobile technology), growing importance of social networks in different roles (information transfer, crowdsourcing, citizen's participation) and big / open data (availabilities of information / knowledge). The application area binds IS development (information systems sciences, mobile services) and medical research (Health, Technology, Clinical Medicine) together. In addition to the health related goals it has also goals related to the research and development methodology (Persuasive Systems Development). The research plan has somehow vague objectives, and the process to achieve them is not clear enough. However, the joint proposed work is of great value.

This type of work crossing the borders of different areas of research and development, having clear goals coming from the important application area, has great potential for success. The development work is tightly connected to the daily health care system, which provides an excellent test field for the solutions developed. New outcomes will appear, in a joint effort of different disciplines, without some risk, hence, providing some breakthrough. There is also potential risk for persuasive methods.

The RC has existing evidence of successful scientific work in the form of publications and prizes. This topic area is active in international level and opportunity for wide international collaboration exists (and is already now used in a beneficial way). Real interactions in between the teams are identified, and the global value of the RC is high.

### **C.4.2. Feasibility of the research plan**

The plan is feasible; some concretism is missing, but the clear binding between the research and the daily healthcare practice increases the probability to achieve good results. The multidisciplinary RC has tradition in collaboration and connections to the innovation units of the university. One of the aims is to test and develop new method as a part of the project; it combines elements from Design Science, Experimental Research, Evidence Based Research. Not much information is given on methods and research plans. Problem areas are identified, but not much information is given on the methods to approach them. No schedule is presented.

The research groups are of high quality (based on the evaluation of the CVs of leaders and educational background of the researchers). They have experience on earlier collaboration. Test environment (national and international level) are specified. No information is given on financial resources, and very little on material ones. Overall, the research groups are very good, with a real critical mass, and enabling real joint work due to previous collaboration. Hire a junior professor to interlink biosciences and information technology.

The Materials management plan is not found in the plan. Scientific publications belong to the artefacts of the project. Records of medical information are under normal maintenance of the health care organisations. Ethical issues are recognised in the plan and taken into account in the current phase of the work.

### **C.4.3. Competence of the RC and research teams**

The RC director has wide record of publications. The ones listed in the plan are published in the leading journals and conferences of the research field. He has also wide experience in organising and leading research projects.

The RC Director does have expertise in this area of work, and some broad expertise, covering several areas of the project. The RC Director has joint publications with members of the other groups.

In general, RC Team Leaders have a very good track record in publications, as well as in project leadership and Ph.D. students' supervision. The h-index varies in between 9 and 40 (with an average of 21.4). A few publications are very much cited. Some of the publications are written in international collaboration.

Overall, the publications average is 167 over RC Team leaders. Journal ones is 18 over the 20 list, which is very good. According to the Bibliometric Analysis the RC belongs to group A and is positioning above average level according to the interpretations of different factors of the analysis. Typical to this kind of new multidisciplinary research area is that the publishing forums relevant to the field do not belong to the highest category in "official analysis"; in this case it gives more value to the fact that this group belongs to the A category in "official" ranking.

The consortium is excellent when taken into account the multidisciplinary characteristics of the research topic. Division of labour and work items is not exactly specified. The competences of the research groups complete each other and knowhow to achieve the proposed goals. External collaborative partners (national and international) fill the gaps / strengthen the competencies.

#### **C.4.4. Research environment and collaboration**

Concerning infrastructure, the use of own labs, and labs in other cities is mentioned, as well as interaction with private centres. There is previous collaboration in between some of the groups, with joint publications. There is a palpable multi-disciplinary connection between Information Technology and Medicine. Real national and international collaboration is foreseen. Links with two doctoral programmes are foreseen. Interaction with other research centres within the University of Oulu is foreseen. No specific information is given on industrial collaboration. There is evidence of prior collaboration in between the five groups of the RC, which creates the conditions for achieving the goals. The current results are tested in real practice and the work has wide impact in the society, especially in the health care sector, which suffers increasing lack of resources. The results support people's longer survival at home without hospital level medical care. Persuasive systems for health can only be solved in a group approach.

The RC has internationally strong profile: the RC has evidence in international level collaboration based on their research and publications; active partnership and influence: The research plan is based on the active development of Information Society and services based on the current trends; Creative community and strong economy: The project is innovative and enables the innovative use of existing technology infrastructure. Public healthcare and general welfare as application area is important. The RC includes in the strategic focus areas of the University (information technology).

The national collaboration network covers both academic and research institutions, also organisations able to test the results, especially in the public sector. Industrial partners would be recommended to participate in the project to transfer the results in products and further in business. This network would be increased with other national researchers in this field.

The project has wide network of international partners having good level reputation in international academic society: Active collaboration with U. Stanford (US) exists; several minor collaborations with other universities (US, NL, JP) exist as well. Collaboration is foreseen as exchange of students and researchers, and joint work. Some evidence of activity related to joint publications with international partners is seen in the lists of publications. Further cooperation with other countries is highly recommended.

#### **C.4.5. Significance of the RC for the researcher training and promotion of professional careers in research**

Link with two doctoral programmes is mentioned, directly involving groups of the RC. There is an excellent track record of supervision of Ph.D. students (the average of RC Team Leaders is 7 Ph.D./ Leader), and there are quite many currently going on. Researcher mobility is foreseen via the international collaborations. About half of the team members have also higher academic degree. For a broader visibility post docs with Marie Curie fellowships should be attracted. The support to postdoctoral research careers is not clear. Researchers' mobility may be promoted via the collaboration with foreign universities.

#### **C.4.6. Societal impact**

The project is tightly connected to the current information society and has high importance both for applied science and practice. The societal impact of the proposed research may be very large in the future, as potential



results have quite a wide application. Results include experimentation, which may lead to actual industrial impact. Because of that closer connection to the industrial partners is warmly recommended to get the results in real business.

#### **C.4.7. International competitiveness or international comparability**

The work is on the frontier of current research work in the field. Given the track record in publications, projects, and Ph.D. supervisions, the RC qualifies to be at the top of international research. It has strongly applied character, which makes its results easy to transfer in daily practices.

#### **C.4.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

**Strengths:** The proposed objectives are of great value, and the RC shows enough experience and critical mass to achieve them with success. The RC has earlier experience in collaboration and wide collaboration network inside the University, in national level and in international research community. The partner organisations have good evidence in high level academic research; this is indicated by publications and earlier research project base.

**Areas of development:** The RC has no specified connections to industrial partners. Clear work plan related to the research topics is missing. This research has some risk and can be overcome by increased international cooperation.

**Recommendation:** PSH should collaborate closely with Global Health - joint funding for them will lead to more beneficial and more widely applicable results.

#### **C.4.9. Final rating (1 – 6): 5 (excellent)**

### **C.5. RC SusBen – Sustainable Benefication; RC Head Hannu Kuopanportti**

#### **C.5.1. Scientific quality and innovativeness of the research plan**

The research plan is vague, and the process(es) to achieve the objectives of the research are not clear at all. The question that is never answered when one reads this proposal is “what is the “state of the art” and what new things in research SusBen proposes to do and why these are innovative?”, in other words a major weakness of the proposal is the lack of a critical survey of the “state of the art”. Surely, there is significant volume of research on crushing and grinding, and on vision based methods for identifying comminuted (particulate) matter; what is then the new research question that SusBen wishes to address in these areas and why? Why is existing knowledge, say about the above, not transferable to mining R&D and new research must be done?

Not easy to give an answer to the “questions” asked in 2 (*Assess the potential of this research for significant new outcomes, scientific breakthroughs and the progress of science in its field. Are there potential risks that could threaten the project but a successful outcome would mean major progress in the field.*), as we are not told what the “state of the art” is and what will be new in this research (see 1). Thus, there is a risk of “re-discovering the wheel” if the R&D were to repeat previous work but (perhaps) for a “different” mineral. Furthermore, because we are not told what the minerals (ores) of this study will be (which sulphide ores and which industrial minerals) it is also very difficult to assess if there will be any significant new outcomes and the potential for breakthrough or whether the task is so demanding that delivering on the objectives in the next five years is realistic and achievable. In other words, this proposal is let down by a weak (not well written) case for support.

Three research teams with expertise in different (and with synergies) fields provide a good basis for the collaboration to address the selected research questions. Ten academic experts, PhD students, collaboration with industry and international networking should help the progress of the project. However, although interactions in between the teams are identified, the global added value is not apparent (for the reasons discussed in paragraphs 1 and 2 above).

#### **C.5.2. Feasibility of the research plan**

The research methods are sound and the research plan is feasible for what the centre wants to do with the facilities available to its researchers (and the importance of mining research in the UO), but we do not know what the new key questions are (see C.5.1.), why these questions must be addressed (how these relate and link with prior R&D in the field)? Furthermore, not much information is given on methods and research plans.

Problem areas are identified, but not much information is given on the methods to approach them. No schedule is presented.

The heart of the project is fed by the existing expertise and the network of collaborations. Laboratory facilities are available in the participating labs and in collaborators. The mini-pilot plant is surely a unique asset and will help the research. No information is given on financial resources, and very little on material ones. Overall, the research groups are small, without a real critical mass.

No real information is given in the proposal about the structure and organisation of the research to help one assess them. The questions asked seem complex enough (but is this indeed the case as we have not seen a critical evaluation of the “state of the art”?) to require larger number of PhD students and could even require larger groups of experts attempting to tackle the “complex” questions (whose complexity however is questionable for the reasons outlined in C.5.1.). The industrial and academic experience of the RC director and group leaders should help the project.

The Materials management plan is not considered in the proposal, and another weakness.

It would be nice to be told what the University of Oulu means when it uses the word ethical in the context of mining R&D. Mining raises many issues regarding the local and wider ecology, local community lives and infrastructures etc. The proposal does not address the above, perhaps these are not considered important (although tailings disposal facilities (tailings dams, liner structures) are indeed mentioned in the research objectives) but aren't they? For example, in gold mining (assuming that gold mining might be one of the research topics as gold mining is in progress in North Finland (Kittilä)) there are issues with the use of cyanide solutions, their handling and disposal and the impact (any?) on the local communities and environment.

### **C.5.3. Competence of the RC and research teams**

The publications record of the RC Director covers areas relevant to the research of the centre but should be better. It is not clear whether the “official metrics” could catch the publications' relevance for this area of engineering.

In general, the RC Team Leaders do not have a good track record in publications, and in project leadership and Ph.D. student supervision. The h-index is considered low. The age of leaders should be a concern for the long term viability of the centre, there are two younger colleagues without (?) tenure, post-docs should be hired and the University of Oulu must start thinking about succession in the longer term and how it will attract staff with experience and research reputation (not an easy task in the mining engineering field).

In bibliometric analysis the RC is ranked low (second worst of T&NS projects). The amount of publications is in an acceptable level, but publication forums do not have high ranking (according to the bibliographic analysis). The publications total is 86 for the RC Team leaders. The journal ones are 10 from the 20 in the list, which is quite modest.

It is not clear whether the RC Director has much experience in managing large teams (own team is a small one) and projects, although the RC Director has been a director at department level in a university. The RC Director does have expertise in this area of research work, and some broad expertise, covering several areas of the project. The team leaders seem to have wide expertise in industry and academy, and in managing research and development projects. The number of PhD theses supervised is low taking into account the length of their academic career. There is complementarity of expertise between the groups, all related to the general area of Mining Engineering. No information is given on the actual split of labour in between the groups.

### **C.5.4. Research environment and collaboration**

Three research groups collaborate in multidisciplinary project. Collaboration network supports the work both at national and international level. Industry network is available. The role of collaborating partners is not clearly specified in the plan. Concerning infrastructure, the use of own labs and other labs within the university is mentioned. No information is given on previous joint work. Multi-disciplinarity is basically just within Mining Engineering. Some national and international collaboration is foreseen, with universities and industry. No specific information is given on training. Interaction with another research centre within the UO is foreseen. Some specific information is given on industrial collaboration. There is no evidence of prior collaboration in between the groups of the RC, which may create difficulties in achieving the goals.

Internationally strong profile assisted by the importance of mining in the arctic region: the RC is thus well focused and has good chances for success; Active partnership and influence: The RC has active role in the re-

search community; Creative community and strong economy: The results should have high economical value. Mining research is included in the strategic focus and development areas of the University. Mining research has full support of the university.

The RC has good national collaboration network. The RC Head has been active member of the professional and academic community in his own area. Some details of the collaboration are included in the plan.

The RC has a good collaboration and an international network. The PIs have activities with international research community and collaborative research experience record. Limited details of their collaborations are included in the plan. However, it is not much clear how these collaborations will work, besides the exchange of researchers.

#### **C.5.5. Significance of the RC for the researcher training and promotion of professional careers in research**

The current number of PhD students in the RC is low. The PIs do not give evidence of active PhD supervision in the past (just a few PhDs supervised in a long academic career). Post-docs should be hired for enhancing the research.

The project provides opportunities for more PhD students than listed in the plan. The research careers for these graduates should be very good. The support for postdoctoral research careers is not mentioned. Researchers' mobility may be promoted via the collaboration with foreign universities

#### **C.5.6. Societal impact**

The RC is of high importance for the national economy (success of mining industry, decrease of negative impacts of mining industry) and in particular for the arctic economy. The societal impact of the proposed research could be large in the future, as potential results can impact strongly the economy and environment. There is however some concern as focus of research seems to be restricted to methods' development. Links with the industry in the relevant sectors are foreseen.

#### **C.5.7. International competitiveness or international comparability**

International research centres in this field are few and usually not at Universities. The potential for this RC making a name for it is very high but this would require careful thought of what must be done and why, in other words it requires careful examination of the research questions (see C.5.1.). However, given the track record in publications, projects, and Ph.D. supervisions, the RC does not qualify currently to be considered as an international player in mining research.

#### **C.5.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

This is a very good proposal for a starting (new) RC in the UO and justifiably placed in the *VENI* category in the RAE2013.

SusBen addresses research relevant to mining engineering. Given that mining is of national and local importance and also a high priority for the University of Oulu, the RC will encounter many challenges in the future. The main (and worrying) weakness of the proposal is its vagueness and lack of clarity about the questions that its research must address. This weakness comes out from reading the proposed research and should be worrying if the team did not realize the importance of the research questions (considered unlikely by the assessors of the proposal) or most likely did not address these research questions because it was not made clear in the call for proposals for the RAE2013 (which could be easily sorted out by the University of Oulu).

The area of research offers many opportunities for "the Oulu miners" to engage with other "Oulu engineers and scientists" for example with biotechnology, chemistry, geology and process engineering research as well as research in ecology and geography. However, as mining deals with the raw materials that make possible the development and production of a range of materials used in the modern economies and Oulu is known for its materials research, it is recommended that for the longer term SusBen explores potential synergies with other centres, for example CASR and Multi-Scale Test.

Areas of the proposal as it currently stands that must be addressed: The proposed objectives are of value, but the RC does not show enough experience and critical mass to achieve them with success. Publications' record must improve and number of PhD students must increase.

#### **C.5.9. Final rating (1 – 6): 4 ( very good)**

## CATEGORY VIDI

### C.6. RC CASR – Centre for Advanced Steels Research; RC Head Timo Fabritius

#### C.6.1. Scientific quality and innovativeness of the research plan

The Centre has proposed a timely, focused and structured research plan of excellent quality, which, however, in some areas is lacking details probably because it was prepared under the constraints imposed by the retirements of the heads of its two laboratories and the recent replacement of one of them. The proposed research is of national importance and innovative. Furthermore, it compares favourably in terms of research priorities with steel research in similar overseas Centres and includes research themes specific to national priorities. Γνώθι σεαυτόν (gnōthi seauton or know thyself) is important for all humans, academics and researchers included (Benjamin Franklin, in his Poor Richard's Almanack, observed the great difficulty of knowing one's self, with: "There are three things extremely hard, steel, diamond, and to know one's self"). The CASR team has been (probably over) self-critical in considering its position as a global leader.

The proposed research tackles head-on challenging new questions that must be urgently addressed by the ferrous metallurgy community world-wide as steel continues to play a prominent role in meeting the demands for advanced steels in modern society, and in particular in the energy and transport industries. The potential for significant breakthroughs is high. The proposed research will contribute in advancing the research field. The proposed research is considered to be extremely important for the Finnish steel industry and will help to strengthen its international competitiveness. While the research is critical (in terms of its importance and potential impact) in the short to medium term, the two research teams have expertise and facilities that could help them to gradually re-position the Centre to re-focus on metals related research by expanding its collaboration with other researchers in the UO, if in the longer term steel research and production in Finland were to be affected by developments outside the European Union.

The Centre has a strong record in high quality education and training of metallurgists in Finland. It also contributes significantly to the education and training of other engineers, for example mechanical engineers, on metals related topics. The Centre also has a very strong record in assisting Finnish industries to solve difficult metals related problems, in building up and sustaining national and international collaborations and benefits from its links with key international steel researchers world-wide. The proposed research will also benefit UG and PG teaching in the UO and in other Universities in Finland. The added value will increase further as the team work together under the direction of the new leaders and as the latter explore possible new avenues for collaboration with other researchers in the UO. The latter will help to strengthen the position of UO in metals related research internationally.

#### C.6.2. Feasibility of the research plan

The research methods are sound and appropriate for the proposed research and the research plans are well-thought out, realistic, feasible and well prioritised. The outlined schedule, though not detailed, is realistic. The research team will deliver research of very high quality.

The resources are adequate for the planned research. The strong dependence of some parts of the proposed research on a range of discipline specific advanced experimental and modelling techniques points out how important the funding for this type of research is and the dangers for steel (and metals) research in Finland if funding were to dry out. The team has a strong record in earning external funding for its research but it would be a mistake if the UO were to expect CASR to continue its very good research only with external funding. Internal support is essential for this type of research to continue in the University of Oulu and North Finland.

The Centre has been in existence since 2006. It has a sound structure, is well organised and has a strong and proven management structure, which will benefit the proposed research.

The Materials management plan is very strong and well structured. There are no applicable ethical issues involved.

#### C.6.3. Competence of the RC and research teams

The RC head is very good for his particular field in metallurgy and already a well-respected academic internationally.

Generations of metallurgists have been educated and trained in Physical Metallurgy using the classical textbook (standard in ALL metallurgy UG and PG courses world-wide) co-authored (1st of the 3 authors named in the latest edition) by the second research leader, who is internationally known and well respected. The second research leader has publications of high quality; the low number of publications is the direct result of his career path (many years in industry).

The publication record of CASR is very good. The bibliometric analysis of the University of Oulu publications for the RAE2013 claims that has taken into account the differences between fields and disciplines regarding publication and citation habits and suggests criteria for comparison purposes. While this approach might be reasonable when comparing, say, physics with chemical engineering, it is not clear whether the analysis has (could) consider the differences between sub-fields in a specific discipline, say, astrophysics with metal physics or slag metallurgy with hydrometallurgy.

The two leaders bring in CASR strong and complimentary expertise and the ethos of working on real world problems to produce high impact solutions and a strong track record of delivering such solutions. The division of labour between the research teams is appropriate and manageable.

#### **C.6.4. Research environment and collaboration**

Steel continues to be a very important commodity in the Finnish economy and key to the prosperity of North Finland. The R&D in CASR is extremely important for both and for strengthening the international position of Finland is the extremely competitive and often volatile steel market. CASR has established very strong links with the national and international steel industries and metals research communities and is highly respected for its contributions in the field. CASR has also helped to raise the profile of UO among technological Universities. Within the UO the CASR team contributes to the highly quality training of UG and PG students. In Finland the CASR is also highly respected for promoting a creative research environment.

The proposed research in CASR is highly compatible with the strategies of the University of Oulu that has given 150-250 kEuro extra funding annually, which is essential support for the prosperity and survival of this centre. Considering metals R&D in the University in the longer term, it would be good to explore synergies and possible new research avenues with researchers in the proposed centres Multi-Scale Test, SusBen and even with Luminous and Global Health (see comments in C.6.1., 2<sup>nd</sup> paragraph).

CASR is a national leader for steel research. It has the expertise and industry and international academic links that will contribute significantly to the success of the proposed research BUT can also act as a catalyst for new innovative metals R&D in the longer term.

CASR has a flourishing international network of contacts and collaborators and has been active in exploring the opportunities that arise from such networks to benefit its research, the profile of the UO and the economy in North Finland. CASR will benefit further in the future as it strengthens its collaborations within the EU.

#### **C.6.5. Significance of the RC for the researcher training and promotion of professional careers in research**

CASR has the expertise and resources required for the training of doctoral students in specific areas of metallurgy. CASR also has a very strong track record of delivering high quality training and is well known for adding high value to the training of doctoral students by exploring possible avenues to give them opportunities to spend time for their research in overseas research labs and steel research centres. While Marie Curie networks in steel research are possible, they are known to be difficult to get when competing with “pure” science(s) and “high profile” topics (e.g. graphene). Possible new research avenues in metals research with other researchers in the UO (see 14) should be exploited as potential sources of funding feasible PhD level R&D via the Marie Curie scheme. Such new research will form the basis (background) on which longer term metals based research could be developed in the European context but (perhaps) with focus on the special needs of North EU communities and industries. The key question for the University of Oulu (as it should be for every University engaged in research) is whether it is prepared to educate and inspire its academics to offer PhD projects in areas they believe are of particular interest or in areas where money has been set aside for particular purposes.

The comments made above apply for postdoctoral research careers as well. The key question for the University is whether it is prepared to educate and inspire its researchers to work in areas they believe are of particular interest or in areas where money has been set aside for particular purposes. The latter initiatives often have a tendency to attract less creative and effective researchers who are simply following where resources are being made available.

### **C.6.6. Societal impact**

The research in CASR is vital for the local and national economy and the prosperity of North Finland.

### **C.6.7. International competitiveness or international comparability**

Very good international competitiveness. CASR compares very favourably with similar research centres overseas and has the potential to evolve long term in collaboration with other centres in the UO and Finland.

### **C.6.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

CASR is a very good research centre in the UO that is justifiably in the Vidi category in the RAE2013.

CASR has proposed a very good programme of research.

CASR has the ethos of working on real world problems and attacking head-on timely and challenging research questions in steel metallurgy.

CASR has a strong track record of producing high impact solutions to steel metallurgy problems and research of high quality.

CASR is very active is exploring the opportunities that arise from national and international networks to benefit its research, the profile of the UO and the economy in North Finland.

The proposed research by CASR is of national importance and innovative and extremely important for the Finnish steel industry. The proposed research will help to strengthen Finland's international competitiveness.

The research teams in CASR have expertise and facilities that, if required, could help them to gradually reposition the Centre to re-focus the metals related research in the University of Oulu (UO) by expanding their collaboration with other researchers in the UO. Re-focus of the metals research in the UO in the longer-term, if decided by the researchers, should be assisted by the UO, for example with new key academic appointments and acquisition of key facilities.

CASR has a flourishing international network of contacts and collaborators which should be enlarged and strengthened further by exploring the opportunities offered by EU projects.

CASR compares very favourably with similar research centres overseas and has the potential to evolve in the long term in collaboration with other centres in the UO and Finland.

The importance of funding CASR's research in Finland should not under-estimated. The dangers for steel (and metals) research in Finland will be extremely serious if funding for CASR were to dry out. The team has a strong record in earning external funding for its research but it would be a mistake if the UO were to expect CASR to continue its research only with external funding. Internal support is essential for this type of research to continue in the UO and North Finland.

### **C.6.9. Final rating (1 – 6): 4 (very good)**

## **C.7. RC IEM – Industrial Engineering and Management; RC Head Jaakko Kujala**

### **C.7.1. Scientific quality and innovativeness of the research plan**

IEM is a vital institution inside Oulu University. It is active in research and PhD production; it has good industry collaboration and a reasonable high amount of PhD students in different research projects. The past strength of RC is associated with strong industry-academia collaboration.

This research plan shows strong emphasis towards high level academic publications, which is a good choice to raise the academic level of the RC. The plan is based on the collaboration between different fields of IEM.

This starting point is good and category "VIDI" describes nicely the nature of the plan. However, substance wise the plan is not perhaps as ambitious or are clear as it could be. The indicated goal is to extend external funding, in which the RC has been very successful, to European FP sources, to complement the current primarily national funding base.

As the RC works hand-in-hand with industry, the relevance and applicability of the research results is high and thereby there is high potential towards new significant outcomes. With its track record the institute has good opportunities to reach the goal, but the goal itself is not very innovative. The plan indicates one topical area

"people along the same corridor" which naturally brings up proximity based coherence and strength of the research work, but simultaneously hides a risk of internal orientation. Multi disciplinarily exists between the different IEM branches but not beyond that. This could turn out to be an obstacle for a major breakthrough.

The RC forms a fairly integrated research community well prepared to cope with IEM research challenges, each having different viewpoints, such as management, operations and people. Although interactions between the teams are identified, the global added value is not apparent.

#### **C.7.2. Feasibility of the research plan**

The research methods of RC are primarily inductive and qualitative. This choice is an appropriate for this particular field. The research work has applied character and typical to it is strong industry collaboration providing primarily case study based inductive evidence. Larger data sets are also achievable provided that surveys or alike are applied. However, for the RC itself the methodological choices are perhaps so self-evident that the plan almost completely misses notes on research methods and research plan details. A few problem areas are identified, but not much information is given on the methods to approach them. No schedule is presented.

Intellectual resources are adequate. Each group is sizable what comes to (human) resources with a critical mass and enabling real joint work, which already exists from previous collaboration. Most of the resources are located in Oulu University, complemented by talents from other research institutions. Existing extraordinary high and active industry driven approach in research is a good basis for the future work.

The RC has a fair share of external funding. However, it is worth noting that these financial resources are apparently available on project basis and thereby are volatile and scarce in nature. The nature of research is not capital intensive and thereby does not require extensive investments in facilities and materials.

The RC is well organised. The general structure is good, but perhaps lacks innovative multidisciplinary aspects.

No information is given in regard to the Materials management plan. The RC should pay attention to research material security to protect the participating partner confidentiality issues and rights, including Oulu University itself.

There are no major ethical aspects involved in IEM research.

#### **C.7.3. Competence of the RC and research teams**

The RC Director has a high professional standing in the domain of work, and some broad expertise, covering several areas of the project. The publications record of the RC Director is very good. The listed 20 publications are published in journals relevant to the topical field.

The Team Leaders have a very good track record in publications, as well as in project leadership and Ph.D. students' supervision. The h-index varies in between 9 and 40 (with an average of 11.5). A few publications are very much cited.

In Bibliographic Analysis the record is in reasonable high level, but just few of the publications are in green area. Impact factor of the publications is not very high. This is typical to the research area itself having pragmatic flavour in publication forums. Overall, the publications average is 211 over RC Team leaders. Journal ones is 20 over the 20 list, which is excellent.

PIs are all experienced team leaders having experience to work in different research projects in different institutes. There is required complementary expertise in between the groups and know how to achieve the proposed goals, although all much related to the general area of IEM. No information is given on the actual split of labour in between the groups.

#### **C.7.4. Research environment and collaboration**

The RC has four research groups but inside one main topic. The deep nature of IEM research is multi- and even transdisciplinary; strategy - operations - people; exactly as the RC is organised. So the RC is interdisciplinary but only within the scope of IEM. Importance of the work to the collaborating industry is high. The groups have exceptionally high number of PhD students and post doctors. International collaboration is at a good level.

Concerning infrastructure, the use of own labs and other centers and industry at the national level is mentioned. There is evidence of prior collaboration in between the groups of the RC, which creates favourable conditions for achieving the goals. National collaboration with industry is mentioned, but without specific in-

formation. The plan brings up some ideas on international collaboration, mentioning a few European frameworks. However, these ideas remain at a bit vague level.

The research plan is consistent with the strategy of the University. The RC has internationally strong profile: the RC is recognised in international context. The social impact is very strong through active industry-academia partnerships and the inherent influence.

The RC collaborates very strongly with all the other IEM research groups in Finland. This is a well working network at all levels supporting the success of this particular RC.

The RC acts as an excellent member in high quality networks. The intended practical benefits are not specified in detail. COOST and Marie Curie fellowships would lead to enhanced international cooperation. Collaboration with foreign universities is part of the RC-plans. Some national comparison is done. Joint conferences and the use of eLearning tools are mentioned as means to implement collaboration.

#### **C.7.5. Significance of the RC for the researcher training and promotion of professional careers in research**

The RC has big group of PhD students and post doc researchers. The track record of supervision of Ph.D. students is outstanding: The average of RC Team Leaders is 12 Ph.D./Leader. Moreover, there seems to be more to come. However, researcher mobility is vaguely mentioned and we wish to recommend that the international exchange of scholars be increased.

The RC has tradition in postdoctoral research and activities relevant to it (mobility, publications). Researchers' mobility may be promoted via a deepened collaboration with foreign universities.

#### **C.7.6. Societal impact**

IEM has close connection to industry as a test field of the research. Because of that the work has high societal impact and also economic value. The societal impact of the proposed research may be large also in the future, as potential results can impact on economy and companies in particular. Although a very "scattered" research is performed in the RC, the very high production of Ph.D. graduates is an excellent way to transfer knowledge and technology to the companies that will employ these graduates.

#### **C.7.7. International competitiveness or international comparability**

The work of RC is at a high national level (SHOK activities) and it is competitive also in internal comparison (collaboration network, visibility created by the publications). Given the track record in publications, projects, and Ph.D. supervisions, the RC qualifies to be at the top of international research. Technology management and project management are the top teams.

#### **C.7.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

**Strengths:** The RC has traditions of fruitful industry-academia collaboration and excellent capability to work together. The research scope covers a wide range of problems encountered in industry. Evidence to act as a top level academic institute exists. The RC has exposed good results in all areas of academic work. The RC is still growing. The RC shows enough experience and critical mass to achieve the proposed general objective with success.

**Areas of development:** The RC does not cover rich, innovative aspects; the target setting in the research plan is biased towards new funding sources and accelerating the publication record in top quality journals.

The research substance itself remains a bit obscure. What comes to international cooperation, we would encourage the RC to hire Marie Curie post docs to increase the international attractiveness of the RC.

#### **C.7.9. Final rating (1 – 6): 4 (very good)**

### **C.8. RC iUBI – Ubiquitous Interactions; RC Head Timo Ojala**

#### **C.8.1. Scientific quality and innovativeness of the research plan**

This is an excellent proposal for an RC, which brings together four research groups in the area of Ubiquitous computing: a variety of aspects in ubiquitous computing, interactive spaces research, human computer interaction in ubiquitous environment, and analytics of data gathered by the wide range wireless infrastructure. This is a continuation and extension of on-going work. It implements the idea of smart city using the infrastructure



implemented in Oulu area as a platform. The infrastructure itself provides excellent basis for various research approaches. The research plan is laid out very clearly in general terms, and a number of sound objectives are formulated in Section 2.1. However, the plan is somewhat missing in concrete details on how to reach the goals.

The RC carries out the research via an uncontrolled experiment in the open UBI Oulu civic laboratory. The research provides the knowledge of human-city interaction and of the impact of ubiquitous computing technologies on people and urban life in general, with an ambitious tagged of creation a smart city. The progress in this field so far has been excellent. Similar work is conducted by several research institutes in Finland and abroad. The plan points out the "holistic characteristic of the RC's approach", in which different technologies and applications are integrated to build up the research platform. New opening is brought by the new professor and previous FiDiPro Fellow - social analytics and modelling of data, behaviour and interaction in the infrastructure. The group is sure to advance the research on ubiquitous computing and smart cities. The societal impact of the research can be very high. As a downside, the research plan is somewhat incremental, and a big risk is the decrease of money to keep up the experimental infrastructure in the city of Oulu.

The four groups included in the RC synergetic core address together the complex problem of city-human interactions. The groups seem to complement each other very well. The work is on the frontier of the research field. The infrastructure available provides extraordinary opportunities to test and analyse services and behaviour among the infrastructure users.

### **C.8.2. Feasibility of the research plan**

The project has focus both in research methodology and in technology / application development. The RC has previous evidence on successful research work and production of academic artefacts, as well as building up the applicable services, products and concepts for the ubiquitous society and smart city concept. However, the research methods, even if they look sound enough, are not presented very clearly. It seems that the groups will continue what they are doing now, with no clear new focus. The proposal contains no research schedules with clear milestones.

Researcher resources are structurally well balanced - including international dimension and different levels of academic career. The structure of the groups is sound and they have earlier been able to attract quite a lot of research grants e.g. from EU, Tekes, and Academy. Financial resources for the research work are available from different sources of external funding - including SHOK. The risk included in the plan is the responsibility to maintain the Open Oulu civic laboratory; it is remained on the responsibility of the RC laboratories after public funding period. The RC does not have funding for maintenance staff and infrastructure costs (renewal of broken components, Internet connectivity, electricity, insurance etc.) The maintenance tasks may burden the RC to sell the capacity for commercial customers. However, the infrastructure has business value, and funding is in balance, at least at the moment.

The RC brings together four research groups with complementary expertise to conduct an exploration of human-city interaction in a real-world city. The structure of the project is very appropriate taking into account the goals of the project. The partners represent different approaches and complete each other.

The management of sensitive data collected by the network is not discussed in the plan. Maybe it is not a problem. As indicated, the RC does not have funding for the maintenance staff and infrastructure costs. The plan is to maintain the Open UBI Oulu civic laboratory open for some time. There are no ethical issues involved.

### **C.8.3. Competence of the RC and research teams**

The RC Head has impressive citations but they are mostly from an earlier project (the LBP), not related to the present project. But there are also some very good papers from the recent years. His record is very good in scientific leadership.

Generally, the publication records of the other PIs are good. Most of the publications are in conferences and related venues. The group should try for the best publication forums to see how valuable their research is scientifically. There is no doubt that from the application point of view, the research is very good.

Comments on the individual RC team leaders:

- Jukka Rieki (Interactive Spaces) published in the leading forums (Pervasive, Personal and Ubiquitous Computing, IEEE Pervasive Computing, MUM). In 2007-2012 his competitive research budget was ~2

MEUR. Currently, he is involved in three ICT SHOK programs, physical user interfaces, context recognition, sensor networks, and Internet of Things.

- Kari Kuutti (INTERACT) is one of the most experienced HCI researchers in Finland – his professorship 1996 was the first one in Finland nominated to HCI. The results of his research have been published in leading forums (CHI, Human-Computer Studies, Personal and Ubiquitous Computing, Presence, CSCW, ECSCW, DIS, MobileCHI, NordiCHI, PD). He was the general chair of ECSCW 2003, program co-chair of NordiCHI 2002, DC co-chair of MobileCHI 2006, and DC co-chair of NordiCHI 2014.
- Vassilis Kostakos (COMAG) was a Fellow of the Finland Distinguished Professor Program in 2010-2012. In 2012 he won a Marie Curie Career Integration grant, as one of only four such grants awarded to Finland across all disciplines in 2007-2012.

The Bibliographic analysis of Oulu RAE does not rank the RC on very high level (category C). The list of publications of the RC members is exhaustive and the plan refers to publications in journals and conferences relevant to the research area itself; this is not equal to the general ranking, which does not take into account the special features of certain research fields very well.

The PIs have experience in applying external funding and managing / organising projects. The two new groups (INTERACT and COMAG) that now join the collaboration bring very nice complementary expertise. However, the structure and division of the teams into subtasks was not clear.

#### **C.8.4. Research environment and collaboration**

The four research groups complete each other and represent different approaches in the multidisciplinary research area. Thus the new RC, wider than the previous MediaTeam Oulu, seems to be a very fruitful and promising environment for multidisciplinary research and researcher training. The combination of computer science and engineering, anthropology, architecture, art and design, economics and education, promote a highly creative environment. As a downside, the interaction of the teams could be described more clearly.

The project supports the strategic goals of the University: Internationally strong profile, Active partnership and influence, Creative community and strong economy (especially this one). The research area belongs to the focus areas of the University (Ubiquitous Computing, Wireless Communication. Thus this is at the core of the strategies of Oulu University and also the City of Oulu.

National collaboration described by the plan covers national research programmes (SHOK) participation; this is one important forum for joint research and development. Through such programmes, the RC is or has been involved with a large number of research groups in Finnish universities. Within Oulu University, the RC collaborates with the Dept. of Architecture.

The list of international collaborators covers important and world leading institutions. CVs of the PIs list a variety of collaboration activities. There is joint EU funding. The RC coordinates the international UBI Challenges designed to move the research from labs into the real world. Arranging such international challenges is a very good way to attract international visibility and collaborations. The RC hosts the UBI Researcher in Residence program that invites foreign researchers for research visits in the open UBI Oulu laboratory.

#### **C.8.5. Significance of the RC for the researcher training and promotion of professional careers in research**

The RC has graduated 13 doctors; the consortium has PhD students and postdoctoral researchers on their list of employees to provide opportunity for future results in scientific career improvement. The production of doctors is fair but there should be more international mobility. There are not many postdocs from abroad. FiDiPro professor provides a new international dimension to the consortium. The plan includes workshops, summer schools and other supporting activities.

The groups seem to be somewhat "inbred" in postdoctoral researchers' respect; it is notable that almost all the post-docs have got their PhD's in Oulu. There should be much more mobility and exchange; the best universities recruit a large part of their postdocs from outside. RC has very good resources from outside funding.

#### **C.8.6. Societal impact**

The research topic is relevant and supports the development of open and modern information society, in which ICT services are available for free or reasonable low level of cost. The goal of the project is also to provide important understanding of the behaviour of people (and intelligent networked devices / things) connected to the network to optimize and develop the infrastructure. The expected social impact of the RC's research is

highly significant, because the RC addresses real-world ubicomp systems and supports the provisioning of better ubicomp services to citizens.

#### **C.8.7. International competitiveness or international comparability**

The RC is on competitive international level. It has good partner connections, but also differentiating aspects related to the research focus compared to the world leaders. Similar work is done elsewhere, but this group has some unique characteristics, especially the long-time use of Oulu city as a living lab. The international competitors (MIT City lab in USA, Lancaster University e-campus in the UK) are focused on narrower tasks. This RC takes on a wider range of technologies and applications.

#### **C.8.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

**Strengths:** RC carries out excellent research work at the city, national, and international level. Excellent infrastructure for conducting research and developing products / services; traditions for productive collaboration. Excellent social relevance. Interesting and forward-looking research agenda and very good and experienced PI's actually, it is not clear why the RC should not be evaluated in the VICI category.

**Areas of development:** long term funding for the infrastructure maintenance (does not belong to university); missing pilot plan would lead to scattered development focus (testing everything nice instead of important). The detailed research plan is missing. There should be more researcher mobility and exchange especially among the junior faculty. A junior professor from another country would be important for international recognition.

A recommendation is to look aggressively for funding and continuation of this RC beyond 2017.

#### **C.8.9. Final rating (1 – 6): 5 (excellent)**

### **C.9. RC MOMA –Molecular Materials; RC Head Risto Laitinen**

#### **C.9.1. Scientific quality and innovativeness of the research plan**

This RC is at the forefront of modern research in the field of new materials, which are important for Finland. The goals presented in the RC are innovative and challenging.

Well-structured research program with a good focus on new materials. Formulating the demand in the area of innovative functionalities opens an avenue to real innovations. In many respects the rational design of materials regarding the functionalities is a booming field and in several subfields real opportunities for innovations exist.

A model system. This field calls for synergy between different disciplines and this is what the RC tries to realize.

#### **C.9.2. Feasibility of the research plan**

This is a first rate research plan with a new approach to an important field. The methods to be applied seem to be in good harmony with the ambitions.

The planned resources are appropriate. The size of the team fits with the broad ambitions. The same seems to apply to the infra-structure.

Experienced scientists in the RC. The organisation for the RC project is simple (flat structure) and adequate. The concrete plans (sharing facilities, mobility personnel, monthly seminars) will add to the success.

Oulu University has excellent infrastructure for carrying out the research proposed by the RC. There are no indications that the management will not be adequate.

#### **C.9.3. Competence of the RC and research teams**

The RC director has an excellent past performance regarding leadership and scientific expertise.

The bibliometric analysis of the PIs shows good impact. In addition, the trend (number of publications, citations) is in a steep positive direction, justifying "very good quality". Excellent.

The RC has very good papers with overall high citation numbers, a remarkable high international level. See the comments above. High quality of the publications.

The field needed is nicely covered by the complimentary expertise. Very experienced.

#### **C.9.4. Research environment and collaboration**

Researcher training in a new field will promote creative research environment. The consortium explicitly plans to act as single high-visibility unit for external contacts. The consortium has good other plans: exchange personal and know-how, application for a doctoral program, plans for yearly summer school.

Good. We trust that the program excellently fits with the Oulu university strategy, although there is a remark that the role of the environment in the future university strategy is uncertain.

Cooperation can contribute significantly to the success of the project. The Finnish contacts seem to be excellent.

There are many international connections, especially with colleagues of Canada. A junior professorship is highly recommended. The international cooperation is quantitatively intense.

#### **C.9.5. Significance of the RC for the researcher training and promotion of professional careers in research**

Well experienced group of cooperation, Marie Curie network has to be improved. The international network is excellent and this will allow the desired mobility of the students and staff members.

The top research is a guarantee for high mobility.

#### **C.9.6. Societal impact**

The societal impact is very high and the main impact will be on the contribution to the high-tech image of Finland.

#### **C.9.7. International competitiveness or international comparability**

There is a high international competition, but this proposal is a very unique approach. The RC is very fit to quickly grow to a high international status. The extremely valuable broad multidisciplinary composition is an avenue to a great future.

#### **C.9.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

Overall rating: outstanding.

**Remarks:** This is an outstanding research proposal at the forefront of research. Molecular materials are the key precursor for the preparation of bottom-up new materials. The head of this RC is an international well known scientist who has published top papers in international journals with a high impact factor.

The approach to molecular materials is for Finland a fundamental research topic, because new molecular materials play the important role for the production of materials with exciting new physical properties. The research group timely combines outstanding science with applications of new materials.

The ranking of 6.0 is fully justified due to the impact of the new ideas for material research.

#### **C.9.9. Final rating (1 – 6): 6 (outstanding)**

### **C.10. RC MtM – More-than-Moore; RC Head Krisztian Kordas**

#### **C10.1. Scientific quality and innovativeness of the research plan**

This is a very innovative project, aiming to create a total value material/technology/device platform, by merging several technologies and expertise already present in the RC, so as to overcome the physical limits of microelectronic devices - to which by Moore's law we are very close nowadays - and expand the diversification of chip functionalities. A wide range of potential applications is envisaged in the proposal that looks quite realistic and is promising to develop into cutting edge devices, the ideal input to trigger new spin-off at national level.

If the RC achieves even a few of the goals listed in Table 1 of their self-evaluation the success of the RC would be remarkable. However, it is unlikely that sufficient progress over the next five years will be made in all of those areas, particularly when competitor institutions are working on components for devices such as these. So the advice is to carefully select a few cutting edge devices and focus the resources on them, so that a successful development might be made.

The majority (except for two people) of the people involved in the RC are based in the Department of Electrical Engineering, yet with different expertise ranging from devices and circuits to process, material and chemistry. Surely the RC structure provides an excellent scientific value of facilities, atmosphere, and opportunities for interactions.

#### **C.10.2. Feasibility of the research plan**

Most of the physical resources required are already in existence at the University, so the plan seems feasible up to a point. The timelines for the work are not detailed, however. We recommend that a roadmap is the first exercise the RC will develop to start activity.

Substantial funding applications shall be made to support the research. Given the previous record of contracts awarded, the RC should be able to achieve adequate funding.

There is a value chain structure to the RC as defined by the diagram in section 2 of the proposal. This is good but it is not clear that it leads fully into spin-offs and engagement with business. However, the proposal does provide some strategies for this engagement.

The Materials management plan has been dealt with via ensuring safety of data and materials and development of new datasets which can be shared with other researchers. There are no applicable ethical issues.

#### **C.10.3. Competence of the RC and research teams**

The RC Head has an excellent publication record with good Journals. There appears to be a lot of energy and dynamism provided by the project leader.

There is a very good publication record among the PIs. The real publication strength comes from some of the senior PIs (e.g. Myllylä) and it might be useful that there is some mentoring of other PIs from the senior PIs on publication strategies. Many of the PIs do not list their funding track record, but there is evidence of national esteem among the PIs and some international esteem among a couple of the senior PIs. There have been some patents.

RC's overall publication record is a strong track record, high quality.

There are two elements bringing complementary expertise to the RC project: 1) Senior and more Junior PIs are combined and this will yield good benefits to the RC, particularly as the senior PIs have excellent track records. 2) Subject specialisms are brought together to deliver the work. The way the work is divided is shown in the figure in section 2 of the proposal, although it is not clear how all of the staff from the RC is divided into the figure.

#### **C.10.4. Research environment and collaboration**

The research environment and collaboration seems to be very good overall. However, it should be noted that the RC is dominated by personnel from the department of electrical engineering with only a couple from another department. Thus one would hope and expect an existing within-department training environment, structures, facilities, research atmosphere and culture serves these people. As such the added value of the RC in terms of the science and structural benefits is not entirely clear. I wonder if wider collaborations can be sought across Oulu (e.g. on novel sensors, new research uses for electronics, environmental or medical cutting edge research) that would benefit from the new technologies.

University of Oulu fulfils the strategy in terms of ambition on technological advances for societal benefit.

The work would be nationally leading and spin off companies and SME involvement looks very likely to happen. The project collaborations, joint degree programs and research exchanges with a wide range of international leaders is excellent.

#### **C.10.5. Significance of the RC for the researcher training and promotion of professional careers in research**

Given (16) this RC offers excellent training opportunities. The RC should seek to grow the doctoral programme (though funding apps etc.) and further stimulate its share of the market for excellent PhD students and post-docs from around the world.

The intended program is internationally appealing and worth to become a good opportunity for post-doc careers and research mobility.

#### **C.10.6. Societal impact**

Depending on the technological advances made the societal impact could be very high. This is an ambitious RC.

#### **C.10.7. International competitiveness or international comparability**

The RC is very strong indeed, and with excellent international visibility.

#### **C.10.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

**Final Assessment:** Outstanding.

**Remark:** Main concern is that this RC project is so dominated by people from one department we have to question whether the RC adds structurally, intellectually etc., anything to what exists or should be provided automatically within the department structure already.

#### **C.10.9. Final rating (1 – 6): 6 ( outstanding)**

### **C.11. RC NorBE – Northern Bioeconomy; RC Head Jouko Niinimäki**

#### **C.11.1. Scientific quality and innovativeness of the research plan**

The research plan is well structured. The plan is of very good quality and the positive judgment of innovativeness is in particular based on the observation that the whole biomass chain (plant biology and chemical fundamentals to products) is covered. The value-chain thinking can (and should) focus the activities.

The field is very broad and many subfields are not yet thoroughly studied. Breakthroughs are well possible in several topical areas. The combination of disciplines gives good opportunities. Good results in this hot topic will be important.

The number of participating groups is large. However, in view of the broad topic this makes sense. In fact the combination is consistent with respect to the disciplines involved. The scientific and engineering added value could be great.

#### **C.11.2. Feasibility of the research plan**

The members of the consortium will benefit from the cooperation. The sub-objectives are extremely diverse but in view of the expertise of the PIs they are realistic. Nevertheless, it is recommended to keep keen on focusing in this broad field of biomass conversion.

A good infrastructure (people, equipment) seems available. The aims and topical areas of the RC are lucidly described, forming a good basis for a good organisation.

The Materials management plan is not applicable. Genetic engineering has ethical aspects. The same applies to food versus biomass application in energy and chemicals production. The consortium is very open to cooperation. Probably, they will take action with respect to any ethical issue they encounter.

#### **C.11.3. Competence of the RC and research teams**

The proposed director has an excellent record in creating a large, well-organised and well-financed group.

The bibliometric analysis of PIs and RC shows a good performance.

The span of expertise is excellent and well-balanced.

#### **C.11.4. Research environment and collaboration**

Given the broad, multidisciplinary character of the area a broad list of expertise is extremely useful. The approach is extremely useful and world-wide there are not many groups with such a wealth of relevant expertise.

Biomass conversion through industrial processes needs strong cooperation with industry, and also in this respect a broad consortium is of high value.

The research topics of the RC are in good harmony with the focus areas of the University of Oulu.

The national cooperation are very good, see for instance the top 5 projects.

The international cooperation is extensive and of excellent quality. It is expected that they can (and will) be further intensified. This will also in a natural way increase the scientific impact of the participating groups.

#### **C.11.5. Significance of the RC for the researcher training and promotion of professional careers in research**

The RC is in a good position. The consortium members have already a track record in training. Concrete plans are presented to replace an already existing platform (ViKeBi) to a higher level.

The track record suggests an excellent future performance. The partners will be able to really promote the highly needed international researchers mobility.

#### **C.11.6. Societal impact**

The topic of the RC is expected to have considerable societal impact: biomass conversion is highly important to Finland. In fact, Finland is globally among the top countries with respect to biomass resources.

#### **C.11.7. International competitiveness or international comparability**

The level of the team is excellent and the participants are of world-level. In addition, the studied aspects of bioeconomy are very important in Finland, and the large resources of biomass in Finland will give the team a competitive edge.

#### **C.11.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

The RC is a perfect combination of disciplines. The entire biomass chain (plant biology and chemical fundamentals to products, including advanced products such as organic solar cells) is covered. Biomass conversion is potentially high impact research and for Finland it is extremely important.

The formation of an RC will help the consortium members to achieve a world class level.

In summary, the topic is well chosen and the level of the consortium is excellent.

#### **C.11.9. Final rating (1 – 6): 5,0 (excellent)**

## **C.12. RC NRNE – Natural Resources of Northern Eurasia; RC Head Wolfgang Maier**

### **C12.1. Scientific quality and innovativeness of the research plan**

Linking ore geology and geophysical interpretation provides an important opportunity for furthering the basic understanding of mineral distribution in northern Scandinavia. This has as well important economic/societal implications. The objective of the project is clearly limited to a systematic quantitative evaluation of the mineral wealth of the Northern Eurasia. This objective is ambitious because of the size of the region. The plan seems to be of high scientific quality, the innovativeness is not an objective. However, sustainable resource exploration could be developed more.

Most economic mineral resources that can be observed on the surface have already been identified. Given this integrating geophysical characterisation of the crust and the mantle lithosphere with surface geology has high potential and should be given great importance.

The practical objectives of the project are appropriate data sets but assessment and modification of ore forming models are included. The same holds for modelling the former ice sheet movements etc., resulting in a critical assessment of existing paradigms used in drift prospecting and mineral exploration.

The geophysical groups led by Korja and Koslovskaja in this RC would benefit from consolidation and further growth and given their importance for obtaining the research objectives they deserve strong support. However, it is not clear if the research period of 5 years is feasible for the project.

The added value is obvious: one single group will not be able to embark on such a project involving large numbers of measurements, modelling etc. This particular RC will combine traditional geological / geochemical mapping with regional scale geophysical mapping of the crust and mantle lithosphere. This appears to be the only

way forward to enhance basic understanding of mineral deposits. Great importance should therefore be given to improving and supporting integrating of geophysical characterisation of crust and mantle lithosphere.

#### **C.12.2. Feasibility of the research plan**

The RC is well prepared to undertake the research. Forward modelling of fluid-rock interaction (reactive transport) is not identified but could be an additional useful research direction to understand the distribution of mineral resources and their relation to the various tectonic provinces in Fennoscandia. On the other hand, the volume of the research area is quite extensive, and the question arises should it be reduced. It appears that the RC intends to wait with PhD projects until year 2-3. We would recommend starting these as soon as possible (provided that funding is available).

The ore geology /geochemistry appears to have solid critical mass. The geophysical groups in the RC may benefit from growth appropriate for their importance in meeting the research objectives. Planned resources for PhD / post doc projects appear appropriate but the PI's may try to obtain further funding during the course of the project. The infrastructure is available partly because of a good networking.

The two main poles of this RC appear to be geological and geophysical characterisation of the bed rock of Fennoscandia. The geophysical groups in this RC are significantly smaller than the ore geology/geochemistry groups. More balance in critical mass between these groups may benefit the RC.

#### **C.12.3. Competence of the RC and research teams**

The director of the RC has a very strong publication record with about 4 papers /yr and in good international leading journals. He has also significant expertise in leading projects. However, he appears to have moved to a different position in the UK. It would therefore be useful to have information about the continuity of the RC given this change.

The PI's have excellent publication records with high quality research published in high quality journals. The bibliometric analysis shows that the impact is on a world-average level. The publications resulting from international cooperation have a slightly higher impact (1.1 versus 0.6 for national cooperation). PI Hanski has an impressive publication record and his participation in this project will ensure its success. PI Koslovskaja is well integrated nationally and internationally and has a strong publication record. PI Korja has strong national and international collaboration. The high multi-disciplinary project MidCrust in which he participates is one particularly good example of cross disciplinary research that has both fundamental research and has a high societal relevance.

The overall publication output of this RC is very strong with publications in high profile international journals.

Yes, combining the PI's in this RC provides strong added value. The RC may consider putting more resources into the geophysical components of the proposed research as the novelty of the research lies in combining more traditional ore-geology research with geophysical characterisation. The management seems to be good and the groups seem to be able to realize the objectives by team work.

#### **C.12.4. Research environment and collaboration**

The RC will provide a good multi-disciplinary research environment for research training. The combination enhances the contacts with industry, national institutes (for instance CSIRO), that is crucial in getting the required data.

The research of this RC appears fully in line with the strategic directions of Oulu University, and the research area coincides with a main focus area (national resources and the environment). The RC has excellent infrastructure and support of Oulu University appears appropriate.

The collaboration with the geological sector in Finland seems to be strong; the RC is well connected nationally to GTK, Helsinki University.

The RC appears to have good international networking connections and the collaboration with the geological sector in the relevant countries (Norway, Sweden, Russia, Australia, and Finland) seems to be strong. However, the RC may benefit from establishing links to one or both of the two main centres of this type of research globally (MERC, CET). It may be a better strategy to collaborate than attempt to compete with these global leaders, which is probably counterproductive.



#### **C.12.5. Significance of the RC for the researcher training and promotion of professional careers in research**

Training workshops for PhD students are planned. No other extensive activities are foreseen. The RC would benefit from integration with larger international frameworks and promotion of student and researcher mobility.

Little information is provided on research mobility and / or support for post-doctoral careers. It is therefore difficult to evaluate this point. No Erasmus type of activities is foreseen. The good international contacts will certainly help in mobility enhancement.

#### **C.12.6. Societal impact**

Mineral resources are of critical importance for both Finland and Europe. Improved understanding of formation and distribution of these resources is clearly relevant for society at large. Sustainable development of these resources is critical for long term viable resource management.

#### **C.12.7. International competitiveness or international comparability**

The RC has a good publication record. It does not have the critical size to merit a comparison with global leaders such as identified in the proposal (CET, MERC) but delivers good basic and applied research in petrological and geophysical characterisation of the crust and mantle lithosphere important for mineral resource exploration.

#### **C.12.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

This is strong RC with high societal relevance. The integration of petrology and geophysics to characterise the crust and mantle lithosphere is timely and relevant and will aid in providing understanding of crust - mantle lithosphere processes responsible for distribution of mineral resources.

The geophysics environment is of high quality but more critical mass could be obtained in this area. The RC could consider collaboration with research groups in reactive transport modelling that may help in understanding the transport and deposition of mineral resources.

The RC may also benefit from establishing links to and collaborating with the most important research centres in this field (MERC, CET).

#### **C.12.9. Final rating (1 – 6): 4,0 ( very good)**

### **C.13. RC Pro ChemE – Sustainable Solutions for Production Process and Environmental Applications; RC Head Riitta Keiski**

#### **C.13.1. Scientific quality and innovativeness of the research plan**

The ProChemE RC innovatively combines chemistry and engineering sciences to bring knowhow and applications for utilisation of renewable resources and the development of sustainable and environmentally friendly processes. The mission of the RC is to provide the knowledge to design sustainable technologies for production processes and environmental applications: "Science into products and production technologies".

The topical areas are relevant and challenging. Innovations regarding materials and catalysis can be directly implemented in a process design.

The integration and related synergy between the disciplines could be explained better. It is advised to explicitly formulate how maximal interaction in the key subfields can be realized. Critical assessment of the subfields chosen might lead to more focus and, as a consequence, in specified fields outstanding performance could be reached.

There is considerable potential for breakthroughs, as illustrated in the following selected topics. Novel materials, for instance catalysts, adsorption materials and hybrid structures are studied. They have large innovation potential. In the current climate environment significant new ideas are proposed such as new ways of capture and utilisation of CO<sub>2</sub> and novel solutions in water purification. A main risk could be in cutting financing.

The added value of the RC is high: the field is very broad and joint efforts of scientists and engineers are the key to success. The RC is a perfect combination in this respect.

#### **C.13.2. Feasibility of the research plan**

In principle the plans are considered to be feasible. The methodologies of the participating groups are sound and will lead to high synergy. The plans and methodology are very good.

In view of the quality of the participating groups and the explicitly mentioned cooperation with other partners it is concluded that the resources will be adequate.

The scientific and technical coherence of the whole project is large, as shown for instance in the clear picture on the cover of the research plan. The management structure seems to be flat, being adequate for such a consortium.

Materials and infrastructure management seem to be adequate. No ethical issues seem to be involved.

#### **C.13.3. Competence of the RC and research teams**

The proposed RC director Prof. Keiski has 30-year experience in the areas directly related to the proposed work. The coherence of the proposal illustrates her very good leadership skills. She published in high-quality refereed journals and her output is at world level.

All PIs have sufficient expertise to carry out the proposed work.

The RC has produced high-quality papers. The bibliometric analysis shows that the impact of the output is on world-average level. See also comments for PIs above. The PIs have the complementary expertise to make the RC to a success.

#### **C.13.4. Research environment and collaboration**

The team members are very active in national and international collaboration. As a result of the creation of the RC even closer co-operations will be generated. This might well be a key to reaching the status of center of excellence in specified areas.

The RC research belongs to the focus area of Environment, Natural Resources and Materials of the University of Oulu. It also follows the strategic goals of Oulu: multidisciplinary actions and internationalisation. The fit with the university goals is excellent.

Long-term research collaboration already exists with the number of Finnish universities and research centers. A good example is the co-operation with the Abo Akademi.

RC is a member of five international networks that include several countries (Brasil, China, France, Germany). It collaborates with EU countries, India and Russia. Good examples are the participation in EFCATS and EUChemMS. It is advised to increase internationalisation further and to participate in the hiring of Marie Curie fellows.

#### **C.13.5. Significance of the RC for the researcher training and promotion of professional careers in research**

Supervision of doctoral students will be positively influence the RC program. More cooperation within Europe is advised, although two Erasmus programs are, at present, part of the activities of the participating groups, see also comments immediately above.

Mobility is very important and exchange programs can stimulate this. The RC includes two postdocs and 22 PhD students as active members of the group. This is a good platform for increasing mobility.

#### **C.13.6. Societal impact**

The Finnish society will benefit strongly from the output (research and education) of this consortium with several practical focal areas. For instance, the efforts of this RC are expected to be accepted by biorefineries and the mining industry.

#### **C.13.7. International competitiveness or international comparability**

The RC team is unique; there is no similar research group in the world. The members produce excellent output and have the potential to grow into world class groups.

### **C.13.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

The RC innovatively combines green chemistry and engineering to bring knowhow for utilisation of renewable resources and the development of sustainable and environmentally friendly processes.

The impact of the research will be increased further by European support with post-docs and exchange programs. In selected focal areas they can develop to world leaders.

The overall assessment is: Excellent

### **C.13.9. Final rating (1 – 6): 5,0 (excellent)**

## **CATEGORY VICI**

### **C.14. RC AMASS– Applied Mathematics and Statistics; RC Head Lasse Holmström**

#### **C14.1. Scientific quality and innovativeness of the research plan**

The RC combines groups of applied mathematics and statistics applying and developing high level mathematical methods towards practical applications such as atmospheric plasma measurements. The plan is very innovative and novel in many ways, showing impressively high level of research. The quality of the research plan with respect to the leading groups of world in that field of science is very high. At present the groups and their research themes are, though, somewhat separate.

The field of research is important and the experience of the members guarantees high quality. Thus there exists a clear potential for deep cooperation.

Lehtinen is a world leader in radar signal processing, where he develops new innovative mathematically rigorous methods, and cooperation with applied mathematicians seems particularly promising - here in particular the research has high potential for important scientific breakthroughs.

The RC forms an interesting combination of researchers in mathematical applications. Their research interest is at present somewhat diverse and focusing might be needed, but a closer collaboration would significantly improve the potential of important breakthroughs by the group.

The five groups will combine skills in Bayesian methodologies, numerical methods and inverse methods to enhance a number of applications. The integration of Lehtinen and the cooperation with Huhtanen and Holmström definitely adds the scientific value of the project.

#### **C.14.2. Feasibility of the research plan**

These are top research groups methodologically and the problems faced by the groups are well selected. The researchers in the RC cover a quite large area of applied mathematics and statistics. This diversity might perhaps present the only restraint for the success of the cooperation. The research methods are based on solid mathematical grounds. The schedule is well defined in the five year plan of the proposal.

The groups have a very good balance of students, post-doctoral and senior researchers and professors, but one gets the impression that RC is organised in support of Lehtinen's group. Here the cooperation could be deepened. The RC has several sources of outside funding adequate for the planned activities. On the other hand, for so many challenging topics the groups are rather small.

The structure seems natural for the aims of the RC project but cooperation activities should be strengthened.

The Materials management plan is not applicable and there are no ethical issues involved with the research.

#### **C.14.3. Competence of the RC and research teams**

The RC Head, Prof. Holmström is a leading researcher in his field. He has a very solid scientific leadership background, perfect for the purposes of the RC, with good level of funding achieved and papers published.

The RC has five teams and PIs with varying merits from international leading researchers to researcher of good and solid research work.

The groups present a wide spectrum of research, but overall the quality of the publication record is significant. However, there are no joint papers between PI's. Citation numbers were not among the highest in the present research assessment.

The RC team leaders bring natural complementary expertise in many different manners and connections.

#### **C.14.4. Research environment and collaboration**

The teams present high quality research in several directions of mathematics and statistics, with connected and interlacing net of interests. However, so far the teams do not appear to share a common research theme - working as an RC would be extremely fruitful for providing high potential for a successful multidisciplinary research and to make RC internationally more visible. Thus the RC presents some very promising ideas for co-operation, and these actions should be further carried out and even intensified.

A strong department of applied mathematics is extremely important for any development in science in a modern university. The proposal of the RC seems to be very well aligned with Oulu University strategies. University of Oulu has given additional funding, such as for Center of Excellence projects, Biocenter Oulu research projects and for some Tekes-project.

All groups have important national collaboration (Finnish Center of Excellence in Inverse Problems, EISCAT3D radar, Aalto University and CSC IT Center for Science).

The EISCAT funding from European Union and EISCAT cooperation for the atmospheric and geospace research is particularly important for the success of the RC. The RC has extensive international collaboration (such as Nordic climate research network, NCAR in USA and EU-networks).

#### **C.14.5. Significance of the RC for the researcher training and promotion of professional careers in research**

All in all the RC with several teams has an excellent record of doctoral training. RC has supervised 30 PhD theses and participates in four national doctoral training programs. The research mobility is on a good level, further improvement will strengthen the RC. Similarly the RC should plan for a new 4-year doctoral training program in mathematical sciences.

The RC provides appropriate resources and activities to support post-doctoral research careers, the younger faculty members have been abroad. However a greater level of mobility might be desirable in the future.

#### **C.14.6. Societal impact**

The work of the RC has important applications in several very different directions, from development of better radar technology to providing statistical expertise necessary in medical or paleoclimate research. Thus the societal impact could be very high through the proposed applications.

#### **C.14.7. International competitiveness or international comparability**

The groups present a wide spectrum of research from international leading experts to researchers of good and solid quality. The RC has strong international connections. In particular, the RC is expected to greatly contribute to the radar signal processing, which leads to better retrievals of atmospheric plasma parameters. Similarly there is a promise to advance paleoclimate reconstructions. Overall, the RC rates very well, but the impact could be higher.

#### **C.14.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

There are some outstanding groups in this RC. Main strengths lie within the development of radar measurement methods, of related signal processing and of other related instruments, as well as in advancement of paleoclimate reconstructions. The RC forms a very interesting coalition of researchers, where a new cooperation gives high potential for important breakthroughs. On the other hand, the range of applications may be too large considering the resources. Focusing would be needed.

Hence to increase the strength of the RC further, we recommend hiring a Junior level Professor.

In particular, a strong department of applied mathematics is an extremely important basis for research in science in a modern university such as university of Oulu.

#### **C.14.9. Final rating (1 – 6): 5,0 (excellent)**

## **C.15. RC CAS – Circuits and Systems Group; RC Head Juha Kostamovaara**

### **C.15.1. Scientific quality and innovativeness of the research plan**

This RC is at the forefront of modern electronics, with strong innovation aspects in both in circuit and systems, the workhorse of manufacturing companies in the electronics segment. In particular, the RC has achieved prominence in high-speed electronics, a sector which will be pursued further by one Group. Also the two other Groups offer innovation and new advancements in signal processing and linearization, and printed electronics. The goals presented are innovative and challenging.

A number of outcomes have already been achieved by the Groups, and major progresses in the fields are expected by the activity of the RC, especially for ultrafast timing in laser ranging and Raman spectroscopy. The only doubt is the coherence, because the research plan looks like a collection of three diverse projects.

The partners have complementary expertise, and the Group of Kostamovaara appears to play the major role. Surely it is not critical to combine the efforts of the three Groups, for example they will be useful to understand nonlinearities and memory effects in the design of accurate, high-speed electronics.

### **C.15.2. Feasibility of the research plan**

This is a first-rate research plan with three separate goals. The research methods are feasible, but the work is organised on on-going basis, no time table is given in the proposal and there is no discussion of potential methodological problems.

There is an overall good combination of personal resources.

The RC has excellent funding resources from Finnish and EU sources. On the personnel there is some imbalance; Kostamovaara's Group is very well structured while the role of the other two teams is not defined as much.

The RC is well equipped with high-speed electronic and optoelectronic design and test equipment facilities, including for example an RF probe station, bonding machines, a ps streak camera with a spectrograph, a high-speed 2D image intensifier, a super-conducting high-speed THz bolometer, several 10-50GHz oscilloscopes with high speed optical measuring heads for high-speed time domain studies.

The RC consists of three groups organised around the high-speed pulse electronics, linearization of electronics, and emerging electronic technologies. The main activities are around Kostamovaara's Group, yet also the other Groups appear well committed to their research objectives.

Oulu University has an excellent infrastructure for carrying out the research proposed by the RC, and the RC already owns all the essential material, components, and long-term expertise in managing. No ethical issues are involved.

### **C.15.3. Competence of the RC and research teams**

The Director of the RC is a world class leader in his field. He is highly prolific in the forefront of international research, and is probably the Professor of Oulu with the topmost rank level of publications in international Journals.

The RC Director has an outstanding record of publications, and the other two team leaders have done good solid work as well: Prof. Rahkonen's group is well known for its work on distortion memory effects in RF power amplifiers, and Prof. Häkkinen has a long-term expertise in the computer aided design of analogue and mixed-signal telecommunications and PLL-based RF synthesizers.

The RC has published very good papers with overall high citation numbers, a remarkable high international level. Same comments as in the first paragraph of C.15.2. apply. Many citations to the Groups come from professional IEEE Journals.

The team leaders do bring complementary expertise, but no doubt that their main contributions will be made by the coordinating team. The first group works in time-domain, the second works in Fourier domain (nonlinearity due to frequency band interactions), and the third group is aimed on emerging technologies. Although some efforts are complimentary the labour is independent.

#### **C.15.4. Research environment and collaboration**

All these aspects (the added value of working as an RC, e.g. promotion of multi-/inter-/transdisciplinary research, researcher training, structural benefits, promotion of creative research environment etc. ) are well thought of and clarified in the proposal, though some doubt remains about the added value of the three Groups working as an RC. Yet the RC, which is advancing the state of the art in most of its research fields (time interval measurement, time-to-digital converters, timing discrimination, avalanche breakdown phenomena and the related Si and GaAs based switching components, picosecond laser diode structures, pulsed time-of-flight laser range finding) is certainly promote creative research environment.

Electronics is one of the strongest spearheads of Oulu University and the whole Oulu region, so the project fits here very well. The RC has been an active member group of the Infotech Oulu since its foundation and has contributed to all of its researcher training activities. Leading industrial companies have design centers in Oulu (Renesas, Texas Instruments, ST Ericsson, Ericsson, Fairchild Semiconductors, Analog Devices, for example). Most of the mixed signal experts these companies are employing have got their education in electronics at the University of Oulu by the experts of the CAS group.

The group seems to have all the necessary national connections. The group belongs to one of the national Centers of Excellence. In particular, Kostamovaara's domestic contacts are excellent. For instance, he participates in the Finnish CoE in Laser Scanning Research. The cooperation is with VTT and ORC (Optical Research Center, Tampere Finland) with many ongoing common projects and research activities (VTT cooperation within Printo-Cent, for example, that forms a world class research community in the field of printed and organic electronics).

There are many international connections, especially to industry. At international level, vivid co-operation exists with University of York, U.K. (laser diode modelling), A.F. Ioffe Institute, Russia (laser diode modelling), Technical University of Vienna, Austria, (semiconductor modelling), Universities of Lund and Trondheim (RF microelectronics) and Technical University of Luleå, Sweden, (SPAD based 3D ranging), for example. The research work has also led to industrial innovations and technology licensing with companies like Sick A.G., Germany, (laser scanner development, EU FP7 project), Process Metrix, USA, (laser scanner development) and Noptel (laser radar development).

#### **C.15.5. Significance of the RC for the researcher training and promotion of professional careers in research**

The Group has produced till the end of 2012 altogether 25 doctoral degrees in electronics. The researcher training is organised through the Infotech Oulu Graduate School membership. The groups organised post graduate courses and workshops and trained new doctors.

The stated goal is to produce on average two to three doctors in the fort-coming years. The supervision will be distributed not only to professors but also to the team members. Gender equality is emphasised.

#### **C.15.6. Societal impact**

Industrial relevance will be very high. Societal impact of the RC project will be seen via applications of new electronic devices based on this RC research.

#### **C.15.7. International competitiveness or international comparability**

This relation is somewhat uneven, ranging from average to outstanding within the three groups.

#### **C.15.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

**Overall rating:** Excellent

**Remarks:** This project is innovative and cutting edge – very well matched to engineering and capable to feed innovative products to industry. Some of the Groups are excellent in all aspects, especially that of the RC leader, but not all the same way. We recommend creating a position for a Junior Professorship.

#### **C.15.9. Final rating (1 – 6): 5,0 (excellent)**

## **C.16. RC CMV – Center for Machine Vision Research; RC Head Matti Pietikäinen**

### **C.16.1. Scientific quality and innovativeness of the research plan**

The RC combines together various approaches in the area of computer vision research. The results of the current achievements are in highest national level (Academy of Finland Ranking) and the RC has good international collaboration. Goals set in the plan form the good continuum to the current work. The research plan has clear objectives, and the approach to achieve is provided. A timely and adequate grand challenge is identified, as well as core areas / specific objectives in it. Clear results to be achieved in each of the core areas are listed. They are of real value and with high potential impact, from both scientific and industrial viewpoints. This is a new approach to machine vision based on the use of natural perceptual interfaces (visual, voice and depth data), analysis of affect and emotional state, multimodal 3D vision, and technologies for energy-efficient embedded vision systems.

The application area is important; the results are applicable in various areas of industry and society. The research plan is excellent and realistic to implement. The RC level collaboration gives value added to the work. The RC has set the goal to reach top ranking in international level; at the moment the international collaboration network is wide and the work is well known, which gives good opportunity to reach the goal. New outcomes may indeed appear, but this seems to be the follow-up of previous work, in a joint effort of some related disciplines, without any real risk. Still, the track record of the group is very good, which gives some confidence on achieving some breakthroughs. A breakthrough is expected in building a seeing and talking face capable to interact with a human. However recognition of emotions looks like a very challenging task already because people of different races and cultures express emotions in a different way.

The RC is international, active in publishing, active in PhD education. Evidence of successful operations exists. Combining the work of four research groups provides means for future success, as seen in the Academy of Finland call. An innovative opening is the "Young Investigator's Team". The first two groups are conceptually interrelated and the development of 3D vision and technologies for energy-efficient systems (3rd and 4th group) will provide necessary tools to achieve the ambitious goals of this RC.

### **C.16.2. Feasibility of the research plan**

The RC has long term tradition in research in the area of Machine Vision. Its research environment, including method base applied, is the result of long term evolution; the current results show its feasibility. Information is given on methods and research plans. Problem areas are identified, and information is given on the methods to approach them. Alternatives are not mentioned. No schedule is presented.

The consortium is well balanced combination of experienced / post-doc researchers and PhD students. Overall, the research groups are very good, with a real critical mass, and enabling real joint work, which already exists coming from previous collaborations. The consortium is international both internally (international teams) and externally (good international collaboration network). The RC has been successful in getting external funding.

The consortium includes different aspects for developing successful machine vision applications based on the improved research environment and methods. Aspects like energy consumption in embedded machine vision systems (fast growing application sector) has been taken into account, in addition to the current trends in the research area (Face and Texture; Multimodal 3D vision). The trend towards important role of IoT includes in the plan.

The research work has no special aspects to be taken into account with respect to materials management. No ethical issues are identified, but given the addressed areas, there can be some (e.g., concerning the privacy of people, related to the identification of people in public areas).

### **C.16.3. Competence of the RC and research teams**

There is a conflict between Bibliographic analysis report and the report of CMV. The reports of the PIs, as well as the research plan, show extensive and high quality publication activity. The RC is publication oriented and has tradition for using international collaboration network in co-authoring. The RC director has a very high h-index (44). He is IEEE Fellow in machine vision. The RC Director has experience in managing teams (the own team is a large one) and projects. The RC Director has expertise in this area of work, and broad expertise, covering several areas of the project.

ERC Team Leaders have a very good track record in publications, as well as in project leadership and Ph.D. students' supervision. The h-index varies in between 14 and 35 (with an average of 20.3). A few publications are very much cited.

The RC has an excellent record in relevant publication forums. Overall, the publications average is 176 over RC Team leaders. Journal ones is 15 over the 20 list, which is very good.

There is complementary of expertise in between the groups, the participating groups do have the required complementary know how to achieve the proposed goals. Information is given on the actual split of labour in between the groups. Prof. Olli Silven is a member of the Finnish Academy of Technology. Prof. Janne Heikkilä is a senior member of IEEE with several publications in top tier forums. Dr. Guoying Zhao is a senior member of IEEE.

#### **C.16.4. Research environment and collaboration**

Four research groups complete each other. They have earlier tradition to co-operate. New openings become possible. The RC is one of the most international research units within the University of Oulu, collaborating with many leading groups abroad. Links with one doctoral programme are foreseen. A M.Sc. Programme is mentioned as a means to "feed" the doctoral programme, which is a very good strategic initiative.

Internationally strong profile: the RC has a good inside international community, apart from the outside collaboration network; Active partnership and influence: The RC has networked both in academic and industry level; Creative community and strong economy: The focus of the RC relates to an important field of ICT. Machine Vision is one of the Focus Areas of the University.

Active national collaboration both in academy and in industry. Good external funding. The collaboration with the Center for Internet Excellence (Dr. M. Ylianttila, [www.cie.fi](http://www.cie.fi)) in mixed reality and 3D internet applications, and in energy-efficient radio receivers (Centre for Wireless Communications (CWC), Univ. of Oulu, M. Juntti; Rice Univ., USA, J.R. Cavallaro) are worth of noticing to support receiving the goals of the RC.

The proposed research themes are included as the most important challenges for ICT research in the Work Programme 2013 of the European Commission (i.e. Cognitive Systems and Robotics, Technologies for Digital Content and Languages, ICT for Health, Ageing Well, Inclusion and Governance, ICT for a Lower Carbon Economy, and ICT for Learning and Access to Cultural Resources). Active international collaboration is foreseen as exchange of students and researchers, and joint work.

#### **C.16.5. Significance of the RC for the researcher training and promotion of professional careers in research**

The plan reports 46 supervised PhD Thesis, and 11 of the doctors have been later nominated as professors and two as adjunct professors (the average of RC Team Leaders is 12 Ph.D./ Leader), and there are quite many currently going on. Researcher mobility is foreseen via the international collaborations. The RC structure is well balanced combination of experienced / young PhDs and PhD students.

The support to postdoctoral research careers is addressed. Researchers' mobility is promoted via the collaboration with foreign universities. A number of postdocs and doctoral students are included into the research teams.

#### **C.16.6. Societal impact**

The societal impact of the proposed research has special future value on economy and companies in particular, and span over several sectors. The very high production of Ph.D. graduates is a very good way to transfer knowledge and technology to the companies that will employ these graduates. The research area is one of the focus areas in ICT and it has wide variety of application opportunities. The RC is active in publishing and higher education. The consortium has also acted as a source of spin-out companies / research groups.

#### **C.16.7. International competitiveness or international comparability**

Given the track record in publications, projects, internationalisation, and Ph.D. supervisions, the RC qualifies to be at the top of international research. The RC research profile is unique and is at the top level. There are no direct competitors. The related research is carried out at Univ. of California, Santa Barbara, USA (vision-based interaction), Imperial College London, UK (affective and behavioural computing), and INRIA Grenoble Rhone-Alpes, France (3D computer vision).



### **C.16.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

**Strengths:** International teams. Good collaboration network. Good evidence of successful research and researcher education. Well balanced RC. Publication intensive. A new approach to machine vision based on the use of natural perceptual interfaces.

**Areas of development:** Difficult to find. However, recognition of emotions is a very challenging task already because people of different races and cultures express emotions in a different way.

**C.16.9. Final rating (1 – 6): 6,0 ( Outstanding)**

## **C.17. RC DCE – Department of Communications Engineering; RC Head Matti Latva-aho**

### **C.17.1. Scientific quality and innovativeness of the research plan**

DCE is the well-established Center for Wireless Communications (CWC) of Oulu University. This is an excellent RC. Research of the RC is done on very topical and important themes in wireless communications and related topics. DCE's mission is to produce novel verified wireless technology and system concepts with the target of enabling cost and energy-efficient future wireless connectivity with focus on: radio frequency (RF) technologies and signal processing, wireless systems and access, and wireless networks. The research plan is solid and very carefully designed. However, the plan emphasises rigorous mathematical theory in the development, but its role remains somewhat unclear.

Based on the history of the group, very positive outcomes can be expected. There is a strong potential in various questions in wireless networking. Especially, breakthroughs are expected in designing of Flexible Radio System and End-to-End Optimised Access and Networks, 5G/6G networking technologies and contributions to the 3D Internet.

This a unique combination of Signal Processing, Radio Access Technologies, Networking and Wireless System group to address the most challenging problems of intense and cost-effective future communications. The PI's seem to complement each other well, and this RC is especially good for the younger scientists and students.

### **C.17.2. Feasibility of the research plan**

The plan is very credible and feasible, taking into consideration the top expertise of the group. The methods are sound. The research plan during 2014-2018 is to concentrate on creating a unified framework to optimise, tailor, and harmonise the joint operation of various wireless networks. As outcomes of this RC plan are:

- Breakthroughs for improving the spectral and energy efficiency of future dense wireless networks.
- Mobile wireless driven Internet architectures and middleware technologies.
- Cross-layer optimised protocols and transmission methods for wireless networks and links.
- Computation, baseband and RF technology for future wireless nodes and devices.

The research goals presented are very innovative and very well motivated, with clear practical applications in mind; however the new methodology required towards these questions remains somewhat unclear.

The operations of this RC are largely dependent on its funding, 70-80% of which is granted by highly competed external sources including European Commission, European Defense Agency, Tekes, Academy of Finland, and national and international companies. The RC is exceptionally well resourced both in personnel and material resources. 7.5 million euro of annual external funding is impressive. The RC consists of four teams, all well-structured with adequate personnel and funding structure.

Excellent, well-established and well-balanced group, combining theoretical research with collaboration and innovations. The RC consists of four Research Groups operating (105-person research and teaching personnel) at the Department of Communications Engineering, University of Oulu.

The research of DCE consists of mathematical analysis and synthesis, computer simulations and algorithm and system level evaluations with the aid of test platforms. For computer simulations and numerical analysis, DCE offers its own dedicated computing cluster with a vast computation capacity. Hardware testing and system verification, on the other hand, are possible with the extensive spectra of measurement test beds and equip-

ment. DCE's researchers developed the in-house low-power sensor network demonstration system. No ethical issues.

### **C.17.3. Competence of the RC and research teams**

The PI is a first-class scientist with very good citations. He has extensive record of publications mostly in peer-reviewed IEEE Transactions on Communications and experience in research and management as the director of the Centre for Wireless Communications in 1998–2006 and Head of the Department of Communications Engineering since 2011. This shows strong administrative background and clear scientific leadership.

Three of the PI's are excellent scientists and one of them is an innovator with industrial background. They are prolific researchers in their areas and have high-quality publication records.

The overall quality of the publication record of the proposed RC is excellent to very good.

The RC is very strong in complementary expertise aspect, covering the whole range of the area from radio communications and signal processing to wireless communications systems and networks.

### **C.17.4. Research environment and collaboration**

The RC seems to form an impressively active and fruitful environment both for fundamental research, researcher training, and collaborations both with international research groups and with industry. The RC presents an interesting combination of research both in theoretical and practical directions. It carries out research from nano-scale communications via radio and system technology to complete wireless systems and networks covering theoretical and experimental research methodologies aimed at producing smart and energy-efficient wireless technology – the cornerstones of the future of the Internet and ubiquitous services.

This RC fits very well with the strategies of Oulu University and actually with the whole Oulu region, whose growth is largely due to the telecommunications industry and its supporting infrastructure, including the Oulu University research groups. The support from the University could be higher; now it seems to be in the range of 20 to 25 percent.

The groups of RC are well connected to researchers in Finland. Especially, Aalto and Tampere Universities are mentioned as collaborators. There is also strong industrial co-operation. Specifically, DCE carries out joint projects with Aalto University and Tampere University of Technology, five projects in the field on Medical ICT. The RC explores e.g. wireless systems in arctic conditions in the Tekes-funded SMARCTIC project which falls within the University's focus area of Environment, Natural Resources and Materials, and is implemented in cooperation with several other University units. The RC forms the nucleus of the Wireless Ecosystem 2020 project. The RCs has intensive cooperation and distribution of tasks with the Technical Research Centre of Finland (VTT).

The international collaborations are very wide and strong. The "cognitive radio" funded by Tekes and the Academy of Finland in cooperation with NSF is organised as a research and networking cluster "Wireless Innovation between Finland and US" (WiFiUS) combining the research efforts of five Finnish universities and research centres with twelve universities and research institutes in the USA. The international joint multiple-year-projects funded by Tekes or the Academy of Finland include projects with Chinese, Japanese, South Korean and Brazilian research groups. There is also support from the EU. There is a strong connection to Rice University, where several of the researchers have held positions. The group has also attracted a total of 3 FiDiPro-professors to join.

### **C.17.5. Significance of the RC for the researcher training and promotion of professional careers in research**

The RC has a very strong record in doctoral training. The doctoral supervision is efficient and well planned. In 2012, the RC received Marie Curie IRSES research exchange funding for the first time for University of Oulu. The RC has a well-formulated doctoral training programme within UniOGS and Infotech Oulu Doctoral Programme for 60–70 students, with 5–10 graduating doctors yearly.

The objectives and resources of the RC to support postdoctoral research careers, including promotion of researcher mobility also seems to be well planned. Several postdocs are included in the teams. The RC has excellent resources for postdoctoral research and has also attracted some postdocs internationally. It is an open question what happens to the postdocs after this period. Their international mobility could be enhanced. Also the recruiting of even more talented foreign postdocs, perhaps with open calls, would be very valuable.

#### **C.17.6. Societal impact**

Through industrial contacts, the impact is very high. Wireless communications are widely used, creating 5G and possibly 6G generations.

#### **C.17.7. International competitiveness or international comparability**

The RC seems to be among the world leaders, on the top international level. Similar research is carried out at the Wireless Networking & Communications Research Center, The University of Texas at Austin (USA), and Communication Systems Research (CSSR) at the University of Surrey, Guildford, (UK).

#### **C.17.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

An extremely active research group with talented and skilful PI's. Through future wireless systems they have important industrial ties, especially designing of Flexible Radio System and End-to-End Optimised Access and Networks, 5G/6G networking technologies and contributions to 3D Internet. The national/international connections, while strong already, could be further enhanced through further researcher exchange at all levels. Marie Curie fellowships for hiring postdocs can be recommended.

#### **C.17.9. Final rating (1 – 6): 5,0 (excellent)**

### **C.18. RC MA – Mathematical Analysis; RC Head Esa Järvenpää**

#### **C.18.1. Scientific quality and innovativeness of the research plan**

This RC works at the forefront of research in mathematics, with a high-quality proposal. The research plan combines the expertise of the RC, in particular, geometric measure theory and mathematical analysis, in a very innovative and interesting manner, touching very topical themes of international research in mathematics, such as new insight to the QUE conjecture, different random structures, fractal geometry and variational problems related to image processing.

The RC contains mathematicians with high quality successful work done in the directions of the plan, which contains several very promising directions - there is a high potential in breakthroughs in topics of the research plan. In particular, joint investigation of the QUE conjecture may lead to breakthrough results.

Even if in pure mathematics group work is not as common as in other branches of science, the RC combines in a natural and innovative way different groups in pure mathematics and the group members complement each other very well.

Co-operation of the whole RC - including joint seminars, meetings and intense courses - will have a boosting effect for all themes within the RC. This will also increase the international visibility.

Particular scientific added value comes from the intention to enhance the classical analysis by combining efforts of four groups (abstract harmonic analysis, nonlinear PDE, fractal geometry and composition operators) around joint problems, such as QUE.

#### **C.18.2. Feasibility of the research plan**

This is pure mathematics research at the highest level. It is not possible to give a tight schedule for the breakthroughs. One could say common themes within the research plan are the different methods of mathematical analysis, and an innovative manner or their combination. As such - taking into account the expertise of the researchers - the methods are very sound and feasible. All in all, the proposal is very solid and well planned.

The groups have an excellent and balanced structure of researchers; graduate students, post-docs, senior researchers and professors. Main part of the teams has appropriate external funding.

The structure, organisation and division to subtasks appear natural. The Materials management plan is not applicable. No apparent ethical issues are involved in the research.

### **C.18.3. Competence of the RC and research teams**

The RC director is a first-class researcher. Prior to moving to Oulu he was a full professor at the University of Jyväskylä. He is internationally well known and has published in very high level journals. He has clearly the required leadership skills for the proposed project.

The PIs: Excellent top class team, some outstanding expertise. Excellent citation numbers. Hästö, in particular, has a very prolific research career with several honours, awards and external grants. Filali and Lindström have performed high quality training and research work.

The overall quality of the publication record of the proposed RC ranges from excellent to outstanding, in the top class in this research assessment. The RC does high quality work and publishes in high level journals.

The leaders and their groups bring together an interesting combination of different methods of mathematical analysis. The division to subtasks is very appropriate and planned very well.

### **C.18.4. Research environment and collaboration**

The cooperation of the groups is crucial for in-seminating the methods and ideas of modern mathematics at University of Oulu. Furthermore the groups have been running the OULUMA centre to attract talented high school students to study mathematics, which is very important also on the national level. Joint cooperation will increase the international visibility of the groups and of the University of Oulu as a research centre in mathematics. This should lead to an increased number of foreign students and researchers.

The RC provides highest level mathematical expertise for the university, fundamental in research in any branch of science. Participation of some of the groups to the Finnish Center of Excellence in Analysis and Dynamics research is (also financially) supported by University of Oulu.

The collaboration with the Finnish Centre of Excellence in Analysis and Dynamics is very fruitful. All groups have excellent cooperation with other mathematics researchers in Finland.

The groups have excellent international collaboration network and several projects of external funding from outside Finland. Cooperation with leading international experts, such as Ledrappier, Falconer and Smirnov are also particularly promising for the success of the project.

### **C.18.5. Significance of the RC for the researcher training and promotion of professional careers in research**

The groups have a very good record of doctoral training with good international connections. The RC has participated actively in national graduate school programs and centers of excellence programs. Three students have obtained PhD degrees in the research teams of the RC, eight doctoral students are expected to graduate by 2014. Participation to Marie Curie programs is recommended.

The groups have excellent international connections, hosts foreign post-doctoral researchers and have former graduate students working in other universities in Finland or abroad. The joint effort of the whole RC will evidently increase promotion of research careers as well as mobility.

### **C.18.6. Societal impact**

Pure mathematics does not have short-range societal impact but has longer-term impact through applications; mathematical analysis is the basis of science, essential for any flourishing research university. In particular, mathematics gives its main societal impact through education and disseminating ideas of mathematical methods within the society. Here the groups have done very valuable work.

Indeed, Finnish mathematics is highly recognised by the international public. It is important to sustain its level.

### **C.18.7. International competitiveness or international comparability**

The RC is an international group with high quality work in topical areas of pure mathematics, containing internationally leading experts. The RC has excellent research impact as evidenced also by the bibliographical data.

### **C.18.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

The RC is an excellent world class group, with topmost bibliographical score. The main research themes combine interesting and modern areas of mathematical analysis. The RC provides excellent potential for breakthroughs within the proposed project.

An even stronger cooperation within Europe is recommended. The RC is focused on pure math. It would be beneficial for this RC and for the University of Oulu to emphasize some potential applications of their results, for example in image restoration.

**C.18.9. Final rating (1 – 6): 6,0 ( outstanding)**

## **C.19. RC SPARC – Space Physics and Astronomy RC; RC Head Ilya Usoskin**

### **C.19.1. Scientific quality and innovativeness of the research plan**

The RC consists of six research teams representing different subjects in Space Physics and Astronomy. The scientific level is high. Research plans are well formed and relevant to each group. The research plan covers a wide range of spatial, energetic and temporal scales of space processes, from the terrestrial to extreme astrophysical environments. The questions to be addressed have a high science quality. Most of them are at the front of current research activities of the world science communities.

There is a potential for new discoveries in space physics and global change. Thus the extreme space weather and space climate events become more and more important for space technology and their improved understanding and potential forecasts are of great value. Asteroid observations, satellite position determination and search for space debris by EISCAT as well as cosmic-ray-induced radiation dosimetry protection are at current focus. For example, NASA plans to open a new program to send spacecraft and then astronauts to change the trajectory of asteroids threatening to hit the Earth. A substantial societal impact is expected in the educational domain. Risks that could threaten the project are minimal.

The RC provides a natural forum for joint activities. It has a wide network both in Finland and abroad. The work of the teams is well recognised at the national and international level.

Establishment of Space Research Center and development of EISCAT/EISCAT\_3D infrastructure are already recommended by University of Oulu for 2012–2015. Thus, the formation of the proposed RC would be the next logical step in this strategy. The RC provides means for improvement of the collaboration between the research teams. Research plans specify goals of each group. The topic area is included in the strategic development of the University.

### **C.19.2. Feasibility of the research plan**

The research plan is feasible and specifies the responsibilities of each team. Space physics goals are tightly connected with improvements in modern technology (radio, satellite). The research methods will mainly include analyses of ground and satellite data and modelling. RC has computer codes and access to data archives. No methodological problems are expected but no detailed schedule is given.

The planned resources are adequate, although no detailed information on financial and material resources is presented. The RC has the ability of obtaining external funding for operating its geographically distributed institutions.

RC consists of six groups working in a wide range of science disciplines. It is a challenging task to unify the efforts of these groups although the laws of physics are the same on the Earth and in the extragalactic space.

The material in question is mainly the huge volume of data. RC has sufficient computer resources to store and use the data. No ethical issues.

### **C.19.3. Competence of the RC and research teams**

RC director has an outstanding record of more than 200 publications in the major science journals (Nature, Phys. Rev. Lett., J. Geophys. Res., etc). He has leadership skills, as a task leader for several international projects and meeting organiser, and he has a substantial science expertise according to his publications and editorial work. However he has no experience of managing large research teams.

All team leads are internationally well-recognised scientists with extensive records of science publications. The h-index varies between 7 and 33 with average of 21.

According to the bibliography analysis the RC is at the top level of the T & NS division. Overall the average number of publication for team PIs is 147, which is excellent.

It will be a challenge task to combine the expertise of a solar-terrestrial scientist with the expertise of a scientist working on extragalactic problems.

#### **C.19.4. Research environment and collaboration**

Working as an RC will certainly be helpful in researcher training and promotion of creative research environment for researchers and students. The RC has joint infrastructure, including offices, computer facilities, library subscriptions, workshops, research stations, guest rooms, and a multi-core computer cluster for massive computations.

The RC satisfies the requirements listed in the strategy of the University: Internationally strong profile, active partnership and influence, creative community and strong economy. The RC's topic is nominated as one of the development areas in the strategic plans of the University of Oulu. University of Oulu provides an excellent environment and resources for the research carried out by this RC.

Collaboration with the national institutions exists in the form of joint projects. Thus the SPARC possesses state-of-the-art experimental research national infrastructures including the EISCAT radar facilities in northern Fennoscandia and on Svalbard, and astroparticle underground infrastructure in the Pyhäsalmi mine. It has collaboration with University of Helsinki (Department of Physics), University of Turku (Department of Physics and Astronomy; Finnish Centre for Astronomy, Finnish Meteorological Institute, and University of Jyväskylä (Department of Physics).

International research collaboration already exists. RC will use data from the ground-based Nordic Optical telescope and European Southern Observatory, as well as from space-borne instruments (Hubble, Spitzer and Fermi space telescopes, XMM-Newton, INTEGRAL, CASSINI, Cluster and SOHO spacecraft), and the cosmic ray detector AMS-2 onboard the International Space Station.

#### **C.19.5. Significance of the RC for the researcher training and promotion of professional careers in research**

The RC is using multi-disciplinary teaching with 15 supervisors; RC expects to enroll about 30 PhD students. The RC members are also involved in organisation of regular international training schools, such as the annual International Radar School (GSE group), and biennial Space Climate International symposia and schools (SC and CRP groups). RC is a part of the Marie Curie ITN Programme (DAGAL; Detailed Anatomy of Galaxies).

RC already has a number of international doctoral students and postdoctoral fellows involved into SPARC (financed by the Academy of Finland and EU FP7). The support of postdocs' research careers is addressed. Research mobility is provided via collaboration with foreign universities.

#### **C.19.6. Societal impact**

Societal impact of the RC project is expected from their contribution to the study and forecast of space weather events, which are critical for the modern technology-dependent society, and asteroid observations, satellite position determination and search for space debris by EISCAT, as well as cosmic-ray-induced radiation dosimetry protection. An important societal impact is expected in the educational area.

#### **C.19.7. International competitiveness or international comparability**

RC is highly rated at international level. Research interests of SPARC partly overlap with those of University of Reading and the Rutherford Appleton Laboratory and the Max-Planck Institute for Solar System Research (MPS) in Germany but SPARC is smaller than MPS in funds and personnel. Research topics related to high-energy astrophysics overlap with topics represented at the Astronomical Institute, University of Amsterdam, which is 10 times larger in that field than SPARC. However the SPARC productivity is comparable or better per capita at the world level. However, we have more theory-oriented activities.

#### **C.19.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

Superb research, highly recognised by the international community for contribution to pale climate studies and for pioneering the field of Space Climate. Challenge in combining research in Space Physics and Astronomy.

One good way would be the use of astrophysical expertise in finding new ideas in tracking asteroids and space debris - one of the urgent problems of Space Science.

**C.19.9. Final rating (1 – 6): 5,5 (excellent - outstanding)**

## **D. RCs evaluated by more than one panel**

### **CATEGORY VENI**

#### **D.1. RC GlobalHealth – Global Change, Geography, Environment and Public Health Research; RC Head Jouni K. Jaakkola (evaluated by panels H&B and T&NS)**

##### **D.1.1. Scientific quality and innovativeness of the research plan**

This proposal is innovative because it is addressing a major 21st century public health problem of climate change that is rarely addressed in a systematic manner. It has excellent potential, as each theme has been given good thought and there are some very good ideas within the plan. The combination of health, environment and information technology is rarely used in such a manner as part of one research team working together. The team and its leadership offer superb international quality of science. Connecting it to the WHO through a collaborating center is another advantage and innovation. The proposed science certainly has great national attention and has potential for international attention and recognition.

The ability to produce high quality science from this RC is highly probable given the history of achievements of its director and the team members of the RC. The scientific breakthroughs are likely to focus on extreme temperature that is part of the environment in Northern Finland. There is a poor understanding of the extent of associations between climate change and health and the factors that influence this association. This RC is likely to fill in the information gap. Although this has been done elsewhere, the aim to predict future public health impact of climate change is challenging and might not be easily achievable due to the complexity of the association but the RC has many other aspects that will make major impact given the multidisciplinary approach.

Working as an RC will ensure the groups are forced to work together rather than in isolation and it provide a commitment to solve the existing challenges of health impact of climate change. A systematic approach from the environment, health and information technology is challenging to achieve and sustain without an RC to hold the teams together. An administrative structure with a director and subgroups and specialties working under the umbrella of the RC is needed to make scientific breakthroughs in this field. It is likely this RC will be elevated to high international ranking in the future.

##### **D.1.2. Feasibility of the research plan**

The aims and goals of the RC are largely feasible based on previous work of the investigators. The epidemiology of morbidity and mortality is readily available from registries, the access to clinical facilities and study is made available, the GIS methods and computations are available, and the ability to conduct meta-analyses and combine data from multiple sources in relation to health impact is feasible, although more difficult to get clear cut future scenarios and extrapolate to the rest of the world because of inherent uncertainty in such analyses. However, they will provide better than what is currently available for such data. They do not acknowledge potential scientific methodological problems or alternative approaches.

The personnel and other resources being made available for the RC are adequate with heavy emphasis on the health expertise of epidemiology and clinical research given that most of the themes are focused on the health impact. There is also a strong team of GIS expertise and personnel. The team already has major financial funding and will be seeking additional international funding. Having only one computer science professor Dr. Kostakos to take on the major role of analyses and future prediction and modelling seems limiting for the RC but this are can be expanded in the near future.

The funding is mostly from the Director and some PIs have excellent external funding, but other PIs have much weaker publication records and limited or only national funding. It will be of paramount importance to lift these complementary fields to a higher level of productivity, impact and international exposure.

The structure is clearly presented in the figure and how the different themes will be linked together and the research methods to address them. This is also presented as the six global health subgroups for each of the different themes. It would have helped to have a diagram for the administrative and leadership organisation but this is not necessary. It will be important to focus on group synergy for the RC.

There is no material management plan detailed but there is mention of the different components available for the study including the registries, the Earth System Models, the GIScience Techniques, the different cohorts, the Ubiquitous infrastructure for collection of behavioural data.

Yes, ethical committee approvals have been granted to all ongoing projects described and future ones will be sought and there is a consent process and all privacy is protected.

#### **D.1.3. Competence of the RC and research teams**

The Director has major publications in top rated journals with high impact factor. His expertise and history of leadership is very strong and across the US, UK and Finland. There is no doubt he will be able to lead this RC successfully.

All PIs are well selected for the proposed projects and themes and each is a leader in the field: Dr. M Jaakkola for the clinical respiratory and epidemiology fields, Dr. Ikäheimo in the physiology and physical and environmental climate in relation to health, Dr. Vainio in immunology, Dr. Rusanen and Hjort in GIS, and Kostakos in computer science. It is understandable that some of the PIs are not as senior as others and therefore have less publication records and leadership but, overall, there are no major concerns in their ability to perform their roles within the RC.

The overall quality of publication records for the proposed RC is comparable to the well performing RCs, especially in international collaborations, despite this group being more recent than the others. They make it with the A group of quality of standard publications.

Yes, the RC clearly covers all aspects of health, geoinformatics, immunology and computer science. There isn't a PI in environmental sciences as a stand-alone topic but this is covered by the Director who has expertise in exposure assessment and the Physical geoinformatics and physiology PIs who have worked with environmental factors.

#### **D.1.4. Research environment and collaboration**

The work of the RC will open new opportunities for training and research that were not thought of and it becomes a hub for anyone in the university interested in any aspect of the RC as well as attract international scholars who learn about the RC given its unique expertise and location in Northern Finland to study extreme temperatures and climate change. There is a great potential in development of a new generation of interdisciplinary researches in environmental impact on human health. The benefits can be realised in training in which students are exposed to work across different themes.

There is explicit value in getting these complementary fields explicitly connected to the Director's ambitions, which should result in the PI-groups that currently have modest track records to become more internationally visible.

The RC is already functioning within the University of Oulu in all its different components, making the best of the present infrastructure. Cooperation takes place with the Center for Environmental and Respiratory Health Research, the Department of Medical Microbiology, the Institute of Health Sciences, the Department of Geography with its involvement in the Finnish University Network in Geoinformatics, the Earth System Models, the GIScience Techniques, the different cohorts, and the Ubiquitous infrastructure from the department of computer science. External support seems appropriate right now, but 1-2 additional hires of top mid-career scholars from elsewhere may be helpful to enhance developments towards excellence across the RC.

The Finnish National Health Registries, the housing registry, PaTuli geospatial data, Remote sensing GIScience, The Finnish Meteorological Institute, National pollen data, Finnish Air Quality data, Earth Systems Model are all research collaborations that will greatly impact this RC and its success. The Finnish/Nordic profiles of all PIs are at least appropriate and, in some cases, much better. The challenge will be to make all of them interact well with the increasingly international focus that is now proposed.

The international research collaboration with the Taiwanese mortality data, Taiwanese Environmental Protection Agency, and other African and Chinese collaborations will continue with the investigators through the RC.



The RC is also being finalised as a WHO collaborating Center in Global Change, Environment and Public Health, which is a major achievement and boost for the international effort of the RC. The RC PIs have many existing international collaborators.

The idea of not only considering adverse effects of heat in Nordic populations, but also the adverse effects of cold at lower latitude is an interesting way to generalize the broader relevance of research and increase international impact. As it appears, the director has clear visions on how to achieve this to the benefit of the RC as a whole.

#### **D.1.5. Significance of the RC for the researcher training and promotion of professional careers in research**

Each of the groups has PhD and other level of trainees, except the computer science group. In group 1 there are 4 PhD students and 1 post-doc, in group 2 there are 2 PhD students and 3 post-docs, in group 3 there are 3 PhD students, in groups 4 there are 3 PhD students, in group 5 there are 2 PhD students and 2 post-doc positions. This level of PhD students will help scientific production and interest in the area. The RC also has applied for a doctoral program in Global Health.

The RC arranges research workshops and weekly meetings targeted to doctoral and post-doctoral researchers. The studies are focused on post-graduate training offered by the RC, the graduate school, and international courses. They will liaise with CONSAMS to develop post-doc programs. They also have several post-docs from other universities. It will be important that all PIs get involved in cooperative research involving postdocs, as they will form the future recruitment base after they have had their subsequent stays abroad. Although some PIs have been explicitly involved in EU-level activities, it is somewhat surprising that no initiatives for EU Marie Curie activities (international postdocs or networks) appear to have been considered.

#### **D.1.6. Societal impact**

The RC will be able to provide new information on the role of long-term environmental exposure on the aetiology and prognosis of respiratory and cardiovascular diseases. Controlled experiments on cold exposure will provide important information for clinical management and public health prevention. The overall RC projects will provide information on the development of measures for mitigation of the adverse effects of global climate change on public health in different climates and development of personalised mobile and internet communication in prevention of adverse environmental effects. This will integrate Finnish strengths in Nordic public health research with global perspectives.

#### **D.1.7. International competitiveness or international comparability**

The RC is providing new insight not offered by the other top international research centers in the field. The major and earliest such center is at the London School of Hygiene and Tropical Medicine but is more focused on infectious diseases in relation to climate change. The other center is at UC Berkeley but it is more focused on indoor pollution from biomass fuel exposure. Therefore, the unique extreme exposure of the climate and comparing it to other environments in countries such as Africa and China, will be leading international efforts in this area.

#### **D.1.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

The RC is a unique combination of multidisciplinary teams coming together from different unrelated backgrounds of health, epidemiology, clinical respiratory experience, geography, immunology and genetics, computer science and other related fields. They all are focused on the influence of climate on health from the perspective of Finland's climate and available infrastructure. They will be utilising several exceptional cohorts and registries, not just from Finland, and link it to sophisticated environmental data and then synthesise them all in a computerised fashion that can make a difference and impact on the health of the population through its availability via smartphones and the internet. The aims are reasonable, while the methods and approaches are appropriately designed to achieve these aims. The leadership is proven and the RC components are already functioning in some capacity. This is an excellent RC that will likely bring international recognition to the University of Oulu. Areas of development would focus on increasing the computer science team and also being more focused on the future prediction goal, given the many unknown assumptions and factors that play a role in this multidisciplinary team approach.

#### **D.1.9. Final rating (1 – 6): 5,5 (excellent - outstanding)**

## **D.2. RC LUMINOUS – Sustainable Northern Communities: Integrating Smart Systems, Structures and Change; RC Head Eva Pongrácz (evaluated by panels HS, H&B and T&NS)**

### **D.2.1. Scientific quality and innovativeness of the research plan**

This is a highly innovative RC that for the first time attempts to bring a very diverse group of scientists and disciplines in health, smart systems, smart structures, diversity, sustainable technology, environmental contaminants, gender issues, and several other seemingly unrelated areas under one RC focused on Finland's Northern Arctic region and its people. Through trans-disciplinary research and development of 'smart' solutions, it aims to work toward a common goal of building sustainable Northern communities as part of the university's Arctic Strategy. The RC consists of 16 research groups and 120 researchers spread over a diverse range of scientific fields, united in the geographical area of study (the Arctic). This makes it stand apart from other initiatives in other universities worldwide who examine low carbon futures / sustainable societies / smart cities etc. The cooperation with the Thule institute is a strong point. This kind of innovative approach is likely to make important impacts if successful. The scientific approach for the different research groups is not explained in enough detail to allow assessment of quality and likelihood of success. The RC did not focus on the data they intend to collect or how they will analyse the gathered information. The feasibility of doing so was not a subject of focus, either.

The work should yield both methodological insights and breakthroughs which can be applied globally, as well as determining options for the future, which are specific to the case study sites. There are, however, several risks that could undermine the RC. The investigators have outlined these in their proposal. It is strongly dependent of the ability to overcome differences in the epistemologies, theories and methods in the very diverse range of disciplines involved. Furthermore, the size of the group is a challenge. How do you make such a big group function in a unified manner? The proposal acknowledges the potential risks – which are many – from dealing with the sheer number of participants – more than 40 – to the risks of conducting large-scale, community based observations of individuals and groups. On the plus side, the risks have been identified by the team, while plans have been put in place to deal with them, including routine interdisciplinary dialogue and training.

The RC has the potential to become an international magnet for researchers interested in the cutting edge of sustainability. The cross-disciplinary nature of the RC will very likely generate new scientific ideas if appropriate environments for collaboration are created. There is clear merit in the interdisciplinary approach being adopted, and the panel supports the way in which the RC has been brought together. The societal problems outlined require exactly this type of a large and diverse team. The chief added value of the proposed RC is the potential it offers by bringing together such a large and diverse group of specialists. This setting should provide a fertile, large intellectual space for the purpose of training students.

### **D.2.2. Feasibility of the research plan**

Clearly, the project is high risk, due to its scale and scope - but it could bring excellent reward. The fine details of the methods are not clear because the RC is so large that the methods for each objective/group are only briefly touched upon. However, the methods described appear to be logical. Attempting to find common methods and epistemologies that can bridge the work of specialists dealing with issues of gender, sustainable urban communities in Northern conditions, smart architecture and smart system is a tremendous challenge. The idea of just bringing this wide range of disciplines together is very appealing but, in logical terms, not as feasible or easy as envisioned by the RC. Instead of two cities, the RC should have started with one city, and instead of 16 research groups they should have started with 6 or 4 groups. After an initial 5 years, they can reassess and expand or correct the course and learn from the challenges they face. They propose to use the first 5 years to assemble this large number of diverse researchers. But this is unlikely to yield the kind of tangible, scientific results that would enable the pursuit of the planned RC.

It would appear that a combination of support structures at Oulu University offer the resources necessary to help the RC to succeed. The Thule institute combined with living laboratories in both Oulu and Lapland seem to fit very well with the overall commitment on the part of the university and Finnish government to tackle the challenges of dealing with a rapidly changing climate while attempting to build sustainable communities. Again, the only question is whether it is possible to coordinate such a diverse group. With such a major RC and diverse research community and groups, one would imagine there are enough resources but, at the same time, this is not an average, normal RC and requires special emphasis on how it will be sustained and how the division of

labour is to be distributed. Surely, there will be encouragement toward the use of resources to employ a 'co-ordinator' for the RC. This idea was not mentioned in the proposal but such a co-ordinator could prove to be vital. The RC is vast and requires collaboration with many stakeholders. Therefore, it would clearly benefit from using someone to act as the main conduit for information flow, both internally and externally, to manage the distribution of RC group newsletters and help arrange meetings, as well as to organise the design labs and other events, and liaise with external parties.

The theoretical model behind the RC is described but nothing beyond that in terms of the structure of the RC or leadership of major themes within the RC. No specific organisational plans are proposed, but it might be helpful that the Thule Institute as an already existing organisation can form a basis from which some kind of organisation can be built. Also researcher exchange programmes, problem solving think tanks, 'Design factory' and 'Researcher hub' events as well as existing laboratories are mentioned as possible instruments of organisation.

The innovative nature of the proposed RC and the scale of its ambitions will require a very well organised and well-coordinated effort along with ample funding. With such a wide range of specialists the organisation of the entire effort is obviously important. The proposal notes that it will try to maintain momentum and direction by holding gatherings and meetings on a regular basis. This is one area where more detailed discussions of the just how they hope to achieve their goals would have improved the proposal.

The management plan is not described beyond the individual Research groups. Ways of bringing together disparate centres and shared doctoral training initiatives are discussed. There is also mention of a new database which would be useful.

There is mention of the confidentiality and privacy of participants and that their participation will be voluntary. Ethical issues will definitely be part of some of the projects, especially considering the participatory orientation mentioned as a common element. There are likely to be issues of managing informed consent for access to, and recordings of, personal data. This is addressed in general terms on p4 of the report. Dealing with issues involving violence or gender inequities suggests that specialists will be addressing highly personal topics. Thus, the subjects will need to be approached in a sensitive manner, not to mention the cultural challenges that will also have to be dealt with.

### **D.2.3. Competence of the RC and research teams**

The Director's leadership skills and experiences look very convincing. As head of the Thule Institute, she would seem to have the kinds of managerial skills that will be required to see such an ambitious plan to fruition. However, the publication record of the RC director is rather weak compared to other RC directors. Only 33 publications and index  $h=7$ , which does not provide assurance about the productivity of the RC in the future. The RC leader has not had major research leadership projects and the largest budget of a project lead by the director was around 218,000 Euro.

The publication records for the different PIs are diverse and different covering all the range; something expected from such an RC. Some are junior with as little as 20 publications, and others are more senior and established researchers with significant research grant proposals. Several of the team leaders appear to be more senior members of the academic community, but they are not necessarily the strongest scholars in the group as a whole. With such a large and diverse group perhaps this mix of younger and more senior team leaders is just what will be required? The skills of the PIs will complement each other well, even though they are very diverse. This interconnected style of teamwork is likely to remain highly efficient, provided there is regular communication and interdisciplinary training activity for the RC as a whole.

Overall quality of RC's publication record is acceptable for the *VENI* category and shows a good number of publications overall. However, given the large number of researchers within the RC, one would have expected a higher quality and overall publication record.

The team leaders clearly are experts in their field and each brings complementary background to the RC. There is no description of the division of labour within the RC or the priorities for the 16 different research groups. The division of labour seems appropriate in that there is a strong balance between the natural and social sciences as well as an ample number of specialists in areas such as smart architecture, smart systems, that will be required to address the range of needs that building sustainable communities will require.

#### **D.2.4. Research environment and collaboration**

The RC combines and benefits lots of ongoing initiatives and adds value to those initiatives enabling U. Oulu to benefit from an RC that would be more than the sum of its parts. The potential training programme for doctoral students, postdocs and faculty could be very good if well co-ordinated. The visionary approach lends itself well to a creative research environment as long as the sub groups are prepared to put sufficient time into the project. There is benefit of working as an RC in terms of compiling the different infrastructures of the diverse areas of research under one RC. Some of the mentioned infrastructure includes the Kastelli Research Center, the Thule Institute, the Sodankylä Geophysical Observatory, many modelling and simulation models, etc. The RC will initiate research exchange programmes for placement of researchers from different research groups into other research groups to facilitate communication. The RC will also organise problem solving groups and events to plan projects and publications as well as annual thematic seminars for presenting interdisciplinary research. They also plan to launch a doctoral program based on the RC.

Given Oulu University is in the North of Finland and close to the Arctic North, it is focused on Northern topics relevant to the RC. The RC will provide a strategic advantage to the University in terms of appealing to international researchers interested in this area of research. The emphasis placed on equality and diversity also seems to reflect the greater mission of the university. The Thule Institute which is hosted by the university will be the main site for the RC. All research groups are located within the university and therefore the RC offers a collective organised community for researchers in this area of research.

The main collaboration of the RC will be with the national circumpolar and Arctic institutions. Strengthening economic activities in the Arctic region is a priority for Finland. No other national collaborations are discussed by the RC. The Thule Institute already maintains collaborations that will only be strengthened by the proposed RC. In addition to the good training ideas presented, we would also encourage workshops/events where stakeholders also engage with the RC - perhaps an annual event for the local communities/stakeholder bodies to understand the whole picture of work at the RC and for researchers (including doctoral students) to listen to stakeholder ideas for the RC (which will evolve through time).

The researchers of the different 16 groups within the RC are already well connected and networked with major research institutions involved in the Arctic and circumpolar health such as Greenland, and universities of Alberta, Akureyri, Umea, Tromsø, Saskatchewan, Purdue, Lulea, Shenyang, Magdeburg, Cape Town, and Russian Academy of Science. Such connections are likely to help in the success of the RC, but there is no description to explain how this will be done. The panels are very supportive of the continuing development of international cooperation as part of a larger strategy for internationalisation.

#### **D.2.5. Significance of the RC for the researcher training and promotion of professional careers in research**

There is a plan to establish a special doctoral programme, and the seminar and forums planned will help in the training of such students. There is also mention of the ability of the RC to recruit doctoral students based on the multidisciplinary approaches. Several Research groups have doctoral students as part of their teams. The innovative and ambitious scope of the proposed RC suggests it would an excellent environment in which to train doctoral level students. With so many and diverse research opportunities, the students will be very well prepared in trans-disciplinary research.

The research environment has the potential to be exciting and diverse with creativity at the core. There is mention for helping post-doctoral researchers to collaborate on multidisciplinary themes but no specifics mentioned. Mechanisms for enabling successful enterprise at PD level need to be determined in more detail. However, the creative workshops mentioned sound excellent. The students who will gain training with the RC should be very attractive candidates for universities that have a strong focus on Arctic issues. Their experience with such a diverse group of interdisciplinary specialists should also help the with finding satisfying positions after receiving their degree.

#### **D.2.6. Societal impact**

The potential social impact is very high. The planned engagement of the RC in the local development processes, the direct emphasis on the development of 'smart solutions' and the RG's participatory orientation suggest a possible empowerment impact in local communities with a focus on human health and well-being. There are specific research groups working on topics of violence and gender equity which would impact society. The virtual communities that are to be enabled with wireless communication and the sustainability platform created

will enable further advances of the two communities in the planned RC (Sodankylä and Hiukkavaara). There are several social and cultural aspects to be studied by the RC but also smart technology is likely to improve the life and wellbeing of the city population. If successful, this can be extrapolated to other populations in other cities.

#### **D.2.7. International competitiveness or international comparability**

The proposal makes a strong argument for the unprecedented scope of the research being proposed. There are no comparable international research centers that address such a complex and multi-disciplinary topic under one RC. Therefore, this RC will be unique in its approach which makes it rather innovative. The ambitious plan to include 16 research groups might undermine the feasibility of carrying out such a project in the context of a research center or community. If successful it can have global implications, but it will need to be managed well to realize that potential. The group needs to publish more high profile papers of high quality in good journals and this should become routine. Perhaps the group can start by co-ordinating a major 'think piece' about the way forward for the North in terms of the focus of the group. The group will not properly be seen as providing top research without a high quality publication trajectory combined with societal impact. The publication strategy needs to be developed in parallel with the strategy for societal impact and the strategy for interdisciplinary training.

#### **D.2.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

This is an exceptionally innovative RC project that can help move the scientific field further in terms of virtual cities and communities living in special environmental, social and structural situations. The idea of creating such a platform to address aspects of smart city, structure and systems but also add the human factor of health and well-being, equity, diversity, culture, and environmental exposure is fascinating and intriguing. Genuine cross-disciplinarity of this kind is both fruitful and necessary, but when it crosses ontological and epistemological borders, it is also very difficult. The proposal has not really addressed that problem. The leadership of such a major RC needs to be more experienced in dealing with a diverse and challenging RC similar to this. There is a major obstacle to try and make two or three disciplines to work together, let alone 10 or 16 different areas of research as proposed by the RC. If the RC started small and focused on the strengths of a few key areas and then built on it, there might be better chances for success.

#### **D.2.9. Final rating (1 – 6): 4,2 (very good - excellent)**

### **D.3. RC MAD-2C – Multimodal Analysis of Dynamic Cooperative Communication; RC Head Seppo J. Laukka (evaluated by panels HS and T&NS)**

#### **D.3.1. Scientific quality and innovativeness of the research plan**

The goal of this RC is to find out what is happening in real face-to-face communicative situations using multidisciplinary and multi-channel registration. The research objectives are clearly described and the approach might well result in innovations. The research will include how various acoustic, visual and heart rate parameters interact as specific cues for interactions and transitions in natural spontaneous conversation. There is clearly strong motivation to build a coherent research program out of some currently disparate projects.

The team has just started in organising themselves as a consortium. There is strong leadership with relevant experience and well developed networks both domestic and international. The planned research is innovative and includes concepts and theory in the academic disciplines of psychology, linguistics and learning. A learning research laboratory has been established and much of the research in this RC will be carried out with the support of this lab. The combination of information technology, psychology, learning theory and biomedical signal processing is innovative. But how is this research going to be carried out is not clear.

This RC is doing research with high relevance but the relationship with well-established international researchers and centers is not very strong. Because the general theme of the research (tracking human interaction by means of physiological recordings) is already familiar, the risk is that the project does not break new ground. The authors claim that the results are applicable in medicine, pedagogy, and psychology. In these fields, they might find at least niche areas for scientific breakthroughs. The RC should be aware that what will be gained might turn out to be useful incremental knowledge rather than major findings. It is difficult to assess the likelihood of a major and significant finding to emerge from the studies described here. Further, it is not clear whether similar research has been done elsewhere. Evidence of collaboration with international researchers is not strong.

This RC has a clear, innovative research approach and realistic scientific goals. However, the description of how the research is going to be carried out and the theoretical contributions could have been better developed. The proposed collaboration across working groups from different disciplines is a major positive factor in this proposal. The size of most of the participating groups is rather small and in particular, the number of doctoral students is limited. It is suggested to investigate the possibility of cooperating with another RC (COACT). Strangely, there seems to be no mention of the Oulu RC (COACT) whose work on human interaction with technology and the environment is directly related, but this can (presumably) be easily rectified locally. Description of the theoretical contributions could be further developed. Because of the recent start, the team deserves the benefit of doubt.

The greatest strength of the proposal is the collaborative nature of the team and its multidisciplinary connections between new technologies and their potential for aiding teachers and other professionals.

#### **D.3.2. Feasibility of the research plan**

The research is quite broad and researchers from academic fields with very different theories and methods used in their research represent special challenges which could be described more in depth. The basis for this RC is functional systems theory which is adequately described in the application. The methodology and plans seem sound. The expected results are written in a rather general way. However, the previous research gives the consortium sufficient credibility. The methods are traditional laboratory physiological recording methods (with some indication of portable devices for field research). The experience of the members of the group suggests that these methods will be well handled. What is less certain is whether the proposed close collaboration between members takes place to the degree that the proposers hope for; since this is a project that is only just starting out, that must remain an unknown.

Both the methods and plans are feasible. The combination of lab and field-based technologies seems well-conceived. However, the research is quite broad and researchers from academic fields with very different theories may present a challenge.

Based on the proposal it would seem that the technologies needed are already available at Oulu so in that regard there seems to be adequate support. The resources seem to be sufficient. The research environment comprises the Clinic of Educational Psychology and The Learning Research Laboratory. Both institutions are “well equipped”.

With five research groups in this RC, the leadership is very important to ensure that the groups also cooperate with one another. No report is offered of structure in the sense of a timetable of activities or proposed specific collaborations among the members; rather there is a set of questions to be asked, and a general ambition that they fit together under the general theme of the proposal. The disciplines do present a logical entity and, as a consequence, there is a sound basis for a good structure of the project.

Materials management plan: The lab will be very important in the data collection process.

No specific ethical challenges appear in the research. Psychology experiments with, or recordings of, adults come under strict ethical guidelines, but these are not mentioned here, nor is any consideration given to the vulnerabilities of children in special education. That needs to be rectified. The composition of the RC is such that they should be able to act in an adequate way.

#### **D.3.3. Competence of the RC and research teams**

The bibliometric study suggests a good level of output for the entire consortium with a very good output level of one of the PIs. Not many publications are in top rated scientific journals. The RC director has a solid publication record, however it was noteworthy he was not the senior author on many of the publications. The proposed director has management experience in managing the Learning Research Laboratory.

The output of the RC PIs is good to very good. Theoretical research contribution is not clear. The team leaders seemed solid, some more so than others seemed quite strong – but the quality of publications appeared to be mixed with conference proceedings rather than journal articles being the most noteworthy example. It is advised to publish more consistently in high impact journals.

The overall quality of the publication record of the proposed RC meets the requirements for the *VENI* level. The publication outlets may to some degree be specific to the disciplines involved (in the case of Seppänen, in computer science) but overall, the record does not seem outstanding. If successful, there is great social impact in the areas of special education and counselling.

This is an innovative group/team. This is one of the strong points of the proposal. The different skills and experiences brought to the project are impressive. Not much is actually discussed concerning the division of labour so that is difficult to assess. The group is quite diverse, but for the goal of the project, this diversity is fully justified. The division of the individual tasks is in full harmony with the individual experts.

#### **D.3.4. Research environment and collaboration**

International networking is important and opens up for an international career, including a career in academia, consulting firms and government agencies. The proposed collaboration across working groups from different disciplines is a major positive factor in this proposal. The team will grow in defining better and better integrated projects. They might be recommended to liaise with the COACT group whose work on human interaction with technology and the environment is directly related. It is highly probable that interdisciplinary work shall commence. International advancement is also expected. With the diversity of skills of the various team leaders, there is potential for strong interdisciplinary advancement. There is an emphasis on applied results which, in turn, could lead to potential breakthroughs in research. The five concrete projects, described at the end of the proposal, clearly show the high potential of the RC team. Working as an RC will promote new integrated research projects. Additionally, the visibility will increase, allowing further improvements to international cooperation.

The RC involves three faculties: Education, Humanities and Technology. There seems to be a solid foundation for success. The cooperation will offer attractive positions for master's level and doctoral students. The fit with Oulu's intention to further establish itself internationally is good, given the traditional science methods involved here. There seems to be strong support for technology at Oulu and its integration with educational training. So, in this regard, there seems to be a solid foundation for the success of the proposed RC.

No national collaborations are reported in the proposal. National cooperation is strongly recommended. In fact, the bibliometric study shows a positive picture. In relative terms, the national collaborations are associated with a slightly higher impact (.99 vs, 91). This area needs further development.

International groups are mentioned in the proposal (Chicago, Dallas and CERP), but seemingly as sources of inspiration rather than as current or intended collaborators. The learning lab is a great resource to attract both younger and senior researchers. The prospect for skills training is good. It can be expected that the researchers will have a higher degree of mobility. For instance, the hiring of Marie Curie fellows will be very beneficial. There is insufficient description about how international collaboration would help this RC to develop. There is also a lack of discussion on how specific collaborations are going to be carried out.

#### **D.3.5. Significance of the RC for the researcher training and promotion of professional careers in research**

This RC has a great potential via e.g. the Oulu University Graduate School. The learning lab is also an important resource to attract both younger and senior researchers. The prospects for skills training are good, given the traditional science methods involved here. It can be expected that the potential for researchers mobility will be increased, for instance hiring of Marie Curie fellows will be very beneficial.

#### **D.3.6. Societal impact**

The expected societal impact of the RC project is high, and most relevant. If successful, there is great social impact in the areas of special education and counselling. The use of technologies to aid professionals in a variety of fields also offers real social payoffs.

#### **D.3.7. International competitiveness or international comparability**

There are a number of groups doing research in the area of Learning Labs and using the theories in this RC. However, this research program seems to be broader. It seems that this is a solid group of researchers whose primary focus is more national than international. The focus in the proposal is also more national than international, but it is advised not to neglect the importance of internationalisation. In fact, the bibliometric study suggests potential for a high international impact.

#### **D.3.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

This proposal makes innovative use of different technologies and laboratory methods to aid those dealing with facial communication. Their overall goals are innovative and well-conceived, but their self-assessment as being

an international leader is not well documented in the proposal. The theoretical contributions are not clear. The big question: how are the five groups or subgroups going to collaborate?

The strength of this proposal is in its ambition to bring together disparate research groups and individuals at Oulu and forge a distinct thematic research framework. The team is in an early stage of development and the potential of creation of real collaboration remains to be proven in practice. The proposal is a good example of a *VENI* project. If successful, the consortium might grow within 4-5 years into a *VIDI*. The level and potential of the proposed RC are concluded to be very good.

**D.3.9. Final rating (1 – 6): 4,0 (very good)**

## **CATEGORY VIDI**

### **D.4. RC iPoB – Integrative Population Biology; RC Head Juha Tuomi (evaluated by panels H&B and T&NS)**

#### **D.4.1. Scientific quality and innovativeness of the research plan**

The plan has a well-thought out structure and the different parts are logically connected. The RC has made a strong case for being a self-organised group with shared vision. The research being conducted is very good and the plans are logical.

The research proposed is grounded in fundamental, basic science. The project will most likely produce high quality science, since it has potential, as is evident from the track record. The RC identifies risks as being the forthcoming retirement of a number of PIs and they seek to recruit new staff that has both subject specific and cross-subject skills.

Combining the research in the way proposed will certainly be beneficial, since the groups have been working together for a few years and they all clearly fit under a joint population biology umbrella. While the focus of the group is fine, there should be some effort to broaden the 'reach' of the group within Oulu and outside of Oulu.

#### **D.4.2. Feasibility of the research plan**

The methods are only briefly described but seem to be the standard ones used in this field, but no in depth research foci have been made explicit.

The RC PIs appear well aware of the needs for growth and sustainability for the group and feel that the organic way the group has come together bodes well for long-term stability and attractiveness for recruitment.

The four themes are well aligned to global research gaps. No problems are evident when considering the Materials management plan. No noteworthy ethical issues are involved.

#### **D.4.3. Competence of the RC and research teams**

The director has a very solid publication record with a mix of empirical and theoretical work. He has experience in leading larger groups, but his interaction network has been mostly national and Nordic. He has not obtained major external funding the last 10 years.

Overall, the publication records of the younger PI's are good or very good for their stage of career. However, the panels felt that there was a lack of big hitting papers in the really top journals.

The publication record of the RC is very solid and good, but the panels found it hard to see developments towards higher international impact.

The main benefit is the combination of empirical and theoretical work. The division of labour is, however, not clearly stated.

#### **D.4.4. Research environment and collaboration**

There is an added value in terms of the focus on basic scientific questions regardless of taxonomy, which would bring people from different areas together in a productive way. This is an initiative to coordinate PhD training in a broad interdisciplinary context, but the innovation aspects are not made explicit. The panel recommends that the RC finds more opportunities for upgrading existing faculty staff (not just doctoral students) through interdisciplinary training and self-organised sessions within the RC.



Sufficient infrastructure seems to be in place, but explicit information is largely lacking.

Despite the number of excellent groups in Finland in this field there seems to be very little collaboration with these groups.

There are plenty of examples of international collaborations, but it is unclear how and why some of the international cooperations make a difference. The publication list for the entire RC has very few non-Nordic names, and quite some papers on which none of the PIs is an author. The RC should think about important strategic collaborations that they might prioritise and think clearly about how the collaborations help deliver success towards the success of the project.

#### **D.4.5. Significance of the RC for the researcher training and promotion of professional careers in research**

Given the size and level of experience of the proposed RC there are ample opportunities of very good PhD supervision. One area the RC may need to work on is to increase the international diversity of backgrounds of staff and doctoral students in the group.

There are good resources for supporting postdoctoral research careers, promotions of mobility less clear. Essentially all names of postdocs and graduate students are Finnish. The panels recommend that there are more opportunities created for all people in the RC to take on leadership and visionary roles.

#### **D.4.6. Societal impact**

Projects like this has limited direct societal value, but having a well-integrated population biology RC in Oulu is important for Finnish Society at large and some of the applied work listed by the RC is directly relevant, but very little on how and why this is so has been explained in concrete terms.

#### **D.4.7. International competitiveness or international comparability**

The RC has a high quality but has some distance to reach the leading core in this field, even on a national level, and there is quite a gap towards the international top in population biology. It is hard to see how the PIs aim to narrow this gap during the course of future years.

#### **D.4.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

There are important strengths in what this RC has to offer such as the self-organised and shared vision of the group. However, the innovative novel directions should have been clearer, and further development plans should have been more specific and ambitious. It is hard to see how world class research is going to develop. An upcoming problem is that two of the PI's are soon reaching retirement and the panel strongly recommend that the recruitment process of new senior as well as more junior staff is started as soon as possible to maintain, or increase, the quality and size of the RC.

#### **D.4.9. Final rating (1 – 6): 3,8 (good – very good)**

### **D.5. RC NEBES – Northern Environment, Biodiversity and Ecosystem Services research; RC Head Björn Klöve (evaluated by panels H&B and T&NS)**

#### **D.5.1. Scientific quality and innovativeness of the research plan**

This is a well written proposal with markers of achievement and ambition appropriate for the Vidi-level. Interdisciplinarity is convincingly emphasised and many PIs are involved. Many of the objectives are challenging and require world class research. The RC uses a combination of hydrology, geomorphology, ecology, and environmental social sciences which is very laudable. It is recommended that the plan is supported by developing an overarching framework or grand challenge that the whole group is working towards to support coherence and also to support clarity on what the group is about for external collaborators and funders.

There is potential for significant new outcomes. Some of the research questions are very large and general and it is not clear how the research programme will address them (e.g. on environmental uncertainty) although those questions are still important. Research on other more focused questions will result in significant outcomes over time (e.g. How does restoration affect biodiversity, hydrology, and nutrient and greenhouse gas fluxes of restored forest and peat lands?) and this will be supported by international collaboration to make the work stronger and more suitable for high impact and Nature papers. The external funding, of particularly the Director, is substantial, but since the proposal aims to cover almost everything in this field, there is a danger of

either spreading efforts too thinly, or focusing major efforts on a few key questions at the expense of others, without a proper evidence-based evaluation of strengths, weaknesses and feasibility.

There is certainly merit in working as an RC as the societal problems outlined by the proposal require interdisciplinary research and solutions. The RC should give some more thought to how it structures and phrases its scientific questions within an overarching framework. It should have been made more explicit how this is going to make a concrete difference in terms of research output that will be used and cited by the international community of interdisciplinary groups with similar interests.

#### **D.5.2. Feasibility of the research plan**

The RC is advised to think about how it prioritises its research questions to support a schedule of activity. Only broad research questions are given with no indication of methods or schedule. More explicit feasibility information is missing, so we remained in the dark on how this work will be carried out in practice. The plan and research questions are too broad and sketchy to be fully credible in terms of feasibility. Many of the questions posed are substantial enough to have been single interdisciplinary RC projects on their own. It remains unclear how they are going to be prioritised in such a way that the RC would end up focusing on the most pressing questions at the interface of hydrology and ecology that can be feasibly addressed. In other words, what is it that the RC can achieve the coming years that would surpass mere joint method development? Where will their future joint papers make an international difference?

The RC is highly competent at delivering interesting science outputs and has very good grant funding portfolio. The resources will need to be targeted to prioritised research questions within this highly interdisciplinary and very welcome research domain.

There is a good balance between senior and junior researchers in this RC, and the available facilities and resources appear to be state of the art. Internationality is good, with a fairly high proportion of non-Finnish researchers.

There are three teams suggested which together will make an extremely good RC. The RC appears to be relatively well integrated, but details on the organisational structure are lacking. The RC is encouraged to think about novel methods through which the team may come together in a stimulating way to create new innovations in this field.

There are no comments on the Material management plan. There are no ethical issues involved.

#### **D.5.3. Competence of the RC and research teams**

The leader of this RC has a very good fund-raising and organisational track record, and has clearly played an important role in leading and coordinating major projects and multi-university doctoral centres. However, the publication record is less convincing. The journals used are very good quality but the director will benefit from being part of an RC that addresses global challenges and which leads to 'big story' publications that are high impact and gain greater citations. The director has a good expertise in hydrology and peat land processes. Tackling, for example, peat land processes of global interest in an interdisciplinary way would certainly be of merit and would enable enhanced citations.

There are some very strong PIs in the team with strong track records and very good research papers and profiles, although there is also considerable variation among the PIs.

The joint summary list for entire RC is very good demonstrating that they occasionally have (co)authored work in international top journals in recent years, and that the drive to continue to expand their impact is present. There are a wide range of topics covered with some very good quality papers. The interdisciplinary spread over Faculties and Departments is good, and the objectives on expected joint output and PhD training commendable.

The expertise of the PIs is nicely complementary, and while there are three teams, the division of labour in the RC is not clearly addressed. It is not clear how these all then combine within the overall RC.

#### **D.5.4. Research environment and collaboration**

The RC promotes multi-disciplinary research in hydrology, engineering, ecology, sociology. There will be benefits of creating shared infrastructure and resources plus an interdisciplinary training environment for doctoral students and staff. The interdisciplinary nature of the project appears to be mostly genuine, the jointly available infrastructure is sufficient, and the strategic interests for applied ecosystem research in Northern Finland

are credible. The RC is nationally very well connected, also because of PIs having good connections to government bodies outside the university.

There is a field station and a history of datasets that can be shared. The RC builds on a track record of field and lab research at Oulu. The research of this RC is fully compatible with the strategic research priorities of Oulu University.

Shared doctoral training centres and collaborations with other research field station sites that are mentioned (e.g. Finnish Game and Fisheries Research Institute) will contribute to the success of the project.

The international collaborators are strong and some are notable. These are productive collaborations, which occasionally produce top papers. Partnership in a large EU-project is clearly an asset as well. The panel recommends that the RC considers some more strategic collaborations which could be developed with international partners (e.g. institutes with field sites and data sets, other international groups with similar interests) to enable the RC to deliver world class research and improve the quality and international relevance of research outputs.

#### **D.5.5. Significance of the RC for the researcher training and promotion of professional careers in research**

There is potential for excellent doctoral training provision across disciplines although it is not clear how this would be delivered by the three team structure outlined in the document. The team as a whole already has a lot of PhD students and so the potential is there to quickly create a large cohort who might share enthusiasm and skills to support interdisciplinary development. The VALUE program offers very good integrative possibilities. Marie Curie activities are not mentioned. There are several post-docs already, but no indications on how to further promote researcher mobility, which seems needed as the postdocs are less international than the PhD students.

Developing international networks for researcher exchange is planned and this should be further encouraged, in a strategic way, along with seeking funding for exchanges to global research centres who work on similar sorts of environments.

#### **D.5.6. Societal impact**

There are some laudable research questions, which may yield societal benefits. Work will be needed to ensure that step-change science is conducted to yield significant benefits, rather than incremental science. Therefore the RC is encouraged to think of what key areas they could focus on to get maximum societal impact for that part of their strategy. However, the panels note that the improved understanding of the effects of climate change on the ecology, landscape stability, and hydrology of cold environments such as in Finland and Fennoscandia is highly relevant for society and strategically important for the University.

#### **D.5.7. International competitiveness or international comparability**

Interdisciplinary cooperation is a model for success in this field. The RC is not at the top international level but they should be encouraged to get there. Their performance and impact according to their own comparisons seems to justify that, but the provided figures have not been scaled directly for number of personnel involved. The panels were not convinced about the chosen benchmarking institutes. There are many other strong centres internationally that could have been chosen and many geography departments and environmental science departments who cover the sorts of domains that the RC seeks to cover. The RC is asked to consider more carefully the nature of institutes it benchmarks itself against, as well as its own benchmarking methods. Nonetheless, this RC has VICI-potential and critical mass to achieve it when properly supported.

#### **D.5.8. Overall assessment: Main strengths and areas of development of the RC project, further remarks and recommendations**

Overall, a healthy level of ambition may be seen in this RC. The Director appears well versed to make this RC a success in the coming years. It is strategically important for Finland in terms of the quality of work and the topic of tackling hydrology, resources and interdisciplinary environmental science for the north territory. The group is very strong and its members are commended for their ambition. The key recommendations are concerned with the matter of designing a clear way to assemble teams, whose objective will be the solution of an overarching challenge. Each member of the staff should be able to agree on a goal that is realistically achievable. Ways in which interdisciplinary skills can be passed on to other staff and students within the RC in a structured manner should be developed. Mechanisms for prioritising activity and structuring research bids need to be

developed (e.g. key performance indicators or targets for the RC). There needs to be a far greater degree of clarity on how to derive and deliver world class integrated research.

#### D.5.9. Final rating (1 – 6): 4,0 (very good)

### 4.3. Summary of the evaluation results and ranking of RCs

The evaluation of individual RCs is shown in Table 4. Altogether 13 RCs were considered as top quality and ranked in the group A. They should receive the financial support as planned for the most successful RCs by the Steering Committee and University Board of Directors. In addition to this, nine RCs were recognised as promising communities with a great potential to success if necessary support were provided by the University of Oulu. They were classified in the following Table 4 as the group B.

**Table 4.** The scoring and ranking of RCs given by the expert reviewers in the three panels, according to the three participation categories: veni, vidi and vici. The scoring scale ranged from 1 to 6, 6 being the best possible scoring. Thirteen RCs were recognised as outstanding (ranking A) and nine RCs as excellent (ranking B).

CATEGORY VENI					
RC ACRONYM	RC HEAD	RC NAME	PANEL	SCORES	RANKING
AgeAds	Heikkinen Hannu I	The age of adjustments? Critical and historical perspectives on governing citizens, wellbeing and environment	HS	6	A
PopStatGen	Savolainen Outi	Population and statistical ecology	H&B	5,6	A
GlobalHealth	Jaakkola Jouni K	Global change, geography, environment and public health research	H&B, T&NS	5,5	A
INSPIRIES	Huotari Maija-Leena	Institutions and practices of new literacies	HS	5	B
OSSI	Oivo Markku	Oulu software and systems initiative	T&NS	5	B
PSH	Oinas-Kukkonen Harri	Persuasive systems for health	T&NS	5	B
BIGS	Röning Juha	Biomimetics and intelligent systems	T&NS	4,5	
LUMINOUS	Pongrácz Eva	Sustainable Northern communities: Integrating smart systems, structures and change	H&B, HS, T&NS	4,2	
MAD-2C	Laukka Seppo J	Multimodal analysis of dynamic cooperative communication	HS, T&NS	4	
Multi-Scale-Test	Argatov Ivan	Multi-scale testing and trans-scale modelling of high-performance materials	T&NS	4	
SusBen	Kuopanportti Hannu	Sustainable Benification	T&NS	4	
OASIS	Tervonen Osmo	Oulu Arthritis consortium - Synergy is solution	H&B	3,5	
CREMA	Ojala Juha	Community research in education music and art	HS	3	
OCCI	Veijola Riitta	Oulu center for clinical immunology	H&B	3	
Phototransduction	Timonen Markku	Phototransduction mechanisms in mammalian brain	H&B	2	
GSC	Mäkelä Jyrki	Gastrointestinal surgical community	H&B	1,5	

CATEGORY VIDJ					
RC ACRONYM	RC HEAD	RC NAME	PANEL	SCORES	RANKING
BARC	Niskanen Markku	RC in bioarchaeological research	HS	6	A
MOMA	Laitinen Risto	Molecular materials	T&NS	6	A
MtM	Kordas Krisztian	More than Moore	T&NS	6	A
CLRC	Kunnari Sari	Child language research center	HS	5,5	A
Proteus	Ruddock Lloyd	Protein structure and function research community	H&B	5,5	A
iUBI	Ojala Timo	Ubiquitous interactions	T&NS	5	B
Living Stories	Syrjälä Leena	Narratives in education - living stories in theory and practice	HS	5	B
NorBE	Niinimäki Jouko	Northern bioeconomy	T&NS	5	B
ProChemE	Keiski Riitta	Sustainable solutions for production processes and environmental applications	T&NS	5	B
EduPhil	Siljander Paul	Educational theory and philosophy	HS	4,5	
ACG	Kallunki Juha-Pekka	Accounting decisions and corporate governance	HS	4	
CASR	Fabritius Timo	Centre for advanced steel research	T&NS	4	
COMPANION	Mainela Tuija	The complexities of organisational activities	HS	4	
GPC-DEDE	Majamaa Kari	Genetic, physiological and clinical aspects of development and degeneration - from the newborn to the oldest of the old	H&B	4	
HEAT	Svento Rauli	Heterogeneity in economic applications and theory	HS	4	
IEM	Kujala Jaakko	Industrial engineering and management	T&NS	4	
NEBES	Klöve Björn	Northern environment, biodiversity and ecosystem services research	H&B, T&NS	4	
NRNE	Maier Wolfgang	Natural resources of Northern Eurasia	T&NS	4	
TE	Lehtola Veli-Pekka	Transcultural encounters	HS	4	
iPoB	Tuomi Juha	Integrative population biology	H&B, T&NS	3,8	
COMET	Karttunen Tuomo	Carcinogenesis: origin, mechanisms and treatment	H&B	3,5	
CATEGORY VICI					
RC ACRONYM	RC HEAD	RC NAME	PANEL	SCORES	RANKING
CMV	Pietikäinen Matti	Center for machine vision research	T&NS	6	A
CVR-Co	Huikuri Heikki	Cardiovascular research community	H&B	6	A
MA	Järvenpää Esa	Mathematical analysis	T&NS	6	A
RELATE-OULU	Paasi Anssi	Crossing borders: the relational and territorial politics of bordering, identities and transnationalisation	HS	6	A

Tissue Homeostasis	Myllyharju Johanna	Tissue development, homeostasis and malignancy	H&B	5,9	<b>A</b>
LET	Järvelä Sanna	Learning and educational technology research unit	HS	5,5	<b>B</b>
SPARC	Usoskin Ilya	Space physics and astronomy RC	T&NS	5,5	<b>B</b>
AMASS	Holmström Lasse	Applied mathematics and statistics	T&NS	5	
CAS	Kostamovaara Juha	Circuits and systems group	T&NS	5	
COACT	Kärkkäinen Elise	Complexity if (inter)action: Towards an understanding of skilled multimodal participation	HS	5	
DCE	Latva-aho Matti	Department of communications engineering	T&NS	5	
DynaHEALTH	Keinänen-Kiukaanniemi Sirkka	Dynamics and determinants of life course health and wellbeing	H&B	5	

## 5. SUMMARY AND CONCLUSIONS

### 5.1. Views of the H&B Panel

#### 5.1.1. General considerations

Overall, the panel felt that there was a good balance between projects focused on global, national and local issues. Topics of specific interest to Northern Finland, such as seasonal depression and type 1 diabetes are addressed, but there is also an aspiration to contribute to global health, as well as to core topics in biochemistry, plant and animal genetics, and medicine. The Vici RC's that were evaluated were strong, whilst the quality of those in the Veni and Vidi categories was more variable. Some Veni RCs were assigned thus for administrative reasons, despite being composed of seasoned researchers, but we identified few that would be competitive for ERC Starting Grants.

#### Links to the university strategy

The vulnerability resulting from geographical isolation in a small country (as far as population is concerned) means that University of Oulu must play to its strengths whilst recognising up-and-coming topics that are likely to be tomorrow's strengths. The field of biomedical sciences is one of your strengths, but within it, there should be a sharper distinction between priority areas and those that are less competitive. The funding consequences of exercises, such as RAE2013, should be more pronounced than has hitherto been the case. The most successful RCs should be given maximum support, whilst those providing only a credible research environment for masters-level training should be more modestly funded, creating room for financing new (and inter- and multidisciplinary) initiatives, and topics of strategic interest to the university and region. The university's strategy and focus areas are currently defined too generically. An 'internationally strong scientific profile' is a worthy goal, but to achieve it, University of Oulu should define more precisely its strategic priority areas, based on the RAE outcome. Recruitment, conversely, should be based on hiring the best people, with genuine strategic vision of their own, regardless of topic area, in order to allow new strengths to emerge.

We suggest that, while there are significant strengths today (primarily the very successful Vici group), the future may require that new areas of strength be identified to grow, possible by recruiting future stars in additional areas.

#### Research environment and resources at the University of Oulu

Biocenter Oulu is a precious resource that nurtures high-quality international bioscience research. It supplies essential infrastructure (e.g. transgenic animals, structural biology), a disciplined but supportive structure for doctoral education and an attractive setting to recruit gifted foreign scholars. Its core facilities require continuous, dedicated investment to ensure access to the latest technologies. The strength of the RCs that Biocenter Oulu embraces testifies to its value. Maintaining, updating and revamping core facilities is costly, both in

equipment costs and in employing skilled senior technical staff that can effectively interface bench scientists with high-end core equipment. However, maintenance and development of core facilities should be a strategic priority for University of Oulu. Further investment in resources for imaging, structural biology, genetics and genomics, including biobanks, is needed to enable the relevant groups to maintain (for Vici RCs) and achieve (for Veni and Vidi RCs) international competitiveness. The establishment of the Medical Research Centre is another positive development which will be of great importance to further strengthen patient-oriented research.

### **Functionality of the University of Oulu organisation**

Within the biosciences, University of Oulu transcends the rigid boundaries of traditional subject areas. The groups within Biocenter Oulu and linked departments are already interactive and sufficiently cross-disciplinary to enable top-level science to flourish. Most of the RC's self-defined in the current RAE represent genuine groupings that could be recognised more explicitly within a single faculty of health and biosciences, each contributing also to teaching according to its strengths. University of Oulu should ensure that all health and bioscience groups interact within a single cohesive administrative structure. Effective and transparent communication within such a large organisation is essential and requires the formation of a strong and decisive faculty management team, which would deliver effective top-down strategic management to ensure that promising new initiatives are identified and nurtured. Such initiatives should formulate clear success criteria to live up to, either in internationally competitive fundamental research, or in key strategic research for the Arctic or Northern Finland, or in securing academic breadth in BSc and MSc education.

The panel felt that the Veni, Vidi, Vici subdivisions of the RAE were overlapping, and contribute little to overall strategy (though are useful denominations for an individual's career progression). Ideally, the most successful RCs should combine all three level of achievement: internationally recognised leadership, breakthrough potential and brilliant newcomers. On the other hand, there is strong support for the RC concept, which makes more sense than traditional departments. University of Oulu should create a follow-up mechanism to ensure that the RCs recognised as outstanding or excellent continue to function as unified entities, and use additional funding for strategic planning and joint activities, e.g. by appointing programme managers for individual RCs or several RCs combined. Communication between RCs with complementary, but independent, research focuses should be encouraged by, for example, the formation of virtual Institutes, Centers or Colleges that have common graduate programs, workshops, international speaker series, and postdoctoral seminar programs. For example, there is a natural synergy between Tissue Homeostasis, COMET and OASIS.

### **General level of science at the University of Oulu**

The median score of the units in H&B is in the range of 4-5 (very good to excellent). This reflects an overall strength of University of Oulu. However, the most outstanding groups deserve stronger emphasis whilst the weaker RCs should be encouraged to restructure or regroup, to raise the overall level yet further. Those with strengths in other areas (teaching, clinical knowhow, public outreach) should focus thereon, rather than attempting to achieve international scientific prominence that is not realistic when critical mass of junior and senior excellence cannot be recruited. The panel recommends, in particular, that the stronger groups in the COMET and OASIS RCs should ally with RC Tissue Homeostasis to promote excellence, and that iPoB adopts innovative approaches similar to PopStatGen to secure the field of population biology.

### **Highlights**

The H&B domain in Oulu is strong in basic cell biology, plant, animal and molecular genetics, and biochemistry and in key areas of translational medicine (cardiovascular disease, some aspects of cancer and developmental disorders). It has the potential to be a significant national and international power in structural biology, provided it hones its research portfolio in this area, and invests more heavily in the latest instrumentation, and in population biology, provided an integrated plan for future recruitment is developed.

### **Missing parts and gaps**

An important outcome of the RAE should be a more internally competitive research environment. Research-based teaching should also be strengthened, to better integrate science and education.

## 5.1.2. Final recommendations

### Doctoral training

The replacement of national (vertical, subject-based) with university-based (horizontal, multi-disciplinary) graduate schools in Finland fosters competition between universities, but risks entrenching parochial practices and narrow scientific vision that a small country can ill-afford. The ethos of well-structured doctoral programmes such as that of Biocenter Oulu should be extended to University of Oulu as a whole, but broad doctoral education in the life sciences can only be achieved by forming content-driven alliances with comparable institutions in Finland, the Nordic region or at least Europe, to increase the range of technical skills, expertise and international exposure of its students. Increased use of instruments such as Marie Curie programmes, EMBO or FEBS short-term fellowships could foster this. There should be the widest possible salary differential between PhD student and junior postdoc to incentivize rapid completion of PhD theses.

### Career development and recruitment programs

Recruiting foreign scientists is vital for international competitiveness, and requires a generous start-up package and other incentives. The initiative for this should come from the top, as a strategic action. In the absence of a dedicated national agency to support inward mobility, University of Oulu, together with the city and local high-tech companies, should establish a service to provide practical assistance for relocation, especially addressing family issues (employment / professional training of spouses, children's multilingual education, pension and tax issues, real estate etc). The International Staff Mobility Office of the University of Copenhagen may provide a good model for this. To facilitate recruitment, Oulu should expand its tenure-track programme. To be viable, only the best junior recruits should succeed in getting tenure. Others would have to seek opportunities elsewhere, or in a staff position as laboratory or core facility managers.

### International relationships

See above (doctoral education, recruitment). Collaborations should be based on genuine scientific partnerships, not just by supplying access to valuable resource collections.

### Fund raising

Without changes in the national tax system, any prospective acquisition of funds from private donors is unlikely to provide substantial funding. However, University of Oulu is a vital asset to the local economy, so the institution deserves major investment from the city, the regional development agency and larger businesses. Donors should recognise the importance of University of Oulu achieving a strong profile in basic sciences, not just those with immediate marketplace applications.

The committee was in agreement that strategic arrangements could be made between the University and the Community, whether it is with funding organisations, industry or city government: actions that could benefit all stakeholders in the joint effort to provide the very best regional business and academics.

### Summary of major priorities

- Attracting new stars to strategically-important topic areas, offering viable start-up packages
- Linking with city and industry to create a joint international staff recruitment facilitation agency
- Sharper prioritization of funding with differentiated focus on fundamental, strategic, or education excellence
- Encouraging / empowering strong RCs to organise joint activities of their members
- Strong communication between RCs to avoid isolation
- Investment in core facilities, especially innovative high-end instrumentation in genomics, cell biology, structural biology, molecular biomechanics, and imaging
- Create a follow-up mechanism to ensure that the RCs recognised as outstanding or excellent continue to function as unified entities.

## 5.1.3 RAE process

The RC concept has merit, but the Veni/Vidi/Vici categorisation is problematic at a collective level, and especially the application of uniform assessment criteria is not appropriate. RCs need clear guidance on what is



expected of them in the RAE submission. They should be asked to explain in everyday language why their proposed activities are of general importance and cutting edge, and to set clear and measurable goals to be achieved for the following period. While the information requested was useful, the Committees felt that a more explicit plan for the use of funds and future requirements was required. We also suggest that there be no conflict of interest between the Steering Committee and the RCs.

## **5.2. Views of the HS Panel**

The HS panel is impressed by the commitment of most RC's to develop and improve their research, and some of this research is of high international standards. The panel gives the following recommendations to Oulu University and to Research Communities who took part in the evaluation process:

### **5.2.1. Proposal preparation**

University of Oulu should provide proposal preparation workshops for the Research Communities participating in the assessment process. Such a workshop could provide RC team leaders with an overview of RC proposal guidelines, clear instructions on proposal writing, guidance on the information to be included, and examples of successful proposals from previous assessments. Proposals should clearly identify innovative aspects of the research, the contribution and value added by the research community above what would otherwise occur in a normal academic environment, and the potential for the RC to promote internationally recognised scholarship.

### **5.2.2. Research Community management**

The RC's should clearly describe the manner in which the different groups within the community will be integrated and work together. Research groups within a Research Community should be encouraged to think carefully about ways to maximize the complementarities between them and to develop a concrete set of organisational protocols that would be incorporated into the proposals. This is especially true for interdisciplinary work where success depends on how a Research Community is organised to promote interdisciplinary cooperation. Interdisciplinary work brings both strengths and weaknesses and RC's should propose institutions and other means by which they will overcome epistemological boundaries. Some RC's have solved this issue well. BARC is a good example of a group with an organisational structure and plan to promote interdisciplinary collaboration. The university can also help to facilitate cooperation through institutional support. Eudaimonia might take this responsibility and help integrate the groups within HS.

### **5.2.3. Globalisation of research**

International recognition requires Research Communities to bring a global perspective to their scholarship. They can utilise the comparative advantages of Oulu and its Arctic location but at the same time think globally in contextualising their research and promoting internationally by publishing regularly in English. TE is an example of a research group whose scholarship should be more widely known to the global research community. Many scholars from Europe, the US and Asia, for example, want to learn about indigenous and minority cultures and their challenges. EduPhil is another example of a strong Research Community that could disseminate their research internationally and contribute more to internationally recognised research-based teacher education. Teachers need a strong philosophical foundation for their empirical and practical work. We believe that research-based teacher education, technology enhanced learning, and research that is related to Oulu's geographical location in the arctic region, are very good focus areas for research at Oulu University.

### **5.2.4. Mobility**

The faculty, researchers, post-docs and Ph.D.'s at the University of Oulu should be more mobile. Oulu graduates tend to stay in Oulu, and in our view there should be stronger stimuli for these graduates to discover what other places in the world can offer. The University should expand efforts to attract international Visiting Professors. Some HS research groups have already done this, for example LET and Living Stories. The University could increase participation in the Finland Distinguished Professor (FiDiPro) funding programme to enhance long-term international cooperation in scientifically significant and strategically key fields and to strengthen the internationally competitive research and innovation of the university. Increasing the number of open tenure track faculty positions and international recruitment for those positions would foster faculty development and growth at Oulu.

### **5.2.5. Evaluation process**

The differentiation of RC's into the three categories Veni, Vidi and Vici was helpful. However, the evaluation form and criteria were the same across all three categories. It would be useful to provide a separate evaluation form for each category with category-specific evaluation criteria.

The HS panel feels it is not very helpful to rank order RC's across the three scientific domains of HS, HB and T&NS on one scale of scientific quality, in view of the very different nature of scientific endeavour between these domains.

## **5.3. Views of the T&NS Panel**

### **5.3.1. General considerations**

It is remarkable how the vast majority of the RCs are of very good, excellent or outstanding quality. The University of Oulu should be congratulated on the high level of performance and ambition of the RCs.

The university should work hard to internationally promote the excellence of its groups in key Arctic research fields, to support the international recruitment of world stars, new researchers and enhanced international funding. The establishment of a new Graduate School in this area would be very welcome and should be a priority activity.

Many RCs are in need of progression planning for staffing their research and creating sustainability. There is an urgent need for the University of Oulu to enable this through accelerated programs of tenure track junior Professorships. We expect that this will also help to attract very strong academics from across the world.

We recommend that the University increases the level of support to research communities for preparing large and complex funding applications such as to the EU. Such support may take the form of dedicated high level administrative support staff that are experienced at dealing with EU proposal paperwork or could be outsourced to specialist organisations to support bid preparation.

We strongly recommend that the University of Oulu takes the lead in Finland in increasing the efficiency of the PhD process so that better quality PhDs are produced in a shorter period of time.

We recommend that interdisciplinarity is supported more generally through support mechanisms across campus to try to link together research communities, communications and create an innovative and stimulating research environment. Support might take the form of knowledge exchange officers or coordinators, who promote interdisciplinary activity, pump priming or seed corn funds, seminars, stimulating activity in Nordic networks etc.

There are a number of key strategic research areas, specific for northern Finland and for the University of Oulu in areas such as metallurgy, mining, ICT, northern hydrology, climate change and environmental biogeochemistry which need support in all possible ways to use the potential that exists to ensure long term growth and the promotion and development of excellence. This will involve supporting entrepreneurship, facilities, industrial relationships and knowledge exchange.

The University must continue to support fundamental disciplinary science and basic research in strategically important areas (e.g. pure and applied mathematics, geophysics) to create strengths on which to base interdisciplinary activity.

We encourage the university and RCs to collaborate within Finland to create consortia to leverage complementarities, in order to maximise domestic resource efficiency.

### **5.3.2. Final recommendations**

RCs should be encouraged to develop key performance indicators or some 'measures of success' that are specific to their own subject domains and RC needs. This would enable the RCs to determine milestones, develop clear strategies for achieving them and to determine whether they are achieving their goals. Such a process would also enable the university to examine progress over time. This scheme would also facilitate any evaluations in 2019/2020 as the panels could look at how the RCs are delivering against their objectives. Note that performance indicators can be different between RCs and disciplines and so these will necessarily need to be sector specific.

In the T&NS fields it was notable that there was a very strong dominance of male RC leaders. Out of 38 people who attended the open session with the T&NS panel, only three were female. More work is required to build research leadership among females in this area.

### **5.3.3. RAE process and future guidelines**

The process of evaluation was good and very diverse internationally. The form of evaluation had repetitive questions and could be shortened without losing any important information. Staff across Oulu felt that the RC evaluation process:

- A. Stimulated good discussions and in some instances served to facilitate new RC development that is real, although in some instances the RCs were artificial for the purpose of the exercise.
- B. Was too prescriptive and limiting in its rules so that really exciting and beneficial RC entities did not form in the way that they would have liked.

There should have been different forms for Veni, Vidi and Vici categories. Determination of the meaning of innovation should have been done. Clarification of the meanings of Creativity, Innovation, Novelty in the evaluation process should have been done.

Recommendation for integration of teaching and research is given, as well as recommendation to reward research – based teaching.

## **6. ANNEXES**

List of RCs and their members

Steering Committee

Guidelines for the RCs

Guidelines for the panellists and evaluation form

Full bibliometric analysis of the RCs

Forms:

- Registration
- Submission of CVs and lists of publications
- Submission of the research plan

## UNIVERSITY OF OULU RESEARCH COMMUNITIES PARTICIPATING IN RAE EVALUATION

Together 49 Research Communities (RC) participated in the RAE evaluation. The table lists the RCs in alphabetical order according to the RC Head. The table also shows the other Principal Investigators (PIs) of the RCs, the personnel of the RCs, institute of the RC Head, name of the RCs, acronyms of the RCs, participation category, evaluation panel (H&B = Health & Biosciences, HS = Human Sciences, T&NS = Technology & Natural Sciences) and the number of research groups (RGs) in each RC.

RC HEAD	RC other PIs	RESEARCH TEAM MEMBERS BY TEAMS	DEPT / INST OF RC HEAD	RC NAME	RC ACRONYM	CATEGORY	PANEL	NO RGs
Argatov Ivan	Porter David, Louhisalmi Yrjö, Laitinen Erkki	<b>Argatov Ivan:</b> Kangaspuoskari Matti, Lahtinen Hannu, Teeriaho Juha-Pekka, Väliheikki Osmo. <b>Porter David:</b> Alasaarela Ilpo, Hannula Jaakko, Miettunen Ilkka, Pikkarainen Teppo, Saastamoinen Ari, Saatio Tommi, Seppälä Antti <b>Louhisalmi Yrjö:</b> Liedes Toni, Vuotikka Antti-Jussi. <b>Laitinen Erkki:</b> Lapin Alexander, Kumpulainen Martti, Risto Vesanen.	Mech. Engin.	Multi-scale testing and trans-scale modeling of high-performance materials	Multi-Scale-Test	Veni	T&NS	4
Fabritius Timo	Porter David, Leiviskä Kauko	<b>Fabritius Timo:</b> Gornostayev Stanislav, Heino Jyrki, Suopajärvi Hannu, Sulasalmi Petri, Heikkinen Eetu-pekka, Haapakangas Juho, Iljana Mikko, Makkonen Hannu, Visuri Ville-Valtteri, Heikkilä Anne, Kärnä Aki, Aula Matti, Alatarvas Tuomas, Kempainen Antti, Sipola Teija, Roininen Juha, Luukkonen Ilmari, Tamminen Satu, Tiensuu Henna. <b>Porter David:</b> Karjalainen Pentti, Mäntyjärvi kari, Somani Mahesh, Nousiainen Olli, Juuti Timo, Järvenpää Antti, Kaijalainen Antti, Kisko Anna, Kodukula Suresh, Manninen Timo, Mehtonen Saara, Pallaspuro Sakari, Pyykkönen Juha, Tervonen Henri, Heikkilä Sami, Anttila Severi, Keskitalo Markku. <b>Leiviskä Kauko:</b> Ruuska Jari, Sorsa Aki.	Process Environ. Engin.	Centre for advanced steels research	CASR	Vidi	T&NS	3
Heikkinen Hannu I	Pietikäinen Petteri, Hakosalo Heini, Väyrynen Kari, Saarinen Jarkko	<b>Heikkinen Hannu I:</b> Meriläinen-Hyvärinen Anneli, Lepy Elise, Kasanen Mervi, Korjonen-Kuusipuro Kristiina, Leinonen Riitta-Marja, Näkkäläjärvi Klemetti, Mustala Aila, Huusko Svetlana, Massa Satu, Luoto Tim, Alt Eine, Lindh Johanna, Marttila Annamaria Sofia, Costa Manso, Claudia Isaura, Seppänen Anna Maarit. <b>Pietikäinen Petteri:</b> Myllykangas Mikko, Salminen Ville, Parhi Katariina, Turunen Jari, Sailo Annukka. <b>Hakosalo Heini:</b> Junila Marianne, Kylli Ritva, Vehkalahti Kaisa, Helminen Katri. <b>Väyrynen Kari:</b> Pulkkinen Jarmo, Ruuskanen Esa, Virkkala Mari-Anne, Korteniemi Kimmo. <b>Saarinen Jarkko:</b> Tervo-Kankare Kaarina, Kajan Eva, Pietilä Miisa, Hambira Wame, Kimaro Mary Ellen, Vainikka Vilhelmiina.	Humanities	The age of adjustments? Critical and historical perspectives on governing citizens, wellbeing and environment	AgeAds	Veni	HS	5

Holmström Lasse	Huhtanen Marko, Lehtinen Markku, Serov Valery, Sillanpää Mikko	<p><b>Holmström Lasse:</b> Klemelä Jussi, Niemenmaa Markku, Pasanen Leena, Iivonen Liisa, Karttunen Kyösti, Launonen Ilkka, Leppälä Emma.</p> <p><b>Huhtanen Marko:</b> Ruotsalainen Keijo, Kemppainen Jukka, Korhonen Lassi, Silvola Minna, Uusitalo Pauliina.</p> <p><b>Lehtinen Markku:</b> Lasanen Sari, Orispää Mikko, Vierinen Juha, Roininen Lassi, Norberg Johannes.</p> <p><b>Serov Valery:</b> Harju Markus, Kiili Hanna, Sandhu Jan, Fotopoulos Georgios, Kyllönen Urpo.</p> <p><b>Sillanpää Mikko:</b> Läärä Esa, Pikkuhookana Pinja.</p>	Mathem. Sci.	Applied mathematics and statistics	AMASS	Vici	T&NS	5
Huikuri Heikki	Ruskoaho Heikki, Kesäniemi Antero Y, Seppänen Tapio, Juvonen Tatu	<p><b>Huikuri Heikki:</b> Junttila Juhani, Perkiömäki Juha, Mälikallio Timo, Kaikkonen Kari, Kenttä Tuomas, Hookana Eeva, Peltola Mirja, Tikkanen Jani, Koivikko Minna, Piira Olli-Pekka, Aro Aapo, Huikuri Pirkko, Koski Päivi, Kaarlenkaski Sari, Kastell Päivi, Lehtinen Anne.</p> <p><b>Ruskoaho Heikki :</b> Vuolteenaho Olli, Kerkelä Risto, Aro Jani, Jurado-Acosta Alicia, Kaikkonen Leena, Kelloniemi Annina, Kinnunen Sini, Magga Johanna, Moilanen Anne-Mari, Ohukainen Pauli, Pennanen Harri, Perjes Abel, Renko Outi, Rysä Jaana, Serpi Raisa, Säkkinen Hanna, Tolonen Anna-Maria, Töllli Marja, Välimäki Mika, Ala-Kopsala Minna, Hänninen Sandra, Junno Juulia, Lehtoranta Lara, Alakoski Tarja, Elmadani Manar, Piuholta Jarkko, Szabo Zoltan, Taponen Saija, Ulvila Johanna, Vainio Laura.</p> <p><b>Kesäniemi Antero Y:</b> Santaniemi Merja, Ukkola Olavi, Marttila-Vaara Minna, Laurila Mirja, Malo Elina, Saukko Meiju, Pisto Pauliina, Lepistö Päivi, Kortetjärvi Saija, Häikiö Heidi, Ukkola Leena, Ojala Pia, Koistinen Marita.</p> <p><b>Seppänen Tapio:</b> Alho Olli-Pekka, Kortelainen Jukka, Noponen Kai, Seppänen Tiina, Tiinanen Suvi.</p> <p><b>Juvonen Tatu:</b> Kiviluoma Kai, Anttila Vesa, Biancari Fausto, Tsang Victor, Jensen Hanna, Yannopoulos Fredrik, Arvola Oiva, Haapanen Henri, Heräjärvi Johanna, Lehtonen Siri, Lorite Gabriela, Alestalo Kirsi, Mäkelä Tuomas, Pernu Roni.</p>	Internal Medicine	Cardiovascular research community	CVR-Co	Vici	H&B	5
Huotari Maija-Leena	Karvonen Erkki, Korkeamäki Riitta-Liisa, Riekkijukka	<p><b>Karvonen Erkki:</b> Kortelainen Terttu, Suominen Vesa, Kurttila-Mattero Eeva, Suorsa Anna, Harju Aki.</p> <p><b>Huotari Maija-Leena:</b> Askola Kreetta, Enwald Heidi, Hirvonen Noora, Karjalainen Riitta-Liisa, Käsäkoski Helena, Ek Stefan.</p> <p><b>Korkeamäki Riitta-Liisa:</b> Suvilehto Pirjo, Hytönen Marja, Jokinen Päivi, Mikkola Henna, Palmgren-Neuvonen Laura, Rousu Katja, Räisänen Sari, Tiainen Outi, Nikula Sirpa-Liisa.</p> <p><b>Riekkijukka:</b> Oja Mika, Sanchez Ivan,</p>	Infor. Studies	Institutions and practices of new literacies	INSPIRIES	Veni	HS	4

		Cortes Marta.						
Jaakkola Jouni K	Jaakkola Maritta, Ikäheimo Tiina, Vainio Olli, Rusanen Jarmo, Hjort Jan, Kostakos Vasileijos	<b>Jaakkola Jouni:</b> Maisonet Milred, Hugg Timo, Quansah Reginald, Alavaikko Salla, Ryti Niilo, Amegah Adeladza Kofi, Balogun Hamudat, Paaso Elina, Korkala Essi, Aittamaa Riitta, Siltari Hanna, Tuokila Mirkka, Mehtonen Ilkka, Koisma Janne, Hassi Juhani. <b>Jaakkola Maritta:</b> Lajunen Taina, Rantala Aino, Sripaiboonkij Penpatra, Heikkinen Sirpa, Hyrkäs Henna, Ketonen Sanna, Wallin Katri. <b>Ikäheimo Tiina:</b> Hintsala Heidi, Jaakkola Kari, Näyhä Simo. <b>Vainio Olli:</b> Syrjänen Riikka, Petrov Petar, Chaquise Eusebio, Kauppila Jaana. <b>Rusanen Jarmo:</b> Antikainen Harri, Kotavaara Ossi, Huotari Tiina, Määttä-Juntunen Heidi. <b>Hjort Jan:</b> Alahuhta Janne, Kivinen Sonja, Sormunen Henna, Tukiainen Helena. <b>Kostakos Vasileijos:</b>	Center for Environ. Resp. Health research	Global change, geography, environment and public health research	Global-Health	Veni	H&B, T&NS	7
Järvelä Sanna	Järvenoja Hanna, Hyvönen Pirkko	<b>Järvelä Sanna:</b> Panadero Ernesto, Laru Jari, Bissbort Dirk, Mykkänen Arttu, Näykki Piia, Malmberg Johanna, Kontio Mari, Kontturi Heikki, Oikarinen Juho, Väyrynen Tuija, Tikkala Päivi, Heimovirta Juha. <b>Järvenoja Hanna:</b> Määttä Elina, Koivuniemi Marika, Kurki Kristiina. <b>Hyvönen Pirkko:</b> Vuopala Essi, Impiö Niina, Kaisto Jenni, Inkilä Tommi.	Educ. Sci. Teacher Educ.	Learning and educational technology research unit	LET	Vici	HS	3
Järvenpää Esa	Filali Mahmoud, Hästö Peter, Lindström Mikael	<b>Filali Mahmoud:</b> Alaste Tomi, Arhippainen Jorma, Kauppi Jukka, Mattas Jussi, Rautio Juho, Rosqvist Juho, Salmi Pekka, Vedenjuoksu Tero. <b>Hästö Peter:</b> Berkovits Lauri, Hakkarainen Heikki, Tiirola Juha. <b>Järvenpää Esa:</b> Järvenpää Maarit, Suomala Ville, Li Bing, Koivusalo Henna, Sahlsten Tuomas, Chen Changhao. <b>Lindström Mikael:</b> Hyvärinen Olli, Nieminen Ilmari, Saukko Erno.	Math. Sci.	Mathematical analysis	MA	Vici	T&NS	4
Kallunki Juha-Pekka	Sahlström Petri, Järvinen Janne	<b>Kallunki Juha-Pekka:</b> Moilanen Sinikka, Jarva Henry, Lehenkari Mirjam, Middleton Alexandra, Karjalainen Pasi, Tan Irene. <b>Sahlström Petri:</b> Elsilä Anna, Lantto Anna-Maija, Vesterinen Heikki, Viero Markku. <b>Järvinen Janne:</b> Henttu-Aho Tiina, Kantola Hannele, Konochevich Julia, Vääätäjä Kim, Kari Johannes, Piironen Jukka.	Oulu Business School	Accounting decisions and corporate governance	ACG	Vidi	HS	3
Karttunen Tuomo	Jukkola-Vuorinen Arja, Karihtala Peeter, Koivunen Petri, Puistola Ulla, Salo Tuula, Turpeenniemi-Hujanen Taina, Vaarala Markku	<b>Jukkola-Vuorinen Arja:</b> Kauppila Saila, Peurala Emmi. <b>Karihtala Peeter:</b> Hintsala Hanna Riikka, Isohookana Joel. <b>Karttunen Tuomo:</b> Mäkinen Markus, Tuomisto Anne, Kantola Tiina, Sirniö Päivi, Hirvelä Saara, Patankar Madhura, Pohjanen Vesa-Matti, Hohtola Ari, Sajanti Saara, Huhta Heikki, Väyrynen Juha, Vuento Riitta.	Inst. Diagnostics	Carcinogenesis: origin, mechanisms and treatment	COMET	Vidi	H&B	8

		<p><b>Koivunen Petri:</b> Väisänen Janne.</p> <p><b>Puistola Ulla:</b> Laatio Liisa, Sova Henri, Pylväs Marjo, Kangas Juha, Autio Eeva, Salonen Riikka.</p> <p><b>Salo Tuula:</b> Nyberg Pia, Pirilä Emma, Sutinen Meeri, Korvala Johanna, Bitu Karolina, Bello Ibrahim, Åström Pirjo, Sundquist Elias, Alahuhta Ilkka, Väyrynen Otto, Jämsä Hannaleena.</p> <p><b>Turpeenniemi-Hujanen Taina:</b> Kuittinen Outi, Haapasaari Kirsi-Maria, Väisänen Anne, Kallio Raija, Tenhunen Olli, Helppi Henni (nee Ruokolahti), Peltonen Jenni, Pasanen Anna Kaisa, Peroja Pekka, Hulkkonen Sina, Sippola Antti, Bur Hamid, Kuitunen Hanne, Harjama Liisa, Lemma Siria.</p> <p><b>Vaarala Markku:</b> Ronkainen Hanna, Lantto Juha, Tonttila Panu, Sumrein Bilal.</p>						
Keinänen-Kiukaanniemi Sirkka	Taanila Anja, Ebeling Hanna, Hetzig Karl-Heinz, Karppinen Jaro, Korpelainen Raija, Männikkö Minna, Saarela Seppo, Hakkola Jukka, Savolainen Markku, Tapanainen Juha, Veijola Juha, Virtanen Jorma, Järvelin Marjo-Riitta	<p><b>Keinänen-Kiukaanniemi Sirkka:</b> Rajala Ulla, Alen Markku, Ronkainen Jukka, Saukkonen Tuula, Hagnäs Maria, Mikkola Ilona, Strandberg Timo, Jokelainen Jari, Ylitalo Tuula, Anttonen Vuokko.</p> <p><b>Taanila Anja:</b> Hurtig Tuula, Heikura Ulla, Nordström Tanja, Lankila Tiina, Koiranen Markku.</p> <p><b>Ebeling Hanna:</b> Moilanen Irma, Räinen Susanna, Lindholm Päivi, Rahko Jukka, Winter Siniemilia.</p> <p><b>Hetzig Karl-Heinz:</b> Leppäluoto Juhani, Vakkuri Olli, Mäkelä Kari, Karhu Toni, Shivaprakash Jagalur, Ghulam Raza, Niiranen Laura. <b>Karppinen Jaro:</b> Paananen Markus, Mikkonen Paula, Karjalainen Ulla, Heikkala Eveliina, Tiira Anniina, Auvinen Juha.</p> <p><b>Korpelainen Raija:</b> Kaikkonen Kaitsu, Miettinen Ismo, Alatalo Riitta, Isojärvi Henri, Vanhala Marja.</p> <p><b>Männikkö Minna:</b> Eskola Pasi, Hietikko Elina, Kelempisioti Anthi, Tervonen Tellervo, Pernu Hilikka.</p> <p><b>Saarela Seppo:</b> Mänttari Satu, Kinnunen Sanni, Niiranen Laura.</p> <p><b>Hakkola Jukka:</b> Turpeinen Miia, Buler Marcin, Aatsinki Sann-Mari.</p> <p><b>Savolainen Markku:</b> Hukkanen Janne, Salonurmi Tuire, Kangas-Kontia Tiia, Huusko Tuija, Ronkainen Justiina, Paavola Timo.</p> <p><b>Tapanainen Juha:</b> Morin-Papunen Laure, Vääräsmäki Marja, Suvanto Eila, Martikainen Hannu, Piltonen Terhi, Männistö Tuija, Pinola Pekka, Pääkkilä Fanni, Koivunen Sanna.</p> <p><b>Veijola Juha:</b> Isohanni Matti, Miettunen Jouko, Mäki Pirjo, Jääskeläinen Erika, Haapea Marianne, Moilanen Kristiina, Penttilä Matti, Husa Anja, Jukuri Tuomas, Koivukangas Jenni, Moilanen Jani, Mukkala Sari, Rannikko Irina.</p> <p><b>Virtanen Jorma:</b> Raustia Aune, Oikarinen Kyösti, Tjäderhane Leo,</p>	Health Sci.	Dynamics and determinants of life course health and wellbeing	Dyna-HEALTH	Vici	H&B	14

		Kullaa Arja, Syrjälä Anna-Maija, Heikkinen Tuomo, Ylöstalo Pekka, Laitala Marja-Liisa, Pohjola Vesa, Kuoppala Ritva, Harila Virpi, Näpänkangas Ritva, Pesonen Paula, Päckilä Jari, Päckilä Pirjo. <b>Järvelin Marjo-Riitta:</b> Ala-Korpela Mika, Kangas Antti, Wang Qin, Sebert Sylvain, Kaakinen Marika, Loh Marie, Palaniswamy Saranya, Huikari Ville, Pirttiniemi Pertti, Lähdesmäki Raija, Silvola Anna-Sofia, Arvonon Päivi, Pentinpuro Raija						
Keiski Riitta	Perämäki Paavo, Lajunen Marja, Muurinen Esa	<b>Keiski Riitta:</b> Ojala Satu, Kolli Tanja, Landabury-Aguirre Junkal, Ainassaari Kaisu, Isomäki Ritva, Myllykoski Liisa, Turkki Auli, Mikkola Jyri-Pekka, Antikainen Sanna, Darif Bouchra, El Assal Zouhair, Häyrynen Piia, Koivikko Niina, Koskinen Rauli, Kärkkäinen Marja, Laitinen Tiina, Mouammine Anass, Nevanperä Tuomas, Niemistö Johanna, Oravisjärvi Kati, Pietikäinen Mari, Pirilä Minna, Pitkäaho Satu, Saavalainen Paula, Seelam Prem Kumar, Valkama Hanna, Väisänen Virpi, Väliheikki Ari, Juntunen Terhi, Ahtinen Kirsi. <b>Perämäki Paavo:</b> Niemelä Matti, Havia Johanna, Pyhtiä Heidi, Suoranta Terhi, Liikanen Seija, Vesala Päivi. <b>Lajunen Marja:</b> Kärkkäinen Johanna, Komulainen Sanna, Lappalainen Katja, Pulkkinen Elina. <b>Muurinen Esa:</b> Tolonen Reeta, Kulju Timo, Pääkkönen Tiina, Riihimäki Markus, Turpeinen Esa, Vuokila Ari.	Process Environ. Engin.	Sustainable solutions for production processes and environmental applications	ProChemE	Vidi	T&NS	4
Klöve Björn	Heino Jani, Virtanen Risto, Tolvanen Anne, Muotka Timo, Karjalainen Timo P, Hjort Jan, Mykrä Heikki, Oksanen Jari	<b>Klöve Björn:</b> Marttila Hannu, Palmer Kathrina, Tammela Simo, Postila Heini, Haghighi Torabi Ali, Rossi Pekka, Ala-Aho Pertti, Mustamo Pirkko, Hyvärinen Maarit, Heiderscheidt Elisangela, Tuukkanen Tapio, Irannezhad Masoud, Mohämmädighävam Sähräm, Eskelinen Riku, Memberu Meseret, Backnäs Soile, Karjalainen Satu Maaria. <b>Heino Jani:</b> Grönroos Mira, Vilmi Annika. <b>Virtanen Risto:</b> Eskelinen Anu, Pyykkönen Tuija, Saccone Patrick. <b>Tolvanen Anne:</b> Hekkala Anne-Maarit, Manninen Outi, Moilanen Jenni. <b>Muotka Timo:</b> Jyväsjärvi Jussi, Louhi Pauliina, Annala Mari, Huttunen Kaisa-Leena, Mlambo Musa, Suurkukka Heli. <b>Karjalainen Timo P:</b> Sarkki Simo, Rantala Lauri, Marttila Maare, Neste Jenni. <b>Hjort Jan:</b> Varanka Sanna. <b>Mykrä Heikki:</b> Mustonen Kaisa-Riikka. <b>Oksanen Jari:</b> Väisänen Anna Maria.	Process Environ. Engin.	Northern environment, biodiversity and ecosystem services research	NEBES	Vidi	H&B,T &NS	9
Kordas Krisztian	Fabritius Tapio, Kinnunen Matti, Juuti Jari, Huuhtanen Mika,	<b>Fabritius Tapio:</b> Bykov Alexander, Sliz Rafael, Czajkowski Jakub, Leppänen Kimmo, Augustine Bobins, Ahmadzadegan Hosein, Vilmi Pauliina,	Elec. Engin.	More than Moore	MtM	Vidi	T&NS	9



	Jantunen Heli, Tuchin Valery, Lloyd-Spetz Anita, Myllylä Risto	Voutilainen Juha-Veikko, Happonen Tuomas, Jokinen Karoliina, Remes Kari. <b>Kinnunen Matti:</b> Lauri Janne, Vihriälä Erkki, Myllylä Teemu, Popov Alexey, Zhao Zuomin, Sorvoja Hannu, Saarela Juha, Honkala Jorma, Vieri Eija. <b>Juuti Jari:</b> Hagberg Juha, Myllymäki Sami, Teirikangas merja, Hannu Jari, Putaalala Jussi, Chen Mei-YU, Kähäri Hanna, Leinonen Mikko, Nelo Mikko, Palosaari Jaakko, Perantie Jani, Sobocinski Maciej, Siponkoski Tuomo, Tuhkala Marko, Uusimäki Antti, Vahera Timo. <b>Huuhtanen Mika:</b> Valtanen Anna. <b>Kordas Krisztian:</b> Tyunina Marina, Mohl Melinda, Toth Geza, Leino Anne- Riikka, Kukkola Jarmo, Mäklin Jani, Lin Jhih-Fong, Halonen Niina, Pitkänen Olli, Dombovari Aron. <b>Jantunen Heli:</b> <b>Tuchin Valery:</b> <b>Lloyd-Spetz Anita:</b> <b>Myllylä Risto:</b>						
Kostamovaa- ra Juha	Rahkonen Timo, Häkkinen Juha	<b>Kostamovaa Juha:</b> Vainshtein Sergey, Mäntyniemi Antti, Jansson Jussi, Nisinen Ilkka, Nissinen Jan, Zheng Shufeng, Duan Goyong, Hintikka Mikko, Kurtti Sami, Alahdad Salim, Hallman Lauri, Keränen Pekka, Lanz Brigitte, Holma Jouni. <b>Rahkonen Timo:</b> Aikio Janne, Hietakangas Simo, Neitola Marko, Schuss Christian, Kursu Olli, Jia Sun. <b>Häkkinen Juha:</b> Kilpelä Ari, Koskela Janne.	Elect. Engin.	Circuits and systems group	CAS	VICI	T&NS	3
Kujala Jaakko	Haapasalo Harri, Väyrynen Seppo, Kess Pekka	<b>Kujala Jaakko:</b> Kauppila Osmo, Eräpuro-Piila Laura, Pekkinen Leena. <b>Haapasalo Harri:</b> Leviäkangas Pekka, Belt Pekka, Härkönen Janne, Möttönen Matti, Herrala Maila, Kropsu-Vehkaperä Hanna, Sahlman Kari, Distanont Anyanitha, Aapaoja Aki, Kinnunen Tuomo, Pekuri Aki, Silvola Risto, Majava Jukka, Vasikainen Soili, Madhooshi Fariba, Tolonen Arto, Kaikkonen Harri, Hänninen Kai. <b>Väyrynen Seppo:</b> Reiman Arto, Paananen Henna, Erkkilä-Häkkinen Sirpa, Vilmi Laura, Kangas Reijo, Haapala Anne, Jounila Henri, Prykäri Tatu, Koivupalo Maarit, Kisko Kari, Sinisammal Janne, Marjala Pauliina, Risikko Tanja, Putkonen Ari. <b>Kess Pekka:</b> Ossiannilsson Ebba, Hietaniemi Kati, Väisänen Saija, Pirinen Rauno, Zulkarnain, Haho Päivi, Shahriare Mahmood, Juntunen Jouni, Isoherranen Ville, Muhos Matti, Väänänen Mirja.	Industr. Engin. Managm.	Industrial engineering and management	IEM	Vidi	T&NS	4
Kunnari Sari	Yliherva Anneli, Välimaa Taina, Loukusa Soile	<b>Kunnari Sari:</b> Paavola Leila, Savinainen-Makkonen Tuula, Ylitalo Riikka, Saaristo-Helin Katri, Välimaa Taina, Körkkö Pentti, Mäkinen Leena, Tolonen Anna-Kaisa, Ervast leena, Heikkinen Elisa, Smolander Sini. <b>Yliherva Anneli:</b> Karjalainen Merja,	Loco- pedics	Child language research center	CLRC	Vidi	HS	4

		Törölä Helena, Heikkinen Minna, Partanen Lea. <b>Välimaa Taina:</b> Kunnari Sari, Laitakari Jaakko, Tolonen Anna-Kaisa, Kanto Laura, Niemitalo-Haapola Elina, Heinänen Kaisu, Wallenius Krista. <b>Loukusa Soile:</b> Suvanto Anne, Mäkinen Leena, Wallenius Krista, Närhi Päivi.							
Kuopanportti Hannu	Hanski Eero, Kujala Kauko	<b>Hanski Eero:</b> Tanskanen Pekka, Timo Lindborg, Keskimölä Aapo. <b>Kuopanportti Hannu:</b> Mäkynen Anssi, Heikkilä Rauno, Yliniemi Leena, Saari Juhamatti, Laukka Aapo. <b>Kujala Kauko:</b> Gehör Seppo, Tuomela Anne, Gasthi Eshan, Koistinen Minna.	Oulu Mining School	Sustainable Benefication	SusBen	Veni	T&NS	3	
Kärkkäinen Elise	Kuure Leena, Haddington Pentti	<b>Kärkkäinen Elise:</b> Keisanen Tiina, Kinnunen Mikko, Siitonen Pauliina, Siromaa (nee Niemelä) Maarit, Sutinen Marika, Virkkula Outi, Grasz Sabine. <b>Kuure Leena:</b> Koivisto Tuomo, Koivistoinen Hilikka, Kälkäjä Salme, Martinväita Annamari, Riekkö Maritta, Tapio Elina, Virtaluoto Jenni. <b>Haddington Pentti:</b> Rauniomaa Mirka.	English Philology	Complexity of (inter)action: Towards an understanding of skilled multimodal participation	COACT	Vici	HS	3	
Laitinen Risto	Huttula Marko, Kursula Petri, Lappalainen Jyrki, Vaara Juha, Weckström Matti	<b>Laitinen Risto:</b> Oilunkaniemi Raija, Tiainen Minna, Rautiainen Mikko, Takaluoma Teemu, Eironen Aino, Karjalainen Minna, Takaluoma Esther, Närhi Sari, Poropudas Merja, Tatarnikova Olga, Tyni Sanna, Perez-Sanchez Clara, Pakkanen Olli, Karppinen Johanna. <b>Huttula Marko:</b> Aksela Helena, Fritzsche Stephan, Cao Wei, Heinäsmäki Sami, Jänkälä Kari, Huttula Saana-Maija, Laksman Joakim, Pankratov Vladimir, Urpelainen Samuli, Anin Dmytro, Lu Chen, Lablonskyi Denys, Karpenko Oleksandr, Kettunen Antti, Löytynoja Tuomas, Mikkilä Mikko-Heikki, Mäkinen Ari, Safari Laleh, Vapa Matti, Lu Dong, Turunen Paavo, Hautala Lauri, Kokkonen Esko, Laakso Miku, Soronen Juho, Tikkala Henri. <b>Kursula Petri:</b> Ruskamo Salla, Han Huijong, Myllykoski Matti, Chukhlieb Maryna, Laulumaa Saara. <b>Lappalainen Jyrki:</b> Hiltunen Jussi, Puustinen Jarkko, Huotari Joni. <b>Vaara Juha:</b> Jokisaari Jukka, Lantto Perttu, Lounila Juhani, Telkki Ville-Veikko, Zhu Jianfeng, Ahola Susanna, Fu Li-Juan, Kantola Anu, Mares Jiri, Gowda Vasantha, Karjalainen Jouni, Kekkonen Päivi, Roukala Juho, Selent Anne, Selent Marcin, Vähäkangas Jarkko, Özcan-Ketola Nergiz, Abuzaid Nuha, Hyvönen Katja, Javed Muhammad Asadullah, Mohammadzadeh Behrouz Gamzegul, Rantaharju Jyrki. <b>Weckström Matti:</b> Vähäsöyrinki Mikko, Hyvönen Marja, Frolov Roman, Heimonen Kyösti, Beis Ioannis, Honkanen Anna, Ignatova Irina, Immonen Esa-Ville, Rusanen Juha,	Chemistry	Molecular materials	MOMA	Vidi	T&NS	6	

		Salmela Ilkka, Takalo Jouni, Tuukkanen Tuomas, Vähäkainu Antti.						
Latva-aho Matti	Juntti Markku, Glisic Savo, Posti Harri	<p><b>Juntti Markku:</b> Asvadi Reza, Bayramoglu Muhammet, Berg Markus, Destino Giuseppe, Hanif Fainan, Huusko Jarkko, Hänninen Tuomo, Janhunen Janne, Kaleva Jarkko, Ketonen Johanna, Kokkonen Joonas, Komulainen Petri, Lehtomäki Janne, Leinonen Markus, Lu Xiaojia, Macagnano Davide, Matsumoto Tadashi, Pyhtilä Juha, Roivainen Antti, Salonen Erkki, Shahabuddin Shahriar, Sonkki Marko, Suikkanen Essi, Tapio Visa, Tervo Valtteri, Tran Le Nam, Tölli Antti, Venkatraman Ganesh, Yadav Animesh.</p> <p><b>Latva-aho Matti:</b> Hirley Alvens, Ikram Ashraf, Azhang Behnam, Bagheri Hamidreza, Barua Bidushi, Bennis Mehdi, Celentano Ulrico, Codreanu Marian, Ferdinand Nuwan, Hu Feng, Joshi Satya, Kapuryhamy Badalge, Katz Marcos, Kaufman Brett, Khan Zaheer, Kärkkäinen Katri, Laddu Keeth, Lehmikangas Mari, Luoto Petri, Lähetkangas Kalle, Morais de Lima Carlos, Juliano Nardelli Pedro, Nguyen Dan, Pantisano Francesco, Pennanen Harri, Pirinen Pekka, Rajatheva Nandana, Samarakoon Sumudu, Syed Tamoor-Ul-Hassan, Wijewardhana Uditha, Xue Qiang.</p> <p><b>Glisic Savo:</b> Dashkova Ekaterina, Ylianttila Mika, Kangas Maria, Karunarathna Suneth, Kumar Pradeep, Liyanage Madhusanka, Lorenzo Beatriz, Pellikka Jari, Porambage Pawani, Shams Alireza, Sugathapala Inosha.</p> <p><b>Posti Harri:</b> Bräsy Timo, Chowdhury Helal, Haapola Jussi, Hovinen Veikko, Hämäläinen Matti, Iinatti jari, Isohookana Matti, Jokinen Markku, Kaivanto Emmi, Karvonen Heikki, Kokkonen Timo, Kohno Ryuji, Kumpuniemi Timo, Leppänen Pentti, Markkula Juho, Niemelä Ville, Paso Tuomas, Petäjälampi Juha, Pouttu Ari, Saarnisaari Harri, Saloranta Jani, Särestöniemi Mariella, Tuomivaara Hannu, Tuovinen Tommi, Vartiainen Johanna, Viittala Harri, Vuontoniemi Risto, Yazdandoost Kamya.</p>	Communi c. Engin.	Department of communicatio ns engineering	DCE	Vici	T&NS	4
Laukka Seppo J	Soini Hannu, Takala Marjatta, Seppänen Tapio, Lehtihalmes Matti	<p><b>Laukka Seppo J:</b> Sarenius Vesa-Matti, Haataja Erkki, Siipo Antti, Latomaa Timo.</p> <p><b>Soini Hannu:</b> Suorsa Teemu, Mäenpää Matleena, Merilehto Milla, Kiema Heli, Rantanen Antti.</p> <p><b>Takala Marjatta:</b> Kairaluoma Leila, Kielinen Marko.</p> <p><b>Seppänen Tapio:</b> Väyrynen Eero.</p>	Edu- cation	Multimodal analysis of dynamic cooperative communicat- ion	MAD-2C	Veni	HS, T&NS	5

		<b>Lehtihalmes Matti:</b> Hautala Terhi.						
Lehtola Veli-Pekka	Alenius Kari, Fält Olavi K, Kuusisto Pekka, Mantila Harri, Oinas-Kukkonen Henry, Kallinen Maija, Enbuske Matti, Korhonen Kuisma	<p><b>Alenius Kari:</b> Mertala Petteri, Mikkonen Juho, Nevalainen Esko, Nousiainen Marja, Rauhalainen Marika, Simuna Erja, Sironen Timo, Timonen Janne.</p> <p><b>Fält Olavi K:</b> Saunavaara Juha, Okkonen Tuula, Juntunen Riika-Leena, Sahi Juha.</p> <p><b>Kuusisto Pekka:</b> Korhonen Kuisma, Johnson Anthony W, Työlähti Nina, Pulkkinen Veijo, Hietasaari Marita, Raudaskoski Heikki, Korpua Jyrki, Sirviö Tommi.</p> <p><b>Lehtola Veli-Pekka:</b> Länsman Anni-Siiri, Jouste Marko, Aikio-Puoskari Ulla, Magga Sigga-Marja, Väyrynen Anna-Liisa, Magga Päivi.</p> <p><b>Mantila Harri:</b> Aikio Ante, Kunnas Niina, Arola Laura, Räisänen Anna-Kaisa.</p> <p><b>Oinas-Kukkonen Henry:</b> Coats Steven, Helo Ari, Lakomäki Sami, Marjomaa Ilkka, Vuontisjärvi Kati.</p> <p><b>Kallinen Maija:</b> Anttila Tero, Huhtanen Jouni, Modares Mirette, Sarviaho Samu.</p> <p><b>Enbuske Matti:</b> Aalto Sirpa, Franzen Patrik, Hakamäki Ville, Hänninen Niko, Koskamo Anne, Kuusela Jari-Matti, Leiviskä Matti, Mäntylä Matti, Oikarinen Kimmo, Okkonen Jari, Salo Matti, Satokangas Reija, Vahtola Jouko, Vaneeckhout Samuel, Äikäs Tiina.</p> <p><b>Korhonen Kuisma:</b> Hietasaari Marita, Korpua Jyrki, Kuusisto Pekka, Lauri Jarkko, Ojajärvi Jussi, Sandbacka Kasimir, Työlähti Nina.</p>	Giellagas Inst.	Transcultural encounters	TE	Vidi	HS	9
Maier Wolfgang	Kozlovskaya Elena, Korja Toivo, Hanski Eero	<p><b>Maier Wolfgang:</b> Lunkka Juha-Pekka, Peuraniemi Vesa, Weisenberger Tobias, Kärki Aulis, Strand Kari, Yang Shenghong, Latypov Rais, Chistyakova Sofia, Köykkä Juha, Guo Fangfang, Luolavirta Kirsi, Konnunaho Juha, Junttila Hanna, Autere Hanna, Eskola Tiina, Immonen Ninna, Kaparulina Ekaterina, Huusko Antti, Roman Seija, Forss Sari, Kontio Riitta, Laurikkala Jukka.</p> <p><b>Kozlovskaya Elena:</b> Hurskainen Riitta, Narkilahti Janne, Silvennoinen Hanna.</p> <p><b>Korja Toivo:</b> Smirnov Maxim, Mahmoud Mohamed, Cheratova Maria, Moisio Kari, Kaikkonen Pertti.</p> <p><b>Hanski Eero:</b></p>	Geosci.	Natural resources of Northern Eurasia	NRNE	Vidi	T&NS	4
Mainela Tuija	Tähtinen Jaana, Hurmelinna-Laukkanen Pia, Ulkuniemi Pauliina	<p><b>Tähtinen Jaana:</b> Heikkinen Marko, Lehtimäki Tuula, Palo Teea, Schreiner Anniina, Virta Anita.</p> <p><b>Mainela Tuija:</b> Puhakka Vesa, Sandhu Maqsood, Lämsä Tuija, Laari-Salmela Sari, Poutanen Hilka, Paloniemi Kaarlo, Juho Anita, Kauppinen Antti, Meewella John, Pernu Elina, Sipola</p>	Oulu Business School	The complexities of organizational activities	COMPANION	Vidi	HS	4

		<p>Sakari, Hermes Jan, Rantakari Anniina, Jansson Noora, Almarri Jasem, Wijetlleke Nalin, Uusitalo Marjut, Musial Monika, Keränen Anne, Vähäkangas Antti, Zhang Xiaotian.</p> <p><b>Hurmelinna-laukkanen Pia:</b> Ahokangas Petri, Koivumäki Timo, Bluemink Johanna, Wang Wan, Myllykoski Jenny, Okkonen Hanna, Sona Marika, Lehto Irene, Shveykovskiy Alexey, Haapanen Lauri, Pajari Sauli.</p> <p><b>Ulkuniemi Pauliina:</b> Johnston Wesley, Nätti Satu, Pekkarinen Saara, Saraniemi Salla, Komulainen Hanna, Ristola Annu, Marin Anna, Ihme Elina, Lappi Minna, Nuojua Outi, Mäläskä Minna, Törmänen Eija-Liisa, Kettunen Kerttu, Helin Satu, Ramachandran Sunder, Abdul kareem Mohamed Ashraf, Oikarinen Eeva-Liisa. Kangasniemi Heta, Holappa Tiina.</p>						
Majamaa Kari	Uusimaa Johanna, Tetri Sami, Kiviniemi Vesa	<p><b>Majamaa Kari:</b> Hinttala Reetta, Kärppä Mikko, Moilanen Jukka, Tuominen Hannu, Hannula Samuli, Sorri Martti, Kytövuori Laura, Ylönen Susanna, Soini Heidi, Häkli Sanna, Heula Anna-Leena, Siitonen Ari, Kiiskilä Jukka, Kervinen Marko.</p> <p><b>Uusimaa Johanna:</b> Hallman Mikko, Rantala Heikki, Harila-Saari Arja Ojaniemi Marja, Moilanen Jukka, Hinttala Reetta, Karjalainen Minna, Salminen Annamari, Kaukola Tuula, Marttila Riitta, Aikio Outi, Kallankari Hanna, Mahlman Mari, Ronkainen Eveliina, Huusko Johanna, Komulainen Tuomas, Widgren Paula, Bolszak Maija, Harvio Maria, Mankinen Katariina, Remes Tiina, Tiirikka Timo.</p> <p><b>Tetri Sami:</b> Löppönen Pekka, Vaaramo Kalle, Qian Cheng.</p> <p><b>Kiviniemi Vesa:</b> Kallio Mika, Sipilä Sampsa, Nikkinen Juha, Kantola Jussi, Hiltunen Tuija.</p>	Neurology	Genetic, physiological and clinical aspects of development and degeneration - from the newborn to the oldest of the old	GPC-DEDE	Vidi	H&B	4
Myllyharju Johanna	Pihlajaniemi Taina, Vainio Seppo, Winqvist Robert, Manninen Aki, Eklund Lauri, Karppinen (ex. Koivunen) Peppi, Soininen Raija, Wei Gonghong, Tasanen-Määttä Kaisa, Quaggin Susan	<p><b>Myllyharju Johanna:</b> Kivirikko Kari, Komu (nee Heikkilä) Minna, Mäki Jouni, Raykhel Irina, Salo Antti, Railo Antti, Aro Ellinoora, Laitala Anu, Ullah Karim, Karsikas Sara, Myllymäki Mikko, Rosendahl Ann-Helen.</p> <p><b>Pihlajaniemi Taina:</b> Heikkinen (nee Latvanlehto) Anne, Heljasvaara Ritva, Huhtala Pirkko, Karppinen SannaMaria, Koivunen Jaakko, Ruotsalainen Heli, Santoleri Sabrina, Tu Hongmin, Izzi valerio, Sormunen Raija, Miinalainen Ilkka, Aikio Mari, Devarajan Raman, Honkanen Hanne-Kaisa, Kaur Inderjeet, Lopez Vanessa, Vicente David, Zainul Zarin, Aho Miki, Auvinen Ann-Marie, Härönen Heli.</p> <p><b>Vainio Seppo:</b> Naillat Florence, Pikkarainen Timo, Shan Jingdong, Skovorodkin Ilya, Murugan Subramanian, Halt Kimmo, Jokela Tiina, Juntila Sanna, Nagy Irina, Pietilä</p>	Biocenter Oulu	Tissue development, homeostasis and malignancy	Tissue Homeostasis	Vici	H&B	11

		<p>Ilkka, Prunskaitė-Hyyryläinen Renata, Pärssinen Heikki, Qi Xu.</p> <p><b>Winqvist Robert:</b> Pylkäs Katri, Peltoketo Hellevi, Grip Mervi, Nurmenniemi Sini, Nikkilä Jenni, Haanpää Maria, Vuorela Mikko, Bose Muthiah, Devarajan Raman, Mantere Tuomo, Tervasmäki Anita, Poulimenes Andriana.</p> <p><b>Manninen Aki:</b> Raykhel Irina, Riipinen Katja, Myllymäki Satu, Teräväinen Terhi, Cattavarayane Sandhanakrishnan.</p> <p><b>Eklund Lauri:</b> Elamaa Harri, Kaakinen Miika, Kangas Jaakko, Näytyuki Marjut, Pietilä (nee Wirkkala) Riikka.</p> <p><b>Karppinen (nee Koivunen) Peppi:</b> Rahtu-Korpela Lea, Karsikas Sara, Myllymäki Mikko, Rosendahl Ann-Helen.</p> <p><b>Soininen Raija:</b> Vuolteenaho Reetta, Ranta Jonna.</p> <p><b>Wei Gonghong:</b> Huang Qilai, Gao Ping, Yang Yuehong.</p> <p><b>Tasanen-Määttä Kaisa:</b> Hurskainen Tiina, Kokkonen Nina, Huilaja Laura, Moilanen Jyrki, Kubin Minna, Försti Anna-Kaisa.</p> <p><b>Quaggin Susan:</b></p>						
Mäkelä Jyrki	Saarnio Juha, Koivukangas Vesa, Tero Rautio	<p><b>Saarnio Juha:</b> Meriläinen Sanna, Karjula Heikki, Niemelä Jarmo, Kauppila Joonas.</p> <p><b>Koivukangas Vesa:</b> Koskela Marjo, Jaurila Henna.</p> <p><b>Rautio Tero:</b> Takala Heikki, Klintrop Kai, Paarnio karoliina, Mäkelä-Kaikkonen Johanna, Ahonen-Siirtola Mirella, Mällinen Jari, Vierimaa Mika.</p> <p><b>Mäkelä Jyrki:</b></p>	Clinical medic.	Gastro-intestinal surgical community	GSC	VENI	H&B	4
Niinimäki Jouko	Tanskanen Juha, Taskila Sanna, Hormi Osmo, Lassi Ulla, Mattila Sampo, Häggman Hely	<p><b>Niinimäki Jouko:</b> Haapala Antti, Hietala Maiju, Illikainen Mirja, Jokinen Henna, Karinkanta Pasi, Karjalainen Mikko, Karvonen Jarno, Kekäläinen Kaarina, Kempainen Kalle, Kinnunen Päivö, Koivuranta Elisa, Körkkö Mika, Laitinen Ossi, Liimatainen Henriikki, Mäkinen Liisa, Ohenoja Katja, Piltonen Petteri, Selkälä Tuula, Stoor Tuomas, Suopajärvi Terhi, Upola Heikki, Visanko Miikka, Ämmälä Ari, Österlund Jani.</p> <p><b>Tanskanen Juha:</b> Ahola Juha, Kupiainen Laura, Leiviskä Tiina, Malinen Ilkka, Goldmann Werner, Kangas Jani, Karhu Mirjam, Keränen Anni, Lamminpää Kaisa, Leppäjärvi Tiina, Väänänen Marja, Penttinen Jorma, Wirkkala Elisa.</p> <p><b>Taskila Sanna:</b> Panu-Perälä Johanna, Järvinen Juho, Tervasmäki Petri, Sotaniemi Ville-Hermann, Ukkonen Kaisa, Ahokas Mikko, Tuohimaa Lilja.</p> <p><b>Hormi Osmo:</b> Sirviö Juho, Heiskanen Juha, Omar Walaa, Pankov Dmitri, Isokoski Erkki, Hasa Tapani, Virtanen Mika, Joensuu Päivi, Aura-Miettilä Kaija, Kylli Seppo.</p> <p><b>Lassi Ulla:</b> Kuokkanen Toivo, Tynjälä</p>	Process Environ. Engin.	Northern bioeconomy	NorBE	Vidi	T&NS	7

		<p>Pekka, Azalim Said, Kangas Teija, Heponiemi Anne, Hernoux Audrey, Holm Jana, Kaakinen Juhani, Karhu Mirjam, Kilpimaa Sari, Kuokkanen Matti, Kuokkanen Ville, Luukkonen Tero, Partanen Kirsi, Pesonen Janne, Prokkola Hanna, Romar Henrik, Runtti Hanna, Tolonen Emma-Tuulia.</p> <p><b>Mattila Sampo:</b> Kajula Marena, Hokkanen Juho, Reponen Petri, Tolonen Ari, Ward Joshua.</p> <p><b>Häggman Hely:</b> Anttila Anna-Kaisa, Ardanov Pavlo, Edesi Jaanika, Hohtola Anja, Jaakola Laura, Jokipii-Lukkari Soile, Karppinen Katja, Koskimäki Janne, Mäkelä Riina, Pirttilä Anna-Maria, Pohjanen Johanna, Rantala Saija, Sarala Marian, Suokas Marko, Sutela Suvi, Uusitalo Taina, Virtanen Elina, Vuosku Jaana, Zoratti Laura.</p>						
Niskanen Markku	Aspi Jouni, Ylimaunu Timo, Tuukkanen Juha	<p><b>Niskanen Markku:</b> Maijanen Heli, Viikama Rosa, Niinimäki Sirpa.</p> <p><b>Aspi Jouni:</b> Salmi Anna-Kaisa, Nunez Milton, Garcia Elena, Heino Matti, Heikkinen Marja, Nevalainen Riikka, Koskela Anni, Harmonen Jenni, Hiltunen Ritva.</p> <p><b>Ylimaunu Timo:</b> Herva Vesa-Pekka, Trandberg Annemari, Kuokkanen Tiina, Nurmi Risto, Kallio-Seppä Titta, Hyttinen Marika, Ikonen Tiia, Kuorilehto Markku, Oikarinen Teija.</p> <p><b>Tuukkanen Juha:</b> Junno Juho-Antti, Koskela Antti, Kamula Kaija, Väre Tiina.</p>	Archaeology	RC in bioarchaeological research	BARC	Vidi	HS	4
Oinas-Kukkonen Harri	Pulli Petri, Jämsä Timo, Korpelainen Raija, Savolainen Markku	<p><b>Oinas-Kukkonen Harri:</b> Yetim Fahri, Zhao Li, Harjumaa Marja, Karppinen Pasi, Langrial Sitwat, Lehto Tuomas, Mian Salman, Muuraiskangas Salla, Stibe Agnis, Steiny Donald, Alahäivälä Tuomas.</p> <p><b>Pulli Petri:</b> Asghar Zeeshan, Pouke Matti, Hyry Jaakko, Ala-Siuru Vesa-Pekka, Niskanen Ilkka, Naukkarinen Mika, Lääkkö Miika.</p> <p><b>Jämsä Timo:</b> Reponen Jarmo, Ahola Riikka, Kangas Maarit, Pulkkinen Pasi, Jauho Anna-Maiju, Määttä Mikko, Keränen Niina.</p> <p><b>Korpelainen Raija:</b> Pyky Riitta.</p> <p><b>Savolainen Markku:</b> Keränen Anna-Maria, Jokelainen Terhi.</p>	Inform. Processing Sci.	Persuasive systems for health	PSH	Veni	T&NS	5
Oivo Markku	Haapasalo Harri, Seppänen Veikko	<p><b>Oivo Markku:</b> Kuvaja Pasi, Sauvola Jaakko, Liukkunen Kari, Markkula Jouni, Juristo Natalia, Turhan Burak, Tosun Misirli Ayse, Pahnla Seppo, Hyysalo Jarkko, Aaramaa Sanja, Kelanti Markus, Tausan Nebojsa, Rodriguez Pilar, Karvonen Teemu, Annanperä Elina, Rohunen Anna, Tulppo Tero, Fucci Davide.</p> <p><b>Haapasalo Harri:</b></p> <p><b>Seppänen Veikko:</b> Väyrynen Karin.</p>	Inform. Processing Sci.	Oulu software and systems initiative	OSSI	Veni	T&NS	3
Ojala Juha	Heikkinen Hannu	<p><b>Ojala Juha:</b> Fredrikson Maija, Hyvönen Leena, Ervasti Marja, Jokela Nina, Erkkilä Tuomas, Sariola Jaana, Knihtilä Aila, Nikander Tiina, Pääkkönen Leena, Raivio Jaana, Virkkula Esa, Jaako Jussi,</p>	Education	Community research in education music and art	CREMA	Veni	HS	2

		Kuivämäki Kari. <b>Heikkinen Hannu:</b> Hyvönen Leena, Tenhu Tapio, Ervasti Marja, Kuivämäki Kari.							
Ojala Timo	Riekki Jukka, Kuutti Kari, Kostakos Vasileios	<b>Ojala Timo:</b> Rautiainen Mika, Zhou Jiehan, Kukka Hannu, Harjula Erkki, Heikkinen Arto, Heikkinen Tommi, Hosio Simo, Jurmu Marko, Liu Meirong, Sarvanko Jouni, Ylipulli Johanna, Leskelä Marika, Valkama Ville, Hakanen Toni, Salmi Ossi, Rätty Teijo, Alatalo Toni, Kruger Fabio, Zanni Daniele. <b>Riekki Jukka:</b> Pirttikangas Susanna, Davidyuk Oleg, Gilman Ekaterina, Leppänen Teemu, Perttunen Mikko, Polojärvi Mikko, Su Xiang, Pyykkönen Mikko, Saloranta Timo. <b>Kuutti Kari:</b> livati Netta, Kinnula Marianne, Molin-Juustila Tonja, Rajanen Mikko, Syrjänen Anna-Liisa, Arhippainen Leena, Alaluusa Sari, Hedberg Henrik, Juustila Antti, Nuojua Johanna, Leinonen Eeva, Pakanen Minna. <b>Kostakos Vasileios:</b> Ferreira Denzil, Goncalves Jorge	Computer Sci Engin.	UBIquitous interactions	iUBI	Vidi	T&NS	4	
Paasi Anssi	Moisio Sami, Saarinen Jarkko	<b>Moisio Sami:</b> Zimmerbauer Kaj, Luukkonen Juho, Kivelä Satu, Jakola Fredrika. <b>Paasi Anssi:</b> Martin Lauren, Ridanpää Juha, Vainikka Joni, Burrows Jonathan, Belcher Oliver. <b>Saarinen Jarkko:</b> Hottola Petri, Prokkola Eeva-Kaisa, Niskala Maaria, Lenao Monkogogi, Löytynoja Tanja.	Geography	Crossing borders: the relational and territorial politics of bordering, identities and transnationalization	RELATE-OULU	Vici	HS	3	
Pietikäinen Matti	Zhao Guoying, Heikkilä Janne, Silven Olli	<b>Pietikäinen Matti:</b> Hadid Abdenour, Chen Jie, Bayramoglu Neslihan, Ruiz-Hernandez John, Kellokumpu Vili, Zhou Ziheng, Guo Yimo, Li Xiaobai, Komulainen Jukka, Ylioinas Juha, Savelieva Iryna, Takala Valtteri, Xilin Chen, Holappa Tuomas, Pfister Tuomas. <b>Zhao Guoying:</b> Hong Xiaopeng, Ghahramani Mohammad, Huang Xiaohua, Zhai Yan. <b>Heikkilä Janne:</b> Rahtu Esa, Kannala Juho, Huttunen Sami, Herrera Castro Daniel, Pedone Matteo, Rezazadegan Tavakoli Hamed, Ylimäki Markus, Rantalankila Pekka. <b>Silven Olli:</b> Hannuksela Jari, Boutellier Jani, Bordallo Lopez Miguel, Hietaniemi Riku, Matilainen Matti, Nyländen Teemu, Remes Jukka, Sangi Pekka, Varjo Sami, four MS thesis workers.	Infotech Oulu	Center for machine vision research	CMV	Vici	T&NS	4	
Pongrácz Eva	Rautio Arja, Sunnari Vappu, Jalagin Seija, Järvelä Marja-Liisa, Hentilä Helka-Liisa, Herneoja Aulikki, Kivimäki Anri, Ikonen Enso,	<b>Pongrácz Eva:</b> Calo Antonio, Piippo Sari, Ylä-Mella Jenni, Jean-Nicolas Louis. <b>Rautio Arja:</b> Rintamäki Hannu, Myllynen Päivi, Abass Khaled, Murtomaa-Hautala Mari, Viitala Pirkko, Tourula Marjo, Sieppi Elina, Kummu Maria, Juutilainen Sandra, Emelyanova Anastasia.	Thule	Sustainable Northern communities: Integrating smart systems, structures and change	LUMINOUS	Veni	H&B, HS, T&NS	16	



	<p>Leiviskä Kauko, Rämö Jaakko, De Oliveira, Andreotti Vanessa, Karjalainen Timo P., Kozlovskaya Elena, Muurinen Esa, Tolvanen Anne</p>	<p><b>Sunnari Vappu:</b> Alaraasakka Eija, Banji Li, Cardona Lopetz Jose, Huuki Tuija, Isopahka Sanna, Kangas Anu, Kangasvuoto Jenny, Karasti Helena, Koistinen Aino-Kaisa, Lamminmäki Tanja, Manninen Sari, Parkkila Helena, Pihkala Suvi.</p> <p><b>Jalagin Seija:</b> Autti Outi, Gunar Burcu, Haapanen Satu, Heikkinen Mervi, Kanto Kati, Kurvinen Heidi, Leppihalme Ilmari, Nissilä Hanna-Leena, Rahikkala Salla, Rönkä Anna-Reetta, Timosaari Niina.</p> <p><b>Järvelä Maria-Liisa:</b> Ahonen Päivi, Bedford Timothy, Cooper Rosalind, Harvala Jukka, Jokikokko Katri, Karjalainen Magda, Kauko Mervi, Pesonen Jaana, Ritola Laura, Räsänen Rauni, Salakka Markku, Stevenson Blair, Shote Lucia, Uematso Kiyoko.</p> <p><b>Hentilä Helka-Liisa:</b> Kjisik Henu, Rönkkö Emilia, Hirvonen-Kantola Sari, Soudunsaari Leena, Tuominen Tuulikki, Miettinen Jenny, Nykänen Kari, Muilu Toivo, Juga Jari.</p> <p><b>Herneoja Aulikki:</b> Pihlajaniemi Henrika, Österlund Toni, Luusua Anna, Tanska Tuulikki, Suopajärvi Tiina, Malaska Mikko, Sanaksenaho Matti, Hannila Raimo, Makkonen Tomi.</p> <p><b>Kivimäki Anri:</b> Haukipuro Lotta, Autio Kari.</p> <p><b>Ikonen Enso:</b> Kovacs Jenő, Selek Istvan, Niva Laura, Hultgren Matias, Yli-Korpela Antti, Pietilä Juho, Aaltonen Harri, Bene Jozef, Honkanen Seppo, Hiltunen Jukka.</p> <p><b>Leiviskä Kauko:</b> Paavola Marko, Juuso Esko, Ruusunen Mika, Tomperi Jani, Nikula Riku-Pekka, Keskitalo Jukka, Mäyrä Outi, Isokangas Ari, Skön Jukka-Pekka, Raatikainen Mika, Liukkonen Mika, Joensuu Iris, Koskela Pekka, Ohenoja Markku, Lahdelma Sulo, Laurila Jouni, Karioja Konsta, Immonen Jussi.</p> <p><b>Rämö Jaakko:</b> Lanzani Giorgio, Niskanen Ilpo, Pellinen Jaakko, Rätty Jukka.</p> <p><b>De Oliveira Andreotti Vanessa Karjalainen Timo P. Kozlovskaya Elena: Muurinen Esa: Tolvanen Anne:</b></p>						
Ruddock Lloyd	<p>Heape Anthony, Hiltunen Kalervo J, Jaakola Veli-Pekka, Juffer Andre, Kastaniotis Alexander, Kellokumpu Sakari, Kietzmann Thomas, Kursula Inari, Lehtiö Lari, Ohlmeier</p>	<p><b>Heape Anthony:</b> Honkanen Henrika, Kangas Salla.</p> <p><b>Hiltunen Kalervo J:</b> Antonenkov Vasily, Autio Kaija, Kreivi Marjut, Shevetsova Antonina, Isomursu Antti, Mäkelä Anne, Vapola Miia, Jiang Guangyu, Pospiech Helmut, Grunau Silke.</p> <p><b>Jaakola Veli-Pekka:</b> Ashok Yashwanth, Nanekar Rahul, Piirinen Henni, Shahid Rehan.</p> <p><b>Juffer André:</b> Sharma Satyan, Anbazhagan Padmanabhan, Lampela Outi, Garma Leo, Niemitalo Olli, Shinya</p>	Biocenter	Protein structure and function research community	Proteus	Vidi	H&B	13

	Steffen, Petäjä-Repo Ulla, Wierenga Rik	<p>Shoko.</p> <p><b>Kastaniotis Alexander:</b> Suomi Fumi, Kerätär Juha, Monteuus Geoffray, Pietikäinen Laura, Raghavan Nair Remya.</p> <p><b>Kellokumpu Sakari:</b> Glumoff Tuomo, Pujol Francois, Pietikäinen Laura, Mettovaara Annika.</p> <p><b>Kietzmann Thomas:</b> Mennerich Daniela, Dimova Elitsa, Samoylenko Anatoly, Kozlova Nina, Richter Kati, Jarva Maire.</p> <p><b>Kursula Inari:</b> Ignatev Alexander, Vahokoski Juha, Saligram Prabhakar Bhargav.</p> <p><b>Lehtiö Lari:</b> Haikarainen Teemu, Venkannagari Harikanth.</p> <p><b>Ohlmeier Steffen:</b> Bergmann Ulrich, Stefanus Eeva-Liisa.</p> <p><b>Petäjä-Repo Ulla:</b> Lackman Jarkko, Khan Hamayun, Mattila Orvokki, Vierimaa Miia, Tuusa Jussi.</p> <p><b>Ruddock Lloyd:</b> Saaranen Mirva, Prus Piotr, Korhonen Kati, Van Dat Ngyuen, Karala Anna-Riikka, Garciarz Anna, Salmivaara Jani, Van Tassel Lisette, Alanen Heli.</p> <p><b>Wierenga Rick:</b> Kiema Tiila, Haapalainen Antti, Koski Kristian, Pudas Regina, Venkatesan Rajaram, Kapetaniou Vanja, Meriläinen Gitte, Kasaragod Prasad, Harijan Rajesh, Jothi Anantharajan, Onwukwe Goodluck, Ratas Ville.</p>						
Röning Juha	Röning Juha, Vainio Seppo	<p><b>Röning Juha:</b> Haapalainen-Ferreira Eija, Kempainen Anssi, Pietikäinen Pekka, Siirtola Pekka, Suutala Jaakko, Tikanmäki Antti, Tokola Teemu, Tuovinen Lauri, Vallivaara Ilari, Wieser Christian, Alasalmi Tuomo, Laakso Marko, LaValle Steven, Koskimäki Heli, Helin Aki.</p> <p><b>Röning Juha:</b> Kuusela Erno, Kettunen Atte, Kauppinen Marko, Juntunen Tomi, Myllylahti Juho, Wahlberg Thomas, Ollila Jussi, Paakkola Petri, Norta Alex, Schaberreiter Thomas, Poikselkä Katja, Norta Alex, Schaberreiter Thomas.</p> <p><b>Vainio Seppo.</b></p>	Computer Sci Engin.	Biomimetics and intelligent systems	BIGS	Veni	T&NS	3
Savolainen Outi	Aspi Jouni, Sillanpää Mikko, Mutanen Marko, Wei Gonghong	<p><b>Savolainen Outi:</b> Kuittinen Helmi, Pyhäjärvi Tanja, Avia Komian, Guzinski Jaromir, Leinonen Päivi, Aalto Esa, Kemi Ulla, Kujala Sonja, Mattila Tiina, Toivainen Tuomas, Zhou Yongfeng, Alatalo Soile.</p> <p><b>Aspi Jouni:</b> Kopatz Alexander, Niskanen Alina, Jansson Eeva, Singh Sujeet, Esparza-Salas Rodrigo.</p> <p><b>Sillanpää Mikko:</b> Nuortio Matti, Knurr Timo.</p> <p><b>Mutanen Marko:</b> Viljakainen Lumi, Tanner Päivi, Pudas Tuula.</p> <p><b>Wei Gonghong:</b></p>	Biol.	Population and statistical genomics	PopStat-Gen	Veni	H&B	5

Siljander Pauli	Oliveira Vanessa, Väyrynen Kari	<b>Siljander Pauli:</b> Sutinen Ari, Pikkarainen Eetu, Juuso Hannu, Kaartinen Sinikka, Hanhela Teemu, Tikkinen Siinamari, Välitälo Riku, Aho Emilia. <b>Oliveira Vanessa:</b> Sitomaniemi-San Johanna, Alaruutari Hanna, Mafi Bobby, Pudas Anna-Kaisa, Hireme James, Nicolson Michelle, Susa Rene, Castillo Katja, Haapakoski Jani. <b>Väyrynen Kari:</b> Schmitt Gerhard, Kivelä Ari, Kontio Kimmo, Koskela Jani, Vermeylen Pieter, Posio Auli.	Education	Educational theory and philosophy	EduPhil	Vidi	HS	3
Svento Rauli	Juutinen Artti, Simonen Jaakko, Puhakka Mikko	<b>Svento Rauli:</b> Perttunen Jukka, Puhakka Mikko, Joenväärä Juha, Conlin Andrew, Tolonen Pekka. <b>Juutinen Artti:</b> Mäenpää Ilmo, Puhakka Mikko, Svento Rauli, Kopsakangas-Savolainen, Maria, Huuhki Hannu, Ruokamo Enni, Teirilä Juha. <b>Simonen Jaakko:</b> Juutinen Artti, Mäenpää Ilmo, Svento Rauli, Huikari Sanna. <b>Puhakka Mikko:</b> Junntila Juha, Korhonen Marko, Koivuranta Matti, Nuutilainen Riikka, Forssell Osmo.	Oulu Business School	Heterogeneity in economic applications and theory	HEAT	Vidi	HS	4
Syrjälä Leena	Estola Eila, Kaasila Raimo	<b>Estola Eila:</b> Puroila Anna-Maija, Kyrönlampi Taina, Viljamaa Elina, Louhela Virpi, Kinnunen Susanna, Alanko Anu. <b>Kaasila Raimo:</b> Hyry-Beihammer Eeva Kaisa, Uitto Minna, Komulainen Jyrki, Säaskilahti Minna, Suhonen Marjo, Utrianen Kati, Kaunisto Saara-Leena, Maikkola Merja, Lassila Erkki. <b>Syrjälä Leena:</b> Karjalainen Pauli T, Rautio Pauliina, Lanas Maija, Ruopasa Leena, Koskela Anne, Mäki Päivi, Aromaa Johanna, Huttu Henna.	Education	Narratives in education - living stories in theory and practice	Living Stories	Vidi	HS	3
Tervonen Osmo	Blanco Roberto, Hörkkö Sohvi, Karppinen Jaro, Lehenkari Petri, Leppilähti Juhana, Männikkö Minna, Nieminen Miiika, Risteli Juha, Saarakkala Simo, Sandor George	<b>Blanco Roberto:</b> Korpi Riikka, Kerimaa Pekka, Vahakari Matti, Heikkilä Kirsi. <b>Hörkkö Sohvi:</b> Rannikko Sirpa, Wang Chunguang, Harila Kirsi, Kummu Outi, Turunen Pauliina, Nissinen Antti, Sahavirta Simo, Raumonen Salli, Kankaanpää Jari, Kyrklund Dan Mikael, Lehtimäki Jaakko. <b>Karppinen Jaro:</b> Kyllönen Eero, Koivisto Katri, Takatalo Jani, Määttä Juhani, Kraatari Minna. <b>Lehenkari Petri:</b> Valkealahti Maarit, Leskelä Hannu-Ville, Pesälä Juha, Palomäki Sami, Aho Olli-Matti, Ek Henna, Savilampi Minna. <b>Leppilähti Juhana:</b> Niinimäki Tuukka, Sirniö Kai, Yli-Luukko Susanna, Harmainen Samppa, Puhto Ari-Pekka, Klemola Tero, Koivunen Reeta, Lantto Ilkka, Heikkinen Juuso, Koskela Sanna, Pakarinen Hari, Flinkkilä Tapio, Syrjälä Hannu, Savola Olli, Ohtonen Pasi, Nortunen Simo, Kortekangas Tero. <b>Männikkö Minna:</b> Taipale Mari, Löjja Marika, Skarp Sini, Kraatari Minna, Welling Maiju. <b>Nieminen Miiika:</b> Rautiainen Jari,	Inst. Diagnostics	Oulu Arthritis consortium - Synergy is solution	OASIS	Veni	H&B	11

		<p>Casula Victor, Hannila Ilkka, Salo Elli-Noora, Lepojärvi Sannamari, Mattila Lauri, Lammentausta Eveliina, Nissi Mikko.</p> <p><b>Risteli Juha:</b> Risteli Leila, Koivula Marja-Kaisa, Turunen Sanna, Koukkula Katja.</p> <p><b>Saarakkala Simo:</b> Hirvasniemi Jukka, Podlipska Jana, Finnilä Mikko.</p> <p><b>Sandor George:</b> Ylikontiola Leena, Raunio Antti, Lappalainen Olli-Pekka.</p> <p><b>Tervonen Osmo:</b> Niinimäki Jaakko, Järvinen Jyri, Tahvonon Pirita.</p>						
Timonen Markku	Saarela Seppo, Kiviniemi Vesa	<p><b>Saarela Seppo:</b> Flyktman Antti, Nissilä Juuso, Särkioja Terttu, Orreveteläinen Minna.</p> <p><b>Kiviniemi Vesa:</b> Abou-Elseoud Ahmed, Korhonen Vesa, Tuovinen Timo, Starck Tuomo.</p> <p><b>Timonen Markku:</b> Räsänen Pirkko, Takala Timo, Jurvelin Heidi, Nissilä Juuso.</p>	Health Sci.	Phototransduction mechanisms in mammalian brain	Photo-transduction	Veni	H&B	3
Tuomi Juha	Orell Markku, Forsman Jukka, Mutanen Marko	<p><b>Tuomi Juha:</b> Huttunen Satu, Markkola Anna-Mari, Taulavuori kari, Aikoi Sami, Jäkäläniemi Anne, Ruotsalainen Anna-Liisa, Taulavuori Erja, Niemelä Marika, Saravesi Karita, Tejesvi Mysore, Wäli Piippa, Ahonen Saija, Hengodage Nirmalee, Huusko Karoliina, Kauppinen Miia, Laitinen Riitta, Lämsä Juho, Kaukonen Maarit, Wäli Pauliina.</p> <p><b>Orell Markku:</b> Hohtola Esa, Koivula Kari, Kvist Laura, Tornberg Risto, Rytönen Seppo, Lampila Petri, Pakanen Veli-Matti, Karvonen Juhani, Ponnikas Suvi, Rönkä Nelli-Mari, Vatka Emma.</p> <p><b>Forsman Jukka:</b> Kivelä Sami, Pöykkö Heikki, Välimäki Panu, Jaakkonen Tuomo, Loukola Olli, , Raitanen Jani.</p> <p><b>Mutanen Marko:</b> Pentinsaari Mikko.</p>	Biol.	Integrative population biology	iPoB	Vidi	H&B, T&NS	4
Usoskin Ilya	Enqvist Timo, Salo Heikki, Mursula Kalevi, Poutanen Juri, Turunen Esa	<p><b>Usoskin Ilya:</b> Kocharov Leon, Mishev Alexander, Stepan Polyanov, Adibpour Farzaneh, Artamonov Anton.</p> <p><b>Enqvist Timo:</b> Kuusiniemi Pasi, Rähä Tomi, Sarkamo Juho, Hissa Johannes, Slupecki Maciej.</p> <p><b>Salo Heikki:</b> Laurikainen Eija, Schmidt Juergen, Comeron Limbourg Sebastien, Janz Joachim, Laine Jarkko, Herrera Endoqui Martin, Diaz Garcia Simon.</p> <p><b>Mursula Kalevi:</b> Asikainen Timo, Zhang Liyun, Virtanen Ilpo, Maliniemi Ville, Munteanu Costel, Holappa Lauri, Virtanen Iiro.</p> <p><b>Poutanen Juri:</b> Neustroev Vitaly, Tsygankov Sergey, Medvedev Aleksei, Kajava Jari, Veledina Alexandra, Pennanen Tuulia, Mushtukov Alexander.</p> <p><b>Turunen Esa:</b> Nygren Tuomo, Aikio Anita, Enell Carl-Fredrik, Manninen Jyrki, Kozlovsky Alexander, Ulich Thomas, Virtanen Ilkka, Pitkänen Timo, Kero Antti, Cai Lei, Kaila Kari, Kuula Ritva, Raita Tero, McKay-Bukowski</p>	Sodankylä Geophys. Observatory	Space physics and astronomy RC	SPARC	Vici	T&NS	6

		Derek.						
Veijola Riitta	Kulmala Petri, Vähäsalo Paula, Glumoff Virpi	<p><b>Veijola Riitta:</b> Hekkala Anne, Hamari Susanna, Seppälä Sanna, Helminen Olli, Pohjola Hikka, Stenius Aino, Kähönen Miia, Mykkänen Teija, Koivikko Minna-Liisa, Karjalainen Airi, Viinikangas Irene, Pohjola Sirpa, Virkkunen Leena, Salmijärvi Päivi, Korpela Marika, Anttila Sirpa, Päckilä Riitta, Multasuo Katja, Holappa Henna.</p> <p><b>Kulmala Petri:</b> Kiveskoski Tiina, Yrjänä Jaakko, Dunder Teija, Holappa Katri, Heinänen Juuso.</p> <p><b>Vähäsalo Paula:</b> Arvonen Miika, Turunen Sami, Kokkonen Tuomo, Lehtilahti Elisa.</p> <p><b>Glumoff Virpi:</b> Grekula Riitta, Karhunen Helli, Kulmala Petri.</p>	Dept. Pediatric s	Oulu center for clinical immunology	OCCI	Veni	H&B	4

## **RAE STEERING COMMITTEE MEMBERS**

The Board of Directors has decided to carry out the research assessment exercise every 6<sup>th</sup> year. The previous assessment took place in 2007 and hence, the Board of Directors has given to the Research Council the task to initiate the second RAE. The Research Council decided on the meeting on 22 February, 2012, that the next overall Research Assessment at the University of Oulu will take place in 2013, so that researcher-based operational units, Research Communities (RCs) will be the target of evaluation. Rector nominated Steering Committee for the task on 2 March, 2012:

Research Rector Taina Pihlajaniemi (chair)

Education Rector Olli Silven (vice chair)

Research Director Sinikka Eskelinen

Professor Raimo Kaasila

Chief Librarian Päivi Kytömäki

Professor Jari Oksanen

Ph.D. student Elina Pernu

Professor Petteri Pietikäinen.

# RAE2013 - RESEARCH ASSESSMENT EXERCISE 2013 OF THE UNIVERSITY OF OULU

## INTERNATIONAL EVALUATION OF RESEARCH GUIDELINES FOR THE PARTICIPATING RESEARCH COMMUNITIES

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Appendix 4: Research field classification and the three evaluation panels



## 1 Background

The strategic goal of the University of Oulu is to consolidate its position among the best multidisciplinary research universities in the world. To achieve this goal, the University regularly carries out international evaluations of its research. The last evaluation was carried out in 2007. This international Research Assessment Exercise (RAE2013) will take place in 2013 and the bibliometric analysis will cover the years 2007 to 2011.

RAE2013 evaluation has a researcher-oriented and future-oriented approach. By using the information gained from RAE2013, the University will be able to identify strong areas, potential new openings and areas in need of development within research. For the researchers, the evaluation offers an opportunity to create larger Research Communities consisting of several research teams, receive feedback from external experts and to obtain national and international visibility.

Peer evaluation will take place in panels comprising national and international experts who will base their evaluation on the materials submitted by the participating Research Communities and on bibliometric analyses of the scientific productivity of Research Communities.

Based on the evaluation, the best Research Communities will be rewarded with additional long-term resources. Further, the results of RAE2013 will be exploited in the allocation of strategic and basic resources, the planning of the next strategy period and the preparation of the University's research policy.

The planning and monitoring of RAE2013 is the responsibility of a specific steering group appointed by Rector Lauri Lajunen and guided by the University Board, the Rector and the Research Council. The feedback from researchers during information and discussion sessions was also valuable in terms of the modification of final guidelines. The Steering Group members are: Taina Pihlajaniemi, Vice Rector (chair); Olli Silven, Vice Rector (vice chair); Sinikka Eskelinen, Director of Research Services (secretary); Raimo Kaasila, Professor; Päivi Kytömäki, Chief Librarian; Elina Pernu, Doctoral student; Jari Oksanen, Professor and Petteri Pietikäinen, Professor.

## 2 Objectives and criteria of the evaluation

The purpose of the evaluation is to raise the profile of the University of Oulu (Univ Oulu) as an internationally recognized high-level science university, by recognizing its strong areas of research and possibilities for significant new research openings. Univ Oulu will use the results of the evaluation to strengthen the international research co-operation with the most recognized institutes in the fields of Univ Oulu's focus areas, and to improve the research opportunities of researchers at the early stages of their independent career.

RAE2013 will be a constructive, supportive and future-oriented process to strengthen the Research Communities (RCs) at the university. The evaluation report will strongly influence the scientific profile of the University - research focus areas and future developmental directions will be identified from the report. Furthermore, the evaluation report has a great impact on the use of strategic funding including recruitment, infrastructures and doctoral programs.

The RAE2013 evaluation also offers an opportunity for the RCs to plan how to achieve excellence in their field of research and stimulate the use of multidisciplinary and transdisciplinary research approaches for building innovative and internationally significant RCs. As a result, the RCs can improve their success in applications for competitive external funding, including the Academy of Finland Centre of Excellence program.

The evaluation will be conducted by three panels, "Health and Biosciences", "Human Sciences" and "Technology and Natural Sciences", formed primarily according to the special research focus areas of Univ Oulu. In the three participation categories (Veni, Vidi, Vici; see Chapter 3) the evaluation will focus on the following aspects of the RCs research:

- Scientific quality and innovativeness
- Feasibility of the research plan
- Scientific merits
- Societal impact
- Research environment and collaboration
- Promotion of professional careers in research
- International competitiveness or comparability



## 3 Participation in the evaluation

### 3.1. Target group

RAE2013 is targeted at RCs at Univ Oulu (consortium of 15-120 persons, consisting of several research groups) which are formed on the basis of collaboration in research and doctoral training. The participating RC may include researchers across department and faculty boundaries. Thus, the participating RCs do not need the approval of their faculty or independent institute, even though it is recommended that faculties and independent institutes encourage their researchers to participate.

### 3.2. Outcomes for Research Communities

Participation in RAE2013 is voluntary – but it is highly recommended. The evaluation report will strongly influence the scientific profile of Univ Oulu as research focus areas and future developmental directions will be identified from the report. That, in turn, will impact on the use of strategic funding (recruitment, infrastructures, doctoral programs and others). Based on the RAE2013 evaluation, two to four of the best RCs from each of the three participation categories Veni-Vidi-Vici will receive an extra long-term annual funding. The level of funding received will be scaled according to the RCs' personnel size. Finally, by forming strong and innovative RCs, the research teams can improve their success in applications for competitive external funding, including Academy of Finland Centre of Excellence funding.

### 3.3. Participation categories Veni – Vidi – Vici

The RCs shall participate in the evaluation under one of the following categories:

**Veni** –New research vistas/openings: The research of the participating RC represents an innovative opening. This can be a new combination of research fields, a new competitive line of research at Univ Oulu, or a special social, national or international demand. Even if the RC in its present form has yet to obtain the proof of international success, its members should show convincing evidence of the high scientific level of their previous research. Examples: Young independent researchers proposing new openings after a successful postdoc period (typically abroad); experienced researchers with significant new vistas/openings. The minimum number of research teams is two (2).

**Vidi** – On the threshold of international breakthrough/recognition: The research of the participating RC is of high quality, but the community has yet to achieve strong international recognition and scientific breakthrough in their field. The RC has strong potential and clear plans on how to improve its international scientific level and impact. This includes determined and systematic methodological development of their research aim and good opportunities to compete successfully for national and international external funding. The minimum number of research teams is three (3).

**Vici** – World class research: The research of the participating RC represents the international cutting edge in its field. The minimum number of research teams is three (3).

The RC determines itself in which category (Veni – Vidi – Vici) of evaluation it participates. The panelists can change the evaluation category of the RC if needed, but they must validate in black and white why they changed the category. NOTE: Each RC can be only registered in one category (Veni/Vidi/Vici).

### 3.4. Construction of the Research Community

**Research Community (RC):** The size of the RC is 15 – 120 persons including the Head of the RC, the other Principal Investigators (PIs: research team leaders), the doctoral students, the postdoctoral and senior researchers, and the technical staff, all currently employed by Univ Oulu. If a person is not currently employed (i.e. on December 1, 2012) by Univ Oulu, then the person in question should be an active member of the RC, e.g. by having a personal grant, research grant or other external research funding administered by Univ Oulu during 2007-2012 (exceptions are handled on a case-by-case basis). Please note below the exception regarding doctoral students who should be members of Univ Oulu Graduate School (UniOGS) by January 7, 2013 at the latest.

**Principal Investigator (PI):** The PI is a research team leader of an RC. The PI is currently employed (i.e. on December 1, 2012) by the Univ Oulu or is a current active member of the University's research community and is affiliated to the university, e.g. by having external funding administered by Univ Oulu during 2007-2012 (exceptions are handled on a

case-by-case basis). In addition, PI carries out her/his own independent research project and has doctoral students/postdoctoral researchers and/or external funding. NOTE: Only one PI/research team is accepted here.

The Head of the RC is one of the RC's PIs and can be a member only in the RC she/he heads.

Postdoctoral and senior researchers, and other RC personnel should be currently employed (i.e. on December 1, 2012) by Univ Oulu or they should be current active members of the University's research community, for example by having a personal grant, research grant or other external research funding administered by Univ Oulu during 2007-2012 (exceptions are handled on a case-by-case basis).

Doctoral students should be current members of UniOGS (by January 7, 2013 at the latest).

Additional instructions: The Head of the RC, senior researchers, postdocs, doctoral students and other personnel can only participate in one RC. The other PIs from the Vidi/Vici category can also act as PIs in one RC of the Veni category, provided that they are proven to have a key role in that RC.

A docentship (i.e. adjunct professorship) alone does not correspond to a current active member at Univ Oulu.

The participating RCs can co-operate with national/international researchers/teams outside of Univ Oulu. Such researchers/teams cannot, however, be included in the number of researchers/teams in the participating RC and their publications without an affiliation to the Univ Oulu and they cannot be included in the RC's bibliometric analysis.

### 3.5. Important deadlines

The RC must register for the RAE2013 evaluation and submit the required evaluation materials within the set deadline. The Evaluation Steering Group reserves the right to reject RCs which do not fulfill the conditions presented here.

Time	Step
by December 21, 2012	1A. Update of SoleCris for publications in 2007 –2011
December 1, 2012 – January 7, 2013	1B. Registration of RC to RAE2013 evaluation
February 1 – 28, 2013	2. Submission of PIs' CVs and selected publications, and selected publications of the RCs
March 1 – 31, 2013	3. Submission of RC's research plan for next 5 years, 2014-2018

## 4 Implementation and timetable of the evaluation

### 4.1. Stages of evaluation

The evaluation will proceed through three stages: 1) registration, 2) submission of evaluation materials in two steps, and 3) external peer review. As the evaluation will involve international experts, the participants are asked to submit all evaluation materials in English.

The RCs wishing to participate in the evaluation must update the scientific articles for the years 2007 – 2011 to SoleCRIS of Univ Oulu, and submit their registration data, evaluation material and research plan. Links to the forms and these instructions can be found on the RAE2013 website at <http://www.oulu.fi/english/RegistrationRAE2013>.

### 4.2. Bibliometric analysis

The RC must update the publications from the years 2007-2011 in the SoleCris system of Univ Oulu by the deadline of December 21, 2012. The researchers' publications will only be evaluated for the period when they have been affiliated to Univ Oulu.

In RAE2013 the bibliometric analysis provides the panelists with the information of the RCs' scientific quality and scientific significance. Thus, the *bibliometric analyses are done at the RC level*, not based on individual researchers' publications. The bibliometric analyses will be carried out by professionals in the Centre for Science and Technology Studies (CWTS), Leiden University, the Netherlands, and in Oulu University Library. The analyses performed by CWTS are based on standard methods using indicators that have been widely tested and approved.

The bibliometrics provided by CWTS/Leiden only cover the publications that have a Thomson Reuters Web of Science (WoS) identification number (UT) in the SoleCris system of Univ Oulu. Univ Oulu Library will update the UTs of RCs in the SoleCris system.

Alternative analysis: In some fields of science WoS-based bibliometric analyses are not relevant. The alternative analysis is done if

- The RC's number of publications is less than 50, or
- The internal coverage is less than 40% in CWTS analyses

The alternative analysis is carried out by the information specialists of Univ Oulu Library using publications indexed in the JUFO publication forum and other means specific to certain research fields.

More information about the Classification of the Ministry of Education and Culture is available on [http://www.aka.fi/Tiedostot/Tiedostot/Liitetiedostot/OKM\\_julkaisutyypiluettelo\\_2010\\_en.pdf](http://www.aka.fi/Tiedostot/Tiedostot/Liitetiedostot/OKM_julkaisutyypiluettelo_2010_en.pdf)

More information about the JUFO is available on <http://www.tsv.fi/julkaisufoorumi/english.html>

More information about the bibliometric analysis performed by CWTS and about the alternative analysis carried out by Oulu University Library is available on RAE2013 "Info bank" [http://www oulu.fi/english/sites/default/files/content/RAE2013\\_bibliometric\\_analyses\\_20092012\\_1.pdf](http://www oulu.fi/english/sites/default/files/content/RAE2013_bibliometric_analyses_20092012_1.pdf) .

#### 4.3. Registration for the evaluation, December 1, 2012 – January 7, 2013

Participating Research Communities must register for the RAE2013 evaluation between December 1, 2012 – January 7, 2013 using the two (2) registration forms available on <http://www oulu.fi/english/RegistrationRAE2013>. *Registration for the evaluation is binding and a prerequisite for participation.*

When registering, the RCs are requested to provide basic information about the composition, scientific research field/fields (see Appendix 4) and the participation category. In addition, the RCs are asked to provide a description of the practical motives ('operational basis') for forming the consortium as well as a public description of the research proposed for evaluation. In addition, the RCs are expected to select the panel and to propose scientific experts for the panels. When making proposals for panelists, the RC must take into consideration the regulations on disqualification of reviewers (see Appendix 1). Very multidisciplinary RCs may suggest two or even three panels where they wish to be evaluated. This must be justified in the registration document.

The information required in registration forms:

1. Responsible person (Head of the RC)
  - last name, first name
  - e-mail
  - phone
  - affiliation
  - street address
  - description of the participating RC
  - name of the participating RC
  - acronym of the participating RC
  - description of the practical motivation ('operational basis') for forming the RC (e.g. research collaboration, joint doctoral training) (max. 2200 characters with spaces)
2. Scientific fields of the RC (based on the official classification of the Academy of Finland)
  - main scientific fields, possible subfields
3. RC's participation category including justification for the selected participation category (max. 2200 characters with spaces)
4. Public description of the RC's research (max. 2200 characters with spaces)
  - description of the *present and future* significance of the RC for Univ Oulu including international aspects, collaboration and researcher training (max. 2200 characters with spaces including keywords)

5. RC's selection for evaluation panel
6. RC's suggestions for eight experts (at least four of them working at a foreign institute) to be invited to the evaluation panels
  - names, e-mails and affiliations of the panelists
7. Excel attachment to provide information on the RC; Research groups and staff
  - number of research groups
  - names of research groups
  - information on Principal Investigators (names, positions, academic degree with year and university, Faculty, Department/Institute, e-mail)
  - information on personnel of the research groups (names, positions, academic degree with year and university, Faculty, Department/Institute, e-mail)

The two (2) registration forms should be sent to the Registration office of Univ Oulu (kirjaamo@oulu.fi) by e-mail. The deadline for the registration is January 7, 2013 at 3 pm local time. NO additions/alterations to the forms are allowed after submission.

Acceptance of registration and search for panelists: The RAE2013 Steering Group accepts the registrations. Research Communities will get notifications confirming whether they fulfill the requirements for RAE2013 participation by the end of January 2013. The search for panelists begins at the beginning of February.

#### 4.4. Submission of additional evaluation material between February 1 – 28, 2013

The RCs are asked to submit the following information to the Registration office of Univ Oulu (kirjaamo@oulu.fi) by e-mail. Deadline for the registration is February 28, 2013 at 3 pm local time. NO additions/alterations to the forms are allowed after submission.

The information required as additional evaluation material:

- Name of the RC and the Head of the RC as in registration Step 1
- Curriculum vitae (CV, maximum four pages) of the Principal Investigators (PIs and the Head of RC). For instructions, see Appendix 3
- List of selected publications of each PI (max. 20 publications per person with an open timeframe and place of work at that time). For instructions, see Appendix 2
- Top 20 scientific publications of the RC with an open timeframe and place of work at that time (consortium level, not just the publications of PIs). For instructions, see Appendix 2
- Max. five (5) most significant competitive external grants (in total) received by RC members between January 1, 2007 and December 31, 2012 (the Academy of Finland, the Finnish Funding Agency for Technology and Innovation TEKES, the EU, foundations, other national funding, other international funding)

The forms and detailed information of the material requested by February 28, 2013 are available on RAE2013 website <http://www.oulu.fi/english/RAE2013> from January 2013.

#### 4.5. Submission of research plan for 2014 – 2018 between March 1 – 31, 2013

The RCs are asked to submit the research plan to the Registration office of the Univ Oulu (kirjaamo@oulu.fi) by e-mail. Deadline for the registration is March 31, 2013 at 3 p.m. local time. NO additions/alterations to the forms are allowed after submission.

The RC's five-year research plan for 2014 – 2018 shall be no more than six (6) pages, covering items 1–4 presented below (spacing 1, Times New Roman 12 pt or equivalent):

- Scientific quality and innovativeness
- Scientific merits of researchers
- Research environment
- Position of the RC with regard to the world leaders in the field and the RC's international collaborators/networks. If the RC has a special national character of research, then international comparability of the RC is described.

The information required for the Research Community's five-year research plan:

1. Scientific goals and innovativeness
  - Background to research, any previous research related to the topic, research objectives
  - Expected results and scientific impact

- Scientific added value expected from the RC activity (justifications for why the implementation of the research plan requires an RC instead of normal research collaboration)
- Expected social impact
- Possible risks on implementation of the research

## 2. Scientific merits of researchers

- Describe the merits and scientific expertise of the RC Head insofar as these benefit the RC leadership
- Describe the merits and scientific expertise and supplementary expertise the PIs add to the RC
- Describe the expertise of the research teams that they add to the RC

## 3. Research environment

- Describe the infrastructure (including RCs) provided by the research environments
- Describe how the research project will promote creative research environments (e.g. strengthening framework conditions for multidisciplinary, interdisciplinary or transdisciplinary research, promoting national and/or international co-operation and researcher training, proposed structural changes, etc.)

## 4. Position of the RC with regard to the world leaders in the field

- Pinpoint the position of the RC with regard to the world leaders in your field/s. If the RC has a *special national character of research*, then *pinpoint international comparability* of the RC. Name 2–3 research units or teams whose research program and research questions are close to your own and that you consider your major reference teams/scientific competitors. Justify your view.
- Name the most important international collaborators/networks of the RC and describe the nature of the co-operation (common funding, consortium/research team, infrastructure, research visits, doctoral education etc.)

The form and detailed instructions for the research plan requested by March 31, 2013 is available at the RAE2013 info bank [http://www oulu.fi/english/Info\\_bank](http://www oulu.fi/english/Info_bank) from February 2013.

## 5. RAE2013 evaluation performed by expert panels

### 5.1. Evaluation panels

There will be three evaluation panels:

- Health and Biosciences
- Human Sciences
- Technology and Natural Sciences

Upon registration the RC selects in which panel(s) they are evaluated. Information of the scientific fields of each panel is in Appendix 3. The members of the panels are selected on the basis of the RCs' suggestions. The panelists are nominated in May 2013.

### 5.2. Material to be sent to the panelists

The evaluators will receive all the material that the RC has submitted and the results of bibliometric analysis of the RC's scientific publications in June 2013:

- Registration forms
- CVs of PIs
- 20 selected publications of PIs
- 20 selected publications of RC
- Information on RC's grants
- Research plan of the RC for 2014-2018
- Result of RC's bibliometric analysis done by CWTS/Leiden or Univ Oulu Library
- Detailed instructions and forms for the evaluators
- For background information, the guidelines for the participating RCs, general information about the Finnish university system, information on Univ Oulu, and the summary report of the previous evaluation RAE2007

### 5.3. Evaluation of the Research Communities

The panelists work with the applications from July to September 2013. The panel in question will rate the application numerically from six (6) to one (1):

6. Outstanding, stands out for exceptional novelty, innovativeness and scientific significance
5. Excellent, extremely good in international comparison – no significant elements to be improved
4. Very good, contains some elements that could be improved
3. Good, contains elements that could be improved
2. Unsatisfactory, in need of substantial modification or improvement
1. Weak, severe flaws that are intrinsic to the proposed project or the plan

The panelists will give written feedback on the RCs'

- Strengths
- Areas of development
- Other remarks
- Recommendations

In addition, the panels are asked to rank the RCs within each category.

The evaluation form and detailed instructions for evaluators are provided in a separate document "[RAE2013 Evaluation Report – Instructions for Panelists](#)".

The panels meet at Univ Oulu in October 2013. The panelists cannot visit the RCs, but open discussion forums are arranged where the RCs can meet the panelists.

After the meeting, each panel ranks its own applications, separately in each participation category Veni – Vidi – Vici. After that the three panels discuss the applications together and carry out the final ranking for each category Veni – Vidi – Vici across the panels' scientific borders. This may require a separate consensus meeting in November 2013.

The panels will give their written feedback in December 2013. Based on the RAE2013 evaluation, two to four of the best RCs from each of the three participation categories Veni-Vidi-Vici will receive an extra long-term annual funding. The level of funding received will be scaled according to the RCs' personnel size. RCs will get the community-specific reports in February 2014. Finally, the RC-specific and university level reports are published in spring 2014.



#### 5.4. Timetable and division of labor

MONTH, YEAR	EVALUATION OFFICE	PARTICIPATING RESEARCH COMMUNITY (RC)
September 2012	RAE2013 opening by the Rector (September 20, 2012 at 10:00) Briefing sessions at Faculties begin Opening of RAE2013 web pages Publication of the guidelines for participation in the evaluation	
October 2012	Briefing sessions at Faculties begin on October 2, 2012 Material added to RAE2013 public www pages	
December 2012		Registration for the evaluation begins on December 1, 2012 RC's scientific articles (2007 –2011) updated to SoleCris database by December 21, 2012
January 2013	Notifications sent to Research Communities confirming whether they fulfill the requirements for participation	Registration for the evaluation ends on January 7, 2013 at 3 p.m. local time
February 2013	Search for panelists begins	Submission of the CVs and lists of publications to steering committee between February 1 – 28, 2013
March 2013	University level analysis of data from the SoleCris	Submission of the research plans to steering committee by March 1 – 31, 2013
May 2013	Nomination of panelists	
June 2013	Evaluation materials to the panelists	
July-September 2013	Panels at work	
October 2013	Panel meetings in Oulu	
November 2013	Consensus meeting of the panels	
December 2013	Written feedback from the panels	
February 2014	RC-specific reports to the Research Communities	
April/May 2014	Publication of the RC-specific and University level report	

## 6. Co-ordination of the evaluation

Practical arrangements related to the evaluation are the responsibility of the Research Services of Univ Oulu. Research Services will collect and compile the evaluation materials, provide instructions and disseminate information, organize the meetings of the evaluation panels, and compile the results into a final report. The Research Services staff includes Head of Research Services Sinikka Eskelinen and Research Coordinator Aija Ryyppö, in addition to whom the RAE2013 Steering Group will guide and participate in the planning and implementation of the evaluation. The professionals at Univ Oulu Library and in the Centre for Science and Technology Studies (CWTS), Leiden University, the Netherlands, carry out the bibliometric analyses of RCs.

Evaluation instructions and communications are continually added to the RAE2013 website <http://www.oulu.fi/english/RAE2013>

Further information:

*General questions:*

Director of Research Services Sinikka Eskelinen (sinikka.eskelinen@oulu.fi)

Research Coordinator Aija Ryyppö (aija.ryyppo@oulu.fi)

Vice Rector Taina Pihlajaniemi (taina.pihlajaniemi@oulu.fi)

*SoleCris & bibliometric analysis:*

Chief Librarian Päivi Kytömäki, (paivi.kytomaki@oulu.fi)

Professor Jari Oksanen (jari.oksanen@oulu.fi)





## Appendix 1: Disqualification of reviewers

A scientific expert must be disqualified and cannot participate in the evaluation of a Research Community (RC) if he or she may benefit from the results of the evaluation. Experts must be disqualified / disqualify themselves in the following cases:

- They are employed by the Univ Oulu.
- They have cooperated with any member of the participating RC, e.g., have coauthored publications in the last three years, belong to the same research group with any member of the RC, have participated in preparing the evaluation documents or in the publication or exploitation of the research results
- They have served as the superior, employee or supervisor of any member of the RC during the last three years.
- They are close to the members of the participating RC: 1) a spouse (also de facto), child, grandchild, sibling, parent, grandparent or a person otherwise especially close (e.g., fiancé/e or a close friend), as well as their spouses (also de facto), 2) a sibling of parent or his/her spouse (also de facto), a child of a sibling, a previous spouse (also de facto), 3) a child, grandchild, sibling, parent or grandparent of a spouse as well as their spouses (also de facto), a child of a spouse's sibling, or 4) a half-relative equivalent to the above.

Experts must be disqualified if their impartiality may otherwise be endangered, or they feel that they have a conflict of interest arising from other reasons than those mentioned above and are therefore not qualified to evaluate the RC.



## Appendix 2: Classification of selected publications of the PIs and TOP 20 publications of RCs

We request that you follow the classification below in your list of selected publications. The classification is based on the classification by the Ministry of Education, Science and Culture (2010). For more information, see the Ministry's Publication Type Classification Manual.

### Classification of publications:

#### A Peer-reviewed scientific articles

Journal article (refereed), original research; review article, literature review, systematic review; book section, chapters in research books; conference proceedings *NB. Doctoral dissertations (articles) also listed under item G.*

#### B Non-reviewed scientific articles

Non-refereed journal article; book section; non-refereed conference proceedings

#### C Scientific books (monographs)

Book; edited book, conference proceedings or special issue of a journal. *NB. Doctoral dissertations (monographs) also listed under item G.*

#### D Publications intended for professional communities

Article in a trade journal; article in a professional manual or guide or professional information system, textbook material; professional conference proceedings; published development or research report or study; textbook, professional manual or guide, dictionary

#### E Publications intended for the general public, linked to the applicant's research

Popularised article, newspaper article; popularised monograph (No letters to the editor, short commentaries or self-published works)

#### F Public artistic and design activities

Published independent work of art; public partial realisation of a work of art; public artistic performance or exhibition; model or design adopted for production/use

#### G Theses

Polytechnic thesis, Bachelor's thesis, Master's thesis, polytechnic Master's thesis; Licentiate thesis; doctoral dissertation (monograph); doctoral dissertation (article)

#### H Patents and invention disclosures

Granted patent, invention disclosure

#### I Audiovisual material, ICT software

Audiovisual material; ICT software

## Appendix 3: RAE2013 Curriculum vitae (CV) submitted by February 28, 2013

Instructions for the Heads of Research Communities (RCs) and Principal Investigators (PIs)

The CV shall be no more than four (4) pages. Use spacing 1, Times New Roman 12 pt or equivalent. The CV is written in English and it shall include the following information:

1. name and year of birth
2. degrees, dates and places, major subject, topic of doctoral dissertation
3. adjunct professorships (i.e. docentships), universities, years of appointments
4. present employment relationship (incl. start and end dates)
5. most important previous employment relationships (incl. start and end dates)
6. most important visits abroad
7. most important scientific and academic administrative positions (incl. start and end dates)
8. most important scientific acknowledgements and awards, memberships in science academies
9. most important research funding
10. research leaderships and supervised doctoral dissertations (as supervisor appointed by a university)
11. other scientific expert positions and scientific achievements: *memberships and positions of trust in scientific communities; memberships in editorial boards of scientific journals or positions as editor-in-chief or editor; referees of scientific journals; preliminary examiner or opponent of doctoral dissertations; assessment of scientific qualifications (e.g. adjunct professorships); faculty or board memberships; memberships in national or international experts, review or steering groups; international peer review of funding applications (e.g. ERC); important international invitation lectures; patents*
12. scientific and societal impact of the applicant's own research (if relevant): *e.g. volume of publications; h-index; most important and/or most cited articles/number of citations; merits in producing and publishing research and data materials*

NOTE! The CV is a public document and shall not include any confidential information.

## Appendix 4: Research field classification and the three evaluation panels

### Research fields of the evaluation panel "Technology and Natural Sciences"

No	Research field	No	Subfield
101	Architecture	1011	Architecture
		1012	Community planning
102	Food engineering		
103	Energy engineering	1031	Bioenergy research
		1032	Fuel cells, solar energy
		1033	Combustion technology
		1034	Electric power engineering
		1035	Nuclear engineering: fission and fusion
104	Physics	1041	Atomic and molecular physics
		1042	Biological and soft matter physics
		1043	Fluid and plasma physics
		1044	Particle and nuclear physics
		1045	Optics, acoustics
		1046	Condensed matter physics
105	Geosciences	1051	Space physics
		1052	Geophysics and - chemistry

		1053	Geoinformatics
		1054	Geology
		1055	Geography
		1056	Meteorology and atmospheric sciences, climate research
106	Chemistry	1061	Analytical chemistry
		1062	Inorganic chemistry
		1063	Physical chemistry
		1064	Organic chemistry
		1065	Polymer chemistry
107	Mechanical engineering and manufacturing technology		
108	Computational science		
109	Medical engineering		
110	Mathematics	1101	Pure mathematics
		1102	Applied mathematics
111	Materials science and technology	1111	Biomaterials
		1112	Functional materials, semiconductors
		1113	Ceramic materials
		1114	Metals
		1115	Polymer materials
		1116	Wood and paper materials

112	Nanoscience and nanotechnology		
113	Process technology	1131	Biomass refinery technology
		1132	Instrumentation engineering
		1133	Process control and control engineering
		1134	Technical chemistry
114	Construction and municipal engineering	1141	Geotechnical engineering
		1142	Construction engineering
		1143	Construction economics
		1144	Municipal engineering
115	Electrical engineering and electronics	1151	Automation and systems technology
		1152	Electronics
		1153	Signal processing
		1154	Electrical engineering
		1155	Computer engineering, computer architecture
		1156	Communications engineering
116	Industrial biotechnology	1161	Biocatalysis
		1162	Bioprocess engineering
		1163	Fermentation

117	Computer science	1171	Computational data analysis
		1172	Software engineering, operating systems, man-computer interaction
		1173	Theoretical computer science
		1174	Information systems science
118	Statistics		
119	Industrial management		
120	Astronomy	1201	Solar, stellar and interstellar matter physics
		1202	Solar system physics and planetary science
		1203	The Milky Way, galaxies and cosmology
121	Environmental engineering	1211	Mining and minerals engineering
		1212	Remote sensing
		1213	Marine technology
		1214	Industrial processes

Research fields of the evaluation panel "Health & Biosciences"

	Research field		Subfield
201	Biochemistry, biophysics		
202	Ecology,		

	evolutionary biology and ecophysiology		
203	Plant biology		
204	Developmental biology and physiology		
205	Microbiology		
206	Genetics		
207	Cellular and molecular biology		
208	Systems biology, bioinformatics		
209	Environmental science	2091	Ecotoxicology and environmental impacts
		2092	Environmental research
301	Food sciences		
302	Agricultural sciences		
303	Forest sciences		
401	Biomedicine		
402	Veterinary medicine		
403	Pharmacy		
404	Dental science		
405	Nursing science		
406	Public health research		



407	Clinical medicine		
408	Sport sciences		
409	Nutrition		
410	Environmental health research		
501	Neuroscience	5011	Molecular and cellular neuroscience
		5012	Systemic and cognitive neuroscience

#### Research fields of the evaluation panel "Human Sciences"

	Research field		Subfield
601	Human geography	6011	Economic geography, regional development and tourism research
		6012	Social and cultural geography, urban studies, regional studies
602	Economics		
603	Education	6031	Adult education
		6032	Vocational education research
		6033	Special education
		6034	Education evaluation
		6035	Early childhood education and preschool education
		6036	General education and teacher education
604	Development		

	research		
605	Business economics		
606	Women and gender studies		
607	Law		
608	Psychology	6081	Developmental psychology, educational psychology
		6082	Psychotherapy
		6083	Health psychology
		6084	Work and organisational psychology
609	Social sciences	6091	Anthropology and ethnology
		6092	Social psychology
		6093	Sociology, demography
		6094	Social policy, social work
610	Science studies		
611	Political science	6111	Public administration
		6112	International relations
		6113	Politology
612	Communication	6121	Informatics
		6122	Journalism
		6123	Library and information science
		6124	Speech communication, organisational communication

		6125	Media and communication research
613	Environmental social science research		
701	Philosophy	7011	History of philosophy
		7012	Practical philosophy
		7013	Theoretical philosophy
		7014	Philosophy of science and methodology
702	History and archaeology	7021	Archaeology
		7022	History
703	Linguistics	7031	Phonetics
		7032	Language, society and culture
		7033	Applied linguistics
		7034	Individual languages and language regions
		7035	General linguistics
704	Literature research		
705	Design research	7051	Artistic design
		7052	Industrial design
706	Art research	7061	Film and television research
		7062	Aesthetics
		7063	Folklore studies
		7064	Musicology

		7065	Semiotics
		7066	Art research, art history, architecture
		7067	Theatre research, dramaturgy
707	Theology	7071	Exegetics
		7072	Church history
		7073	Church sociology
		7074	Practical theology
		7075	Systematic theology
		7076	Comparative religion

# RAE2013 EVALUATION REPORT

Date:	
Evaluation panel:	
Experts:	
RC director:	
Acronym of the RC:	
Category of the RC:	

Please fill the table above.

Please evaluate the material taking into account the participation category of each **Research Community (RC)** described in **Appendix 1**. In addition to the numerical rating 6 – 1 shown in **Appendix 2**, please give a written evaluation for each of the specific questions. Indicate:

- Strengths
- Areas of development
- Other remarks
- Recommendations

We also ask you to fill the “Declaration of the Conflict of Interest” table in **Appendix 3**.

In addition to scoring individual RCs we ask the Panel to make a ranking of RCs within the categories Veni – Vidi – Vici.

Please note that this evaluation report is a public document.

Scientific quality and innovativeness of the research plan		Rating:
1.	Assess the scientific quality and innovativeness of the research plan.  Comments:	Subrating:
2.	Assess the potential of this research for significant new outcomes, scientific breakthroughs and the progress of science in its field. Are there potential risks that could threaten the project but a successful outcome would mean major progress in the field.  Comments:	Subrating:
3.	Assess the scientific added value of working as a RC.  Comments:	No numerical rating.
Feasibility of the research plan		Rating:
4.	Are the research methods sound and the research plan feasible? Does the RC acknowledge potential scientific or methodological problem	Subrating:

	<p>areas and how are alternative approaches being considered? Is the proposed schedule appropriate and well planned?</p> <p>Comments:</p>	
5.	<p>Are the planned resources (personnel, financial and other material resources) adequate for the implementation of the planned RC activities?</p> <p>Comments:</p>	Subrating:
6.	<p>Assess the structure and organisation of the RC project.</p> <p>Comments :</p>	No numerical rating.
7.	<p>How is the Materials management plan considered?</p> <p>Comments:</p>	Subrating:
8.	<p>If there are ethical issues involved, how are these taken into account?</p> <p>Comments:</p>	No numerical rating.
<b>Competence of the RC and research teams</b>		<b>Rating:</b>
9.	<p>Estimate overall quality of the publication record of the proposed RC director. Estimate the merits, scientific expertise and leadership skills of the proposed RC director for the proposed project.</p> <p>Comments:</p>	Subrating:
10.	<p>Estimate overall quality of the publication record of the proposed RC team leaders (Principal Investigators). Estimate the merits and scientific expertise of the proposed RC team leaders (Principal Investigators) for the proposed project?</p> <p>Comments:</p>	Subrating:
11.	<p>Estimate overall quality of the publication record of the proposed RC.</p> <p>Comments:</p>	Subrating:
12.	<p>Do the proposed RC team leaders (Principal Investigators) bring complementary expertise to the RC project? Is the division of labor between research teams/sub-projects of the consortia appropriate?</p> <p>Comments:</p>	Subrating:
<b>Research environment and collaboration</b>		<b>Rating:</b>

13.	Besides scientific added value, what is the added value of working as a RC (e.g. promotion of multi-/inter-/transdisciplinary research, researcher training, structural benefits, promotion of creative research environment etc.)?	Subrating:
Comments:		
14.	Assess the compatibility of the research of the RC project with the strategies of the host institution. How does the University of Oulu support the RC project (including appropriate research infrastructures)?	No numerical rating.
Comments :		
15.	Assess the national research collaborations that can significantly contribute to the success of the RC project.	Subrating:
Comments:		
16.	Assess the international research collaborations that can significantly contribute to the success of the RC project.	Subrating:
Comments:		
<b>Significance of the RC for the researcher training and promotion of professional careers in research</b>		<b>Rating:</b>
17.	Evaluate the objectives and resources of the RC to supervise doctoral students and integration of these activities into larger frameworks as doctoral programmes and Marie Curie networks, and the promotion of researcher mobility.	Subrating:
Comments:		
18.	Evaluate the objectives and resources of the RC to support postdoctoral research careers, including promotion of researcher mobility.	Subrating:
Comments:		
<b>Societal impact</b>		
19.	Assess the expected societal impact of the RC project.	No numerical rating.
Comments:		
<b>International competitiveness</b>		
20.	Assess how the RC as a whole rates in relation to top international research in its field. If the RC has a specific national character of research, then instead assess international comparability.	Subrating:
Comments:		

Overall assessment	Final rating:
<p>Indicate main strengths and areas of development of the RC project. In addition, you may give further remarks and recommendations:</p>	



## RAE2013 EVALUATION REPORT – Instructions to panelists

### APPENDIX 1: Participation categories of RCs: Veni – Vidi – Vici

Please evaluate the RC materials taking into account the participation category of RC. Each RC can participate in one of the three (3) categories (Veni – Vidi – Vici) described below. The RC determines itself in which category it participates. Your Panel can change the category of the RC if needed but you have to validate in black and white why you changed the category of the RC.

<p><b>New research vistas / openings – Participation category VENI</b></p>
<p>The research of the participating RC represents an innovative opening. This can be a new combination of research fields, a new competitive line of research at Univ Oulu, or it has a special social, national or international demand. Even if the RC in its present form has yet to obtain the proof of international success, its members should show convincing evidence of high scientific level in their previous research. Examples: Young independent researchers proposing new openings after a successful postdoc period (typically abroad); experienced researchers with significant new vistas / openings.</p>
<p><b>On the threshold of international breakthrough / recognition – Participation category VIDJ</b></p>
<p>The research of the participating RC is of high quality, but the community has yet to achieve a strong international recognition and scientific break-throughs in their field. The RC has strong potential and clear plans how to improve its international scientific level and impact. This includes determined and systematic methodological development of their research aim and high possibilities to successfully compete for national and international external funding.</p>
<p><b>World class research – Participation category VICI</b></p>
<p>The research of the participating RC represents the international cutting edge in its field.</p>

## APPENDIX 2: Rating the RCs

Please rate the RC material using the scale below. Rating number six (6) is the best rating. You are encouraged to use the entire scale.

Rating 6 - 1	Description
<p style="font-size: 48pt; text-align: center;">6</p> <p>Outstanding quality of procedures and results</p>	<p>Outstandingly strong research, also from international perspective. Attracts great international interest with a wide impact, including publications in leading journals and/or monographs published by leading international publishing houses. The research has world leading qualities in its field of science. The research focus, key research questions scientific significance, societal impact and innovativeness are of outstanding quality.</p> <p><i>NB! In cases where the research is of a national character and, in the judgment of the evaluators, should remain so, the concepts of "international attention" or "international impact" etc. in the grading criteria above may be replaced by "international comparability".</i></p> <p>The ambition to develop the community together is of outstanding quality.</p> <p>Please give a special emphasis:</p> <ul style="list-style-type: none"> <li>- in <i>veni</i>-category on the novelty, innovativity and feasibility of the research plan</li> <li>- in <i>vidi</i>-category on the solid basis of the research plan and its potential to develop to world class research</li> <li>- in <i>vici</i>-category on the quality of the research plan with respect to the leading groups of world in that field of science</li> </ul>
<p style="font-size: 48pt; text-align: center;">5</p> <p>Excellent quality of procedures and results</p>	<p>Research of excellent quality. Typically published with great impact, also internationally. Without doubt, the research has a leading position in its field in Finland.</p> <p>The ambition to develop the community together is of excellent quality.</p> <p>Please give a special emphasis:</p> <ul style="list-style-type: none"> <li>- in <i>veni</i>-category on the novelty, innovativity and feasibility of the research plan</li> <li>- in <i>vidi</i>-category on the solid basis of the research plan and its potential to develop to world class research</li> <li>- in <i>vici</i>-category on the quality of the research plan with respect to the leading groups of world in that field of science</li> </ul>
<p style="font-size: 48pt; text-align: center;">4</p> <p>Very good quality of procedures and results</p>	<p>The research is of such very good quality that it attracts wide national and international attention.</p> <p>The ambition to develop the community together is of very good quality.</p> <p>Please give a special emphasis:</p> <ul style="list-style-type: none"> <li>- in <i>veni</i>-category on the novelty, innovativity and feasibility of the research plan</li> <li>- in <i>vidi</i>-category on the solid basis of the research plan and its potential to develop to world class research</li> <li>- in <i>vici</i>-category on the quality of the research plan with respect to the leading groups of world in that field of science</li> </ul>
	<p>Good research attracting mainly national attention but possessing international potential, extraordinarily high relevance may motivate good</p>

<p style="font-size: 48pt; text-align: center;">3</p> <p>Good quality of procedures and results</p>	<p>research. The ambition to develop the community together is of good quality. Please give a special emphasis:</p> <ul style="list-style-type: none"> <li>- in <i>veni</i>-category on the novelty, innovativity and feasibility of the research plan</li> <li>- in <i>vidi</i>-category on the solid basis of the research plan and its potential to develop to world class research</li> <li>- in <i>vici</i>-category on the quality of the research plan with respect to the leading groups of world in that field of science</li> </ul>
<p style="font-size: 48pt; text-align: center;">2</p> <p>Unsatisfactory quality of procedures and results</p>	<p>In some cases the research is unsatisfactory and reports do not gain wide circulation or do not have national or international attention. Research activities should be revised. The ambition to develop the community together is of unsatisfactory quality. Please give a special emphasis:</p> <ul style="list-style-type: none"> <li>- in <i>veni</i>-category on the novelty, innovativity and feasibility of the research plan</li> <li>- in <i>vidi</i>-category on the solid basis of the research plan and its potential to develop to world class research</li> <li>- in <i>vici</i>-category on the quality of the research plan with respect to the leading groups of world in that field of science</li> </ul>
<p style="font-size: 48pt; text-align: center;">1</p> <p>Weak quality of procedures and results</p>	<p>The research is weak and reports do not gain wide circulation or do not have national or international attention. Research activities should be revised. There is no ambition to develop the community together. Please give a special emphasis:</p> <ul style="list-style-type: none"> <li>- in <i>veni</i>-category on the novelty, innovativity and feasibility of the research plan</li> <li>- in <i>vidi</i>-category on the solid basis of the research plan and its potential to develop to world class research</li> <li>- in <i>vici</i>-category on the quality of the research plan with respect to the leading groups of world in that field of science</li> </ul>

For each specific question, a written evaluation should be given in addition to indicating a rating number.



# The RAE2013 bibliometric analysis based on publications from years 2007–2011

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Appendix 1. Names and acronyms of RCs used in the bibliometric reports, the reporting organization and grouping into Veni, Vidi and Vici categories

Appendix 2. CWTS Report of the bibliometric performance study of the Research Communities of the University of Oulu 2013

Appendix 3. Oulu University Library report of additional bibliometric analysis

## Introduction

Bibliometrics is one significant method to evaluate academic publishing. Bibliometric evaluation typically measures the output, quality and impact of scientific publishing. The most common measures are publishing activity, the number of citations a publication has had, and the quality of the publications.

The University of Oulu has chosen the Centre for Science and Technology Studies (CWTS), Leiden University, the Netherlands, to carry out the bibliometric evaluation for RAE2013. The analyses performed by CWTS are based on the Web of Science database (WoS) and standard methods, using indicators that have been widely tested and approved. There are, however, large differences between fields and disciplines regarding publication and citation habits. CWTS has developed impact measures to correct for field differences. Still, it should be noted that in some fields the current CWTS bibliometric toolbox does not work properly because WoS does not cover all fields of science equally well. In such cases, Oulu University Library has carried out additional bibliometric analyses to describe publishing in these fields. It should be borne in mind, however, that these numbers are not comparable between different fields, and therefore the results should be interpreted with special care.

## Bibliometric analyses

The Centre for Science and Technology Studies (CWTS) carried out preliminary bibliometric analyses for all 49 research communities (RCs) (Appendix 2). As Web of Science does not cover all fields of science equally well, it cannot be used for impact analyses for all RCs. CWTS together with the University of Oulu RAE2013 Steering Group defined the criteria for the inclusion of analyses performed by CWTS. If the number of publications of the RCs found in Web of Science was less than 25, the CWTS analyses were considered unreliable and additional analyses were needed. Altogether 32 RCs (65 %) fulfilled the criteria for inclusion and 17 RCs needed additional analyses. CWTS bibliometric performance report for those 32 RCs is in Appendix 2 Annex B and the report of additional analysis by Oulu University Library for 17 RCs can be found in Appendix 3.

CWTS performed a separate citation analysis of conference proceedings articles for six RCs with substantial conference proceedings output. The analysis was based on Web of Science Conference Proceedings Citation Indexes. The analysis was carried out for RCs with at least 25 conference proceedings articles found in Web of Science.

## The data used in the RAE2013 bibliometric analysis

The data used in the bibliometric analysis for RAE2013 was extracted from the publications recorded in the publications database *Oulun yliopisto tutkii*<sup>1</sup> of the University of Oulu. The database consists of publications that are either affiliated with the University of Oulu or whose author is employed by the University of Oulu. Researchers of the University of Oulu are asked to record their publications yearly to the database, and Oulu University Library is responsible for the verification of the records. For RAE2013, researchers at the University of Oulu were asked to recheck that all their relevant publications were found in the database.

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<sup>1</sup> [https://solecris.oulu.fi/crisyp/disp/\\_/en/welcome/nop?kieli=1&menuid=0](https://solecris.oulu.fi/crisyp/disp/_/en/welcome/nop?kieli=1&menuid=0)

The database *Oulun yliopisto tutkii* is primarily designed to produce information about the publication performance of the University of Oulu for the needs of the university administration and for the Ministry of Education and Culture. The classification of publication types in the database follows the classification of the Ministry of Education and Culture (Table 1.; Ministry of Education and Culture Publication Data Collection Manual 2012, p. 23<sup>2</sup>). Categories A, B and C in Table 1 are defined as scientific. The data that Oulu University Library sent to the Centre for Science and Technology Studies (CWTS) for the bibliometric analyses consisted of the publication categories A, B and C for each research community. Oulu University Library used the same data to perform the additional analyses when needed.

Table 1. Publication types used by the Ministry of Education and Culture to classify the publications produced by Finnish universities. The publication categories of the *Oulun yliopisto tutkii* database follow this classification.

- A Peer-reviewed scientific articles
  - A1 Journal article (refereed), original research
  - A2 Review article, Literature review, Systematic review
  - A3 Book section, Chapters in research books
  - A4 Conference proceedings
- B Non-refereed scientific articles
  - B1 Non-refereed journal articles
  - B2 Book section
  - B3 Non-refereed conference proceedings
- C Scientific books (monographs)
  - C1 Book
  - C2 Book (editor), chapters in research books, conference proceedings or special issue of a journal
- D Publications intended for professional communities
  - D1 Article in a trade journal
  - D2 Article in a professional book (incl. an introduction by the editor)
  - D3 Professional conference proceedings
  - D4 Published development or research report or study
  - D5 Textbook, professional manual or guide
- E Publications intended for the general public
  - E1 Popularised article, newspaper article
  - E2 Popularised monograph
- F Public artistic and design activities
  - F1 Published independent work of art
  - F2 Public partial realisation of a work of art
  - F3 Artistic part of a non-artistic publication
- G Theses
  - G1 Polytechnic thesis, Bachelor's thesis
  - G2 Master's thesis, polytechnic Master's thesis
  - G3 Licentiate thesis
  - G4 Doctoral dissertation (monograph)
  - G5 Doctoral dissertation (article)
- H Patents and innovation announcements
  - H1 Granted patent
  - H2 Invention announcement
- I Audiovisual material, ICT software
  - I1 Audiovisual material
  - I2 ICT software

## Summary

The Centre for Science and Technology Studies (CWTS) carried out Web of Science-based preliminary bibliometric analyses for all 49 research communities. CWTS carried out a standard bibliometric analysis for 32 RCs and for six RCs a separate citation analysis of conference proceedings articles. Oulu University Library (OULib) carried out additional analyses for 17 RCs which didn't fulfill the criteria for standard CWTS analysis. The names and acronyms of the RCs used in the report and the reporting organization (CWTS/OULib) and the grouping of the RCs into the participation categories Veni-Vidi-Vici are presented in Appendix 1. The results of the bibliometric analyses are presented in Appendices 2 and 3.

## Appendix 1.

### Names and acronyms of RCs used in the bibliometric reports, the reporting organization and grouping into Veni, Vidi and Vici categories

Table 1. Names and acronyms of RCs used in the report and the reporting organization. The Centre for Science and Technology Studies (CWTS) reports in Appendix 2 Annex B and Oulu University Library (OULib) reports in Appendix 3.

<i>Acronym</i>	<i>Name</i>	<i>Bibliometric report by</i>
ACG	Accounting Decisions and Corporate Governance	OULib
AgeAds	The Age of Adjustments? Critical and historical perspectives on governing citizens, wellbeing and environment	OULib
AMASS	Applied Mathematics and Statistics	CWTS
BARC	RC in Bioarchaeological Research	CWTS
BISG	Biomimetics and Intelligent Systems	CWTS
CAS	Circuits and Systems Group	CWTS
CASR	Centre for Advanced Steels Research	CWTS
CLRC	Child Language Research Center	OULib
CMV	Center for Machine Vision Research	CWTS
COACT	Complexity of (inter)action: Towards an understanding of skilled multimodal participation	OULib
COMET	Carcinogenesis: origin, mechanisms and treatment	CWTS
COMPANION	The complexities of organizational activities	CWTS
CREMA	Community of Research in Education, Music, and the Arts	OULib
CVR-Co	Cardiovascular Research Community	CWTS
DCE	Department of Communications Engineering	CWTS
DynaHEALTH	Dynamics and Determinants of life course Health and Wellbeing	CWTS
EduPhil	Educational Theory and Philosophy	OULib
GlobalHealth	Global Change, Geography, Environment and Public Health Research	CWTS
GPC-DEDE	Genetic, physiological and clinical aspects of development and degeneration - from the newborn to the oldest of the old	CWTS
GSC	Gastrointestinal Surgery Community	OULib
HEAT	Heterogeneity in Economic Applications and Theory	OULib
IEM	Industrial Engineering and Management	CWTS
INSPIRIES	Institutions and Practices of New Literacies	OULib
iPoB	Integrative Population Biology	CWTS
iUBI	UBIquitous Interactions	OULib
LET	Learning and Educational Technology Research Unit	OULib
Living Stories	Narratives in Education – Living stories in theory and practice	OULib
LUMINOUS	Sustainable Northern Communities: Integrating smart systems, structures and change	CWTS
MA	Mathematical Analysis	CWTS
MAD-2C	Multimodal Analysis of Dynamic Cooperative Communication	CWTS
MOMA	Molecular Materials	CWTS
MtM	More-than-Moore	CWTS
Multi-Scale Test	Multi-Scale Testing and Trans-scale Modeling of High-Performance Materials	OULib
NEBES	Northern Environment, Biodiversity and Ecosystem Services Research	CWTS
NorBE	Northern Bioeconomy	CWTS
NRNE	Natural Resources of Northern Eurasia	CWTS
OASIS	Oulu Arthritis consortium – Synergy Is Solution	CWTS
OCCI	Oulu Center for Clinical Immunology	CWTS
OSSI	Oulu Software and Systems Initiative	OULib



Phototransduction	Phototransduction mechanisms in mammalian brain	CWTS
PopStatGen	Population and Statistical Genomics	CWTS
ProChemE	Sustainable Solutions for Production Processes and Environmental Applications	CWTS
Proteus	Protein Structure and Function Research Community	CWTS
PSH	Persuasive Systems for Health	CWTS
RELATE-OULU	Crossing borders: The relational and territorial politics of bordering, identities and transnationalization	OULib
SPARC	Space Physics and Astronomy RC	CWTS
SusBen	Sustainable Benefication	OULib
TE	Transcultural Encounters	OULib
Tissue Homeostasis	Tissue Development, Homeostasis and Malignancy	CWTS

Table 2. RCs grouped into Veni, Vidi and Vici categories.

Veni	Vidi	Vici
AgeAds	ACG	AMASS
BISG	BARC	CAS
CREMA	CASR	CMV
GlobalHealth	CLRC	COACT
GSC	COMET	CVR-Co
INSPIRES	COMPANION	DCE
LUMINOUS	EduPhil	DynaHEALTH
MAD-2C	GPC-DEDE	LET
Multi-Scale Test	HEAT	MA
OASIS	IEM	RELATE-OULU
OCCI	iPoB	SPARC
OSSI	iUBI	Tissue Homeostasis
Phototransduction	Living Stories	
PopStatGen	MOMA	
PSH	MtM	
SusBen	NEBES	
	NorBE	
	NRNE	
	ProChemE	
	Proteus	
	TE	

Appendix 2.

CWTS Report of the bibliometric performance study of the Research  
Communities of the University of Oulu 2013

# Report of the bibliometric performance study of the Research Communities of the University of Oulu 2013

Results of the output and impact analysis

**Ed Noyons, CWTS, Leiden University**



# Report of the bibliometric performance study of the Research Communities of the University of Oulu 2013

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*Results of the output and impact analysis*

**Ed Noyons**  
**CWTS, Leiden University**



**Universiteit Leiden**



UNIVERSITY of OULU  
OULUN YLIOPISTO

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The pictures in this report are copied from the University of Oulu website or taken by the author.

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## 1 Introduction

The University of Oulu, founded in 1958, is an international science university with an ambition to create innovation for the future, well-being, and knowledge through multidisciplinary research and education (<http://www.oulu.fi>). As one of the bigger, multidisciplinary universities it is an important player in the Finnish research arena. As a part of the Research Assessment Exercise RAE2013, the University of Oulu wishes to measure the performance of its 49 research communities from a bibliometric perspective. This report presents the results of this analysis, executed by CWTS.

The publication output data was registered and processed very accurately by the Oulu University Library. For the aim of the study, 49 research communities (RCs) were defined in a variety of disciplines and fields. For each RC publication data was collected in the period 2007-2011 and submitted to CWTS.

A bibliometric study typically measures output and impact using publication and citation data. There are, however, large differences between fields and disciplines regarding publication and citation habits. CWTS developed impact measures to correct for field differences. Still, it should be noted that in some fields, and therefore for some RCs, the current CWTS bibliometric toolbox does not work properly. In such cases, the value of bibliometric results will be modest and presented results limited. In the section on data collection and methodology, we will discuss the criteria. Special attention is paid to conference proceedings. This type of output plays an important role for a number of RCs but is not included in the standard CWTS impact measurement. In an additional analysis we investigate the value of conference proceedings for a selection of RCs and how they relate to the impact of other output types.



## 2 Data collection and methodology

The Oulu University Library registered and processed all publication data (2007-2011) for the 49 research Communities (RCs) very accurately before it was sent to the CWTS. An overview list of RCs is in Table 1. Throughout the report we will refer to the acronyms of the RCs rather than to the full names.

**Table 1: List of 49 RCs of the University of Oulu**

<i>Acronym</i>	<i>Full name</i>
ACG	Accounting Decisions and Corporate Governance
AgeAds	The Age of Adjustments? Critical and historical perspectives on governing citizens, wellbeing and environment
AMASS	Applied Mathematics and Statistics
BARC	RC in Bioarchaeological Research
BISG	Biomimetics and Intelligent Systems
CAS	Circuits and Systems Group
CASR	Centre for Advanced Steels Research
CLRC	Child Language Research Center
CMV	Center for Machine Vision Research
COACT	Complexity of (inter)action: Towards an understanding of skilled multimodal participation
COMET	Carcinogenesis: origin, mechanisms and treatment
COMPANION	The complexities of organizational activities
CREMA	Community of Research in Education, Music, and the Arts
CVR-Co	Cardiovascular Research Community
DCE	Department of Communications Engineering
DynaHEALTH	Dynamics and Determinants of life course Health and Wellbeing
EduPhil	Educational Theory and Philosophy
GlobalHealth	Global Change, Geography, Environment and Public Health Research
GPC-DEDE	Genetic, physiological and clinical aspects of development and degeneration - from the newborn to the oldest of the old
GSC	Gastrointestinal Surgery Community
HEAT	Heterogeneity in Economic Applications and Theory
IEM	Industrial Engineering and Management
INSPIRES	Institutions and Practices of New Literacies
iPoB	Integrative Population Biology
iUBI	UBIquitous Interactions
LET	Learning and Educational Technology Research Unit
Living Stories	Narratives in Education – Living stories in theory and practice
LUMINOUS	Sustainable Northern Communities: Integrating smart systems, structures and change
MA	Mathematical Analysis
MAD-2C	Multimodal Analysis of Dynamic Cooperative Communication
MOMA	Molecular Materials
MtM	More-than-Moore
Multi-Scale Test	Multi-Scale Testing and Trans-scale Modeling of High-Performance Materials
NEBES	Northern Environment, Biodiversity and Ecosystem Services Research
NorBE	Northern Bioeconomy
NRNE	Natural Resources of Northern Eurasia
OASIS	Oulu Arthritis consortium – Synergy Is Solution
OCCI	Oulu Center for Clinical Immunology
OSSI	Oulu Software and Systems Initiative
Phototransduction	Phototransduction mechanisms in mammalian brain
PopStatGen	Population and Statistical Genomics
ProChemE	Sustainable Solutions for Production Processes and Environmental Applications
Proteus	Protein Structure and Function Research Community
PSH	Persuasive Systems for Health
RELATE-OULU	Crossing borders: The relational and territorial politics of bordering, identities and transnationalization
SPARC	Space Physics and Astronomy RC



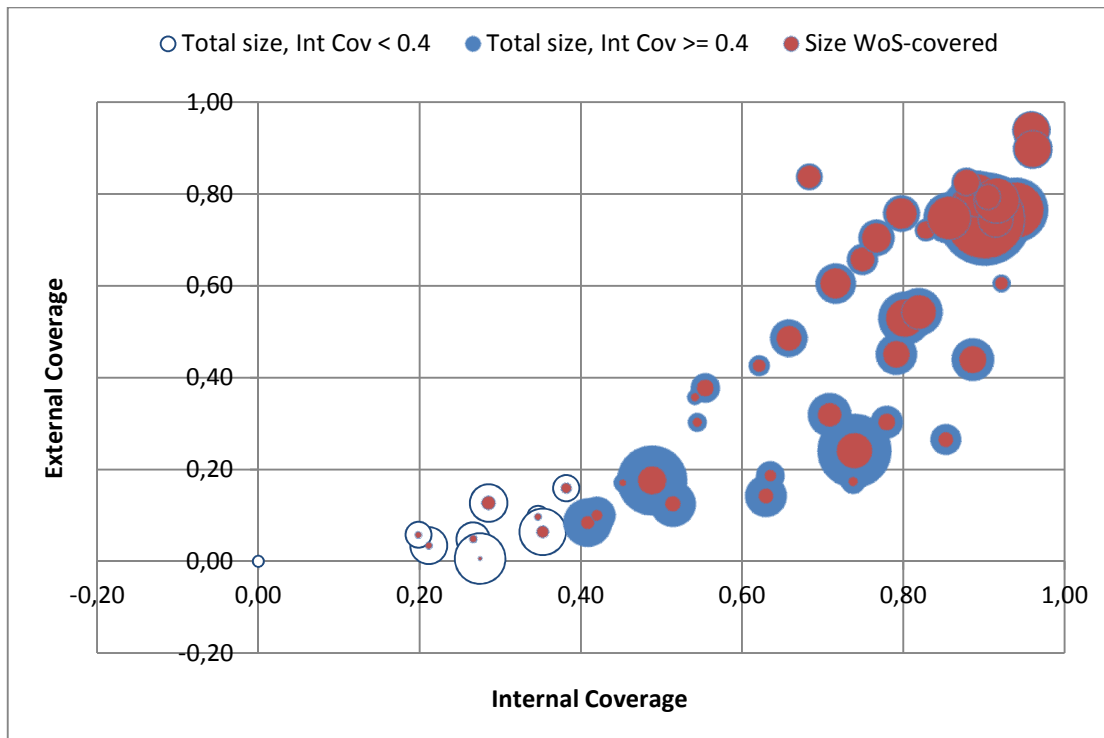
Acronym	Full name
SusBen	Sustainable Benefication
TE	Transcultural Encounters
Tissue Homeostasis	Tissue Development, Homeostasis and Malignancy

Regarding the results in our report, it should be noted that we only include articles and reviews<sup>1</sup> in journals covered by the Web of Science (WoS) database in our standard bibliometric analyses. The WoS database is a multi-disciplinary bibliographic database covering around 20,000 international journals with citing relation between individual articles. The WoS is a suitable database for our bibliometric analyses because the citation impact can be measured in broad sense (not only within one discipline) and will be applied in a consistent way for all RCs, sufficiently covered. And because we received all publication output from the RCs, we were able to assess the representativeness of the covered output. The coverage of our analyses can be measured in two ways. The simplest measure is the *external coverage* (Ext\_cov). It is defined by the number of publication output items covered by the WoS as a share of the total output. If an RC published 75 papers covered by our analyses and 25 not covered (book chapters, books, proceeding papers), the external coverage is 0.75 ( $75/[75+25]$ ). We can only measure the external output if we received all publication output. If we only have the publications covered by the WoS, we don't know what the external coverage is. In those cases we assess the coverage by measuring the *internal coverage* (Int\_cov). The internal coverage of an oeuvre (set of publications in the WoS) is measured by the average of references also covered by the WoS. Because we assume that authors primarily refer to relevant publications, we consider the internal coverage a proxy for the representation of an RC's output covered in the analysis (i.e., by the WoS) as compared to its entire oeuvre.

We have found that the internal coverage correlates strongly with the external coverage. In the case of the 49 RCs this was confirmed. In the diagram below (Figure 1), we plotted the internal coverage (horizontal axis) against the external coverage (vertical axis) of the output (volume represented by the circle surface) of the 49 RCs. The outer (Blue or open<sup>2</sup>) circle represents the total output, the inner (Red) circle represents the part of the oeuvre, we included in our analyses.

<sup>1</sup> In the previous version of the CWTS bibliometric impact assessment, letters were included but counted as 0.25. In the current approach letters are excluded.

<sup>2</sup> Open circles represent RCs with an internal coverage below 0.4, which is normally the threshold to yield trustworthy bibliometric impact values.



**Figure 1: Overview of numbers of publications per RC and their coverage by the WoS (2007-2011)**

The diagram clearly illustrates the strong correlation between internal and external coverage<sup>3</sup> but also reveals some interesting and particular cases. A number of RCs have a (very) high internal coverage but a very low external coverage. This suggests that their output included in our analyses is a good representation of their scholarly output although they still have a substantial non-covered output. In some cases the non-covered output regard proceedings papers, in other cases the non-covered output involves books, book chapters or otherwise. However, as indicated by a high internal coverage, such output types seem less relevant within the scholarly debate as they are hardly referred to.

For some cases, where the non-covered output involved mainly proceedings papers, we studied in more detail the impact (numbers of citations received) and related the outcomes to the results from the standard impact analyses (section 3.3).

In the bar chart below, we depict the numbers of output by RC. We discern the following three types of output:

- Blue: all publication output registered
- Red: all WoS output (including proceedings papers, letters, notes etc.)
- Green: WoS output (articles and reviews only) used in the CWTS standard analyses.

With this information we could identify different groups of RCs which will be analyzed separately.

<sup>3</sup> Pearson correlation is 0.84. For the sake of the argument no additional statistical test are necessary.

We clustered the RCs into four groups:

- A. 25 or more papers covered by our standard analyses (Green) and no substantial (additional) proceedings papers;
- B. 25 papers or more and more than 25 proceedings papers (Red not Green, adding a substantial part to the output)
- C. Less than 25 papers covered by our standard analyses but 25 or more proceedings papers (Red);
- D. RCs with less than 25 articles, reviews or proceedings papers.

All RCs in group A and B will be analyzed with the standard CWTS indicators. All RCs in group B and C will be analyzed in an additional conference proceedings evaluation (section 3.3).

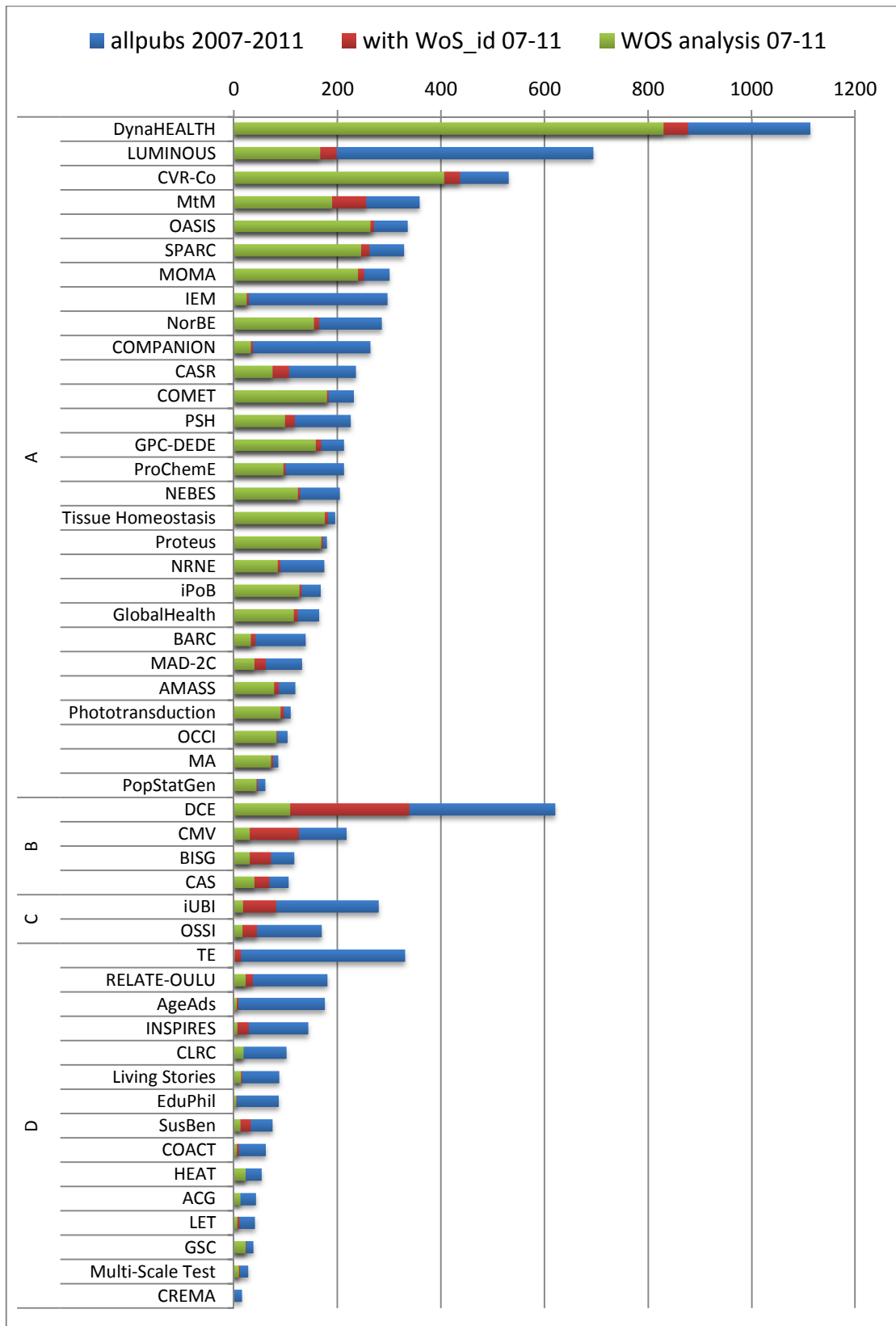


Figure 2: Overview of output of 49 University of Oulu RCs (2007-2011)

The RCs in Group D have too few publications to be analyzed with our standard impact or any other citation impact measure. In these cases we confined ourselves to an output analysis only. For some RCs the output can be quite

substantial. All RCs in group D will also be analyzed extensively by the Oulu University Library.

The RCs in groups B and C will be analyzed by a special proceedings approach (Section 3.3). The RCs in A and B with more than 25 articles and reviews in the WoS (not including proceedings) are analyzed by the standard CWTS impact approach and as such key in this report.



### 3 Results

#### 3.1 Output analysis of the RCs with little or no WoS output

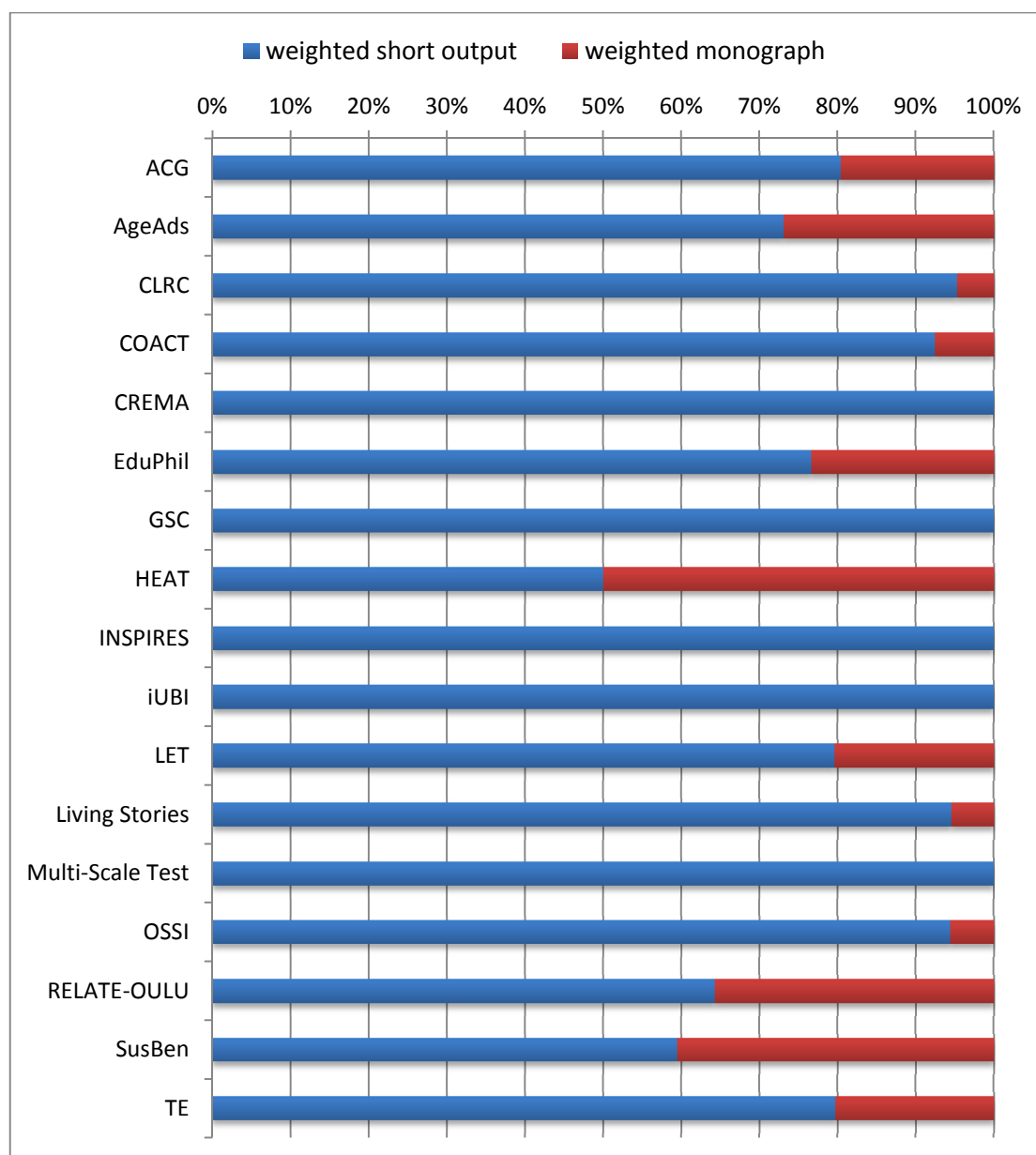
The RCs in group C and D (see Figure 2) have less than 25 articles or reviews covered by the WoS. An overview of their output is below (Table 2).

**Table 2: Overview of scholarly output per type (2007-2011) for University of Oulu RCs not included in the standard impact analyses**

	Compilation	Conference publication	Scientific journal	Scientific monograph	Introduction to Edited book	Total output
<b>ACG</b>	3	9	29	2	0	43
<b>AgeAds</b>	58	29	63	12	13	175
<b>CLRC</b>	38	14	44	1	5	102
<b>COACT</b>	25	10	18	1	8	62
<b>CREMA</b>	3	9	2	0	2	16
<b>EduPhil</b>	39	7	26	5	10	87
<b>GSC</b>	0	0	38	0	0	38
<b>HEAT</b>	13	0	31	9	1	54
<b>INSPIRES</b>	13	94	32	0	4	143
<b>iUBI</b>	24	208	46	0	2	280
<b>LET</b>	8	8	21	2	2	41
<b>Living Stories</b>	31	6	48	1	2	88
<b>Multi-Scale Test</b>	1	13	14	0	0	28
<b>OSSI</b>	8	94	58	2	8	170
<b>RELATE-OULU</b>	44	27	78	18	13	180
<b>SusBen</b>	1	49	16	9	0	75
<b>TE</b>	135	45	111	16	23	330

Overall, compilations, conference publications (proceedings papers) and scientific journals are the most important media for scholarly output, in terms of absolute numbers. Obviously monographs and edited books contribute less to the volume of output (as measured by sheer numbers). As such we don't detect relevant differences between the RCs.

If we discern short scholarly outputs (in compilations, proceedings, journals and edited books) and long outputs (monographs) and attribute different weights, we do see interesting differences. In the chart below (Figure 3), we weighted a monograph 5 times the value of a short output and plotted the proportional output for each RC.



**Figure 3: Proportional output distribution of C and D group RCs, where long outputs are weighted 5 times and short outputs once.**

From this overview we discern HEAT, RELATE-OULU and SusBen as RCs with the most prominent preference for output in monographs. To a lesser extent ACG, AgeAds, EduPhil, LET and TE show an interest in monographs. The other RCs in this category have a clear preference for the shorter output types.

This means that, except for the ones mentioned here, the other C and D RCs may be evaluated on the basis of their oeuvre, provided that the sources in which they publish their research is covered by the database on the basis of which the analysis is performed (WoS, Scopus).

A more detailed and sophisticated analysis of these RCs (not in our standard analyses) is executed by the Oulu University Library.

### 3.2 Standardized analysis of selected RCs

We found 32 RCs with at least 25 publications covered by our analyses (articles and reviews) in 2007-2011. For all publications published by these RCs we conducted a standard CWTS output and impact assessment. The output and impact assessment involves a counting of publications per year and a calculation of citations per publication, normalized by the field to which they belong. The normalization of received citations by field has recently been improved by CWTS. We are now able to establish this at a higher resolution than traditionally (See Annex A). The new normalization is referred to as *source normalization*. The basics behind the source normalization, for instance, of publication A involves the citing behavior of those publications citing that publication A. The longer the list of references in publications citing A, the higher the reference value, i.e., the less relative value each citation to A has. There is one downside of the source normalized MNCS related to the traditional version. In the tradition MNCS the world average (and hence reference value) is 1. In the source normalization the world average is above one if the database on which the analysis is based, grows. In a growing environment the number of publications with references grows whereas the publications to which the references are linked remains as they were. Hence the world average is higher than 1; how much higher than 1 depends on the growth rate of the database. We estimate that in the current version of the WoS the world average is around 1.1.

The output measurement regards the production of an RC, not the productivity. Productivity can only be measured if the input is known (number of researchers, amount of research FTE, or amount of funding).

Moreover, impact is a valuable additional dimension to assess an RC's performance. Hence, we reward the contribution of the better papers that are more likely to become highly cited.

In the table below (Table 3), we provide an overview of the results for the 32 selected RCs for the period 2007-2011, citations including 2012. The indicators used are:

<b>P</b>	Number of publications	Number of publications 2007-2011 (articles and reviews, covered by WoS)
<b>Int_cov</b>	Internal coverage	Proxy for WoS coverage of full output (see Section 2)
<b>MNJS</b>	Mean Normalized Journal Score	Normalized impact (See MNCS below) of all papers in the journals used. This is a much more sophisticated variant of the journal impact factor
<b>TCS</b>	Total Number of Citations	Number of citations received by oeuvre (2007-2011)
<b>MCS</b>	Mean Citation Score	TCS divided by the number of papers in oeuvre
<b>MNCS</b>	Mean Normalized Citation Score	MCS normalized by the 'field' to which each paper belongs, the field being the set of citing publications.
<b>PPtop10%</b>	Proportion Papers Top 10%	Proportion of papers belong to the 10% most cited ones. The expected value would be 0.10, i.e., in a normal distribution we expect 10 out of a 100 to belong to the top 10%.



The indicator P, number of publications, regards output production. The MNJS indicates the impact of the journals in which the RCs were able to get their papers published. TCS refers to the total number of citations received and used in this analysis, while MCS measures the number of citations received per publication (P). The MNCS and PPTop10% indicators regard impact (MCS), normalized by field and citation window<sup>4</sup>. The indicator *int\_cov* is a proxy for the coverage of the entire RC oeuvre in our analyses (as discussed in Section 2). For all impact measures (MNCS, MNJS, MCS, TCS, PPTop10%) we disregarded self-citations. If one of the citing authors matches one of the cited authors, a citation is not counted.

**Table 3: Bibliometric performance of 32 selected RCs of the University of Oulu (2007-2011)**

RC	P	Int_cov	MNJS	TCS	MCS	MNCS	PPTop10%
AMASS	78	0.75	1.15	168	2.15	0.65	0.05
BARC	33	0.74	1.04	79	2.39	0.95	0.09
BISG	31	0.85	1.25	179	5.77	0.90	0.10
CAS	40	0.55	1.16	51	1.28	0.84	0.15
CASR	75	0.71	0.99	164	2.19	0.88	0.13
CMV	31	0.63	1.55	260	8.39	3.34	0.52
COMET	179	0.94	1.22	1,382	7.72	1.27	0.14
COMPANION	33	0.51	0.96	73	2.21	0.81	0.09
CVR-Co	405	0.94	1.70	4,845	11.96	2.02	0.18
DCE	109	0.49	1.04	155	1.42	0.93	0.17
DynaHEALTH	821	0.90	1.64	10,605	12.92	2.00	0.21
GlobalHealth	116	0.77	1.27	692	5.97	1.59	0.12
GPC-DEDE	157	0.91	1.40	1,175	7.48	1.24	0.15
IEM	25	0.41	0.88	30	1.20	0.24	0.00
iPoB	127	0.80	1.29	535	4.21	1.40	0.13
LUMINOUS	167	0.74	1.04	666	3.99	0.95	0.12
MA	72	0.68	1.15	277	3.85	5.12	0.36
MAD-2C	40	0.78	1.06	101	2.53	0.91	0.15
MOMA	240	0.89	1.06	533	2.22	0.61	0.05
MtM	190	0.80	0.97	767	4.04	1.16	0.16
NEBES	124	0.72	1.43	803	6.48	1.87	0.23
NorBE	155	0.82	0.96	406	2.62	0.67	0.06
NRNE	85	0.66	1.27	294	3.46	0.94	0.12
OASIS	263	0.92	1.20	1,638	6.23	1.36	0.16
OCCI	82	0.90	1.73	714	8.71	1.20	0.15
Phototransduction	90	0.88	1.09	461	5.12	0.90	0.12
PopStatGen	44	0.83	1.77	553	12.57	3.77	0.39
ProChemE	96	0.79	1.06	308	3.21	0.84	0.10
Proteus	169	0.96	1.30	1,439	8.51	1.10	0.14
PSH	99	0.89	1.43	848	8.57	1.28	0.08
SPARC	246	0.86	1.09	1,504	6.11	1.77	0.18
Tissue Homeostasis	175	0.96	1.48	1,527	8.73	1.17	0.12

Below in Figure 4, the two normalized impact indicators are plotted by RC. The diagram shows clearly the strong correlation. If the PPTop10% is high, the MNCS

<sup>4</sup> A citation window is introduced to correct for shorter windows for more recent publications. The maximum of 4 years is to adopt as much as possible the same impact period for all publications.

is also high and the other way around. If the PPTop10% is much higher than the MNCS, it means that there are relatively many high impact papers but the low impact papers are cited much less (e.g., CMV, DCE). If the PPTop10% is significantly lower than the MNCS, it means that there are relative few outliers (e.g., MA).

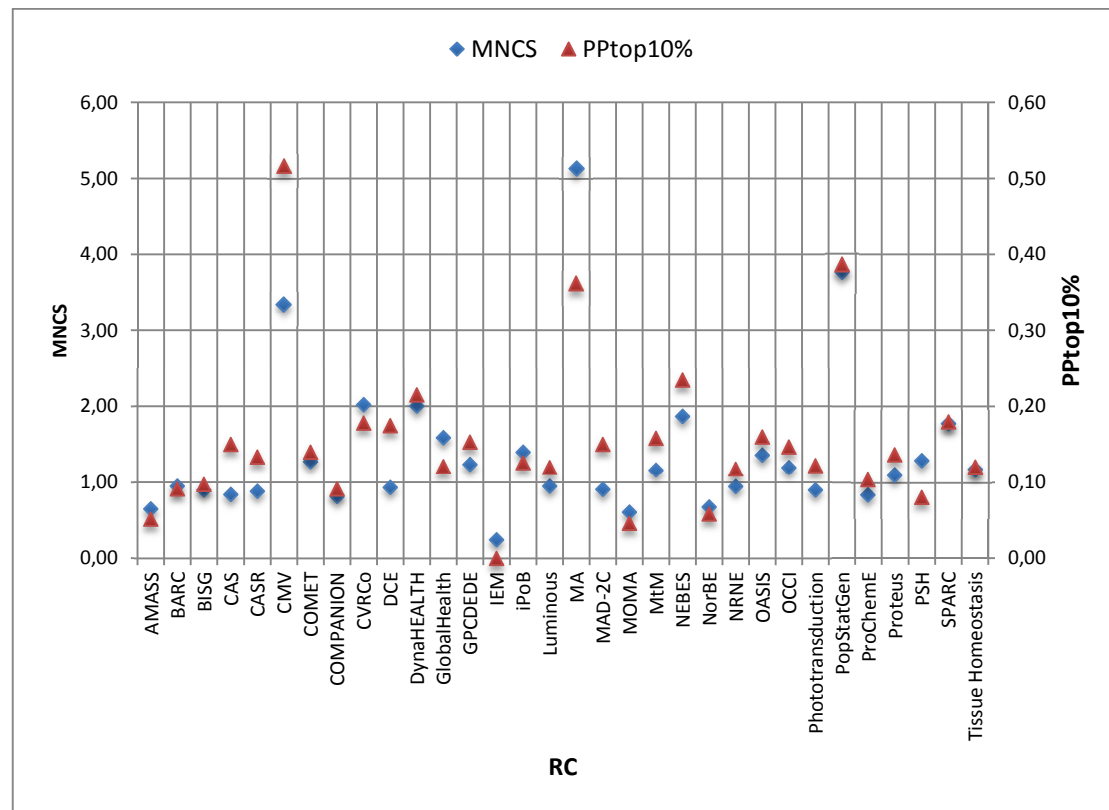


Figure 4: Impact overview of 32 RCs (2007-2011)

Furthermore, the overview shows that most RCs are at a similar level with an MNCS between 1 and 2. The positive outliers (CMV, MA and PopStatGen) involve RCs with relative low numbers of papers. In order to distinguish the impact of RCs in more detail, we measured the trend of the impact and derived. In Annex B we listed the results for all 32 RCs. Hence we could count the number of periods in which the impact was above a certain threshold. We chose the MNCS as primary impact indicator and counted the number of periods per RC in which the MNCS was above 2. This yields the following list (Table 4) of most stable high impact RCs, having three or more occurrences.

Table 4: Overview of most stable high impact RCs 2007-2011

RC	# MNCS >2
CMV	5
CVR-Co	4
DynaHEALTH	3
MA	5
PopStatGen	3

CMV and MA show an impact that is above the thresholds not only over the entire period but also in each sub period (2007-2008, 2008-2009 etc.) The other RCs in the list have at least three periods in which they show an MNCS above 2 and may as such be identified as the outstanding RCs regarding impact. One of them (CMV) will also be included in the proceedings analyses.

Finally an analysis of the journals in which the RCs get their papers published (MNJS) shows that CMV, CVR-Co, DynaHEALTH, OCCI and PopStatGen perform best overall. CVR-Co and OCCI even manage an MNJS above 1.5 in all five periods.

### 3.3 Additional analysis of RCs with a substantial output in proceedings

In this section we will have a closer look at 6 RCs. These 6 RCs have more than 25 proceedings papers covered by the WoS in 2007-2011 (Proceedings edition).

Four of them (BISG, CAS, CMV and DCE) were also included in the standard analyses because they also had more than 25 journal articles.

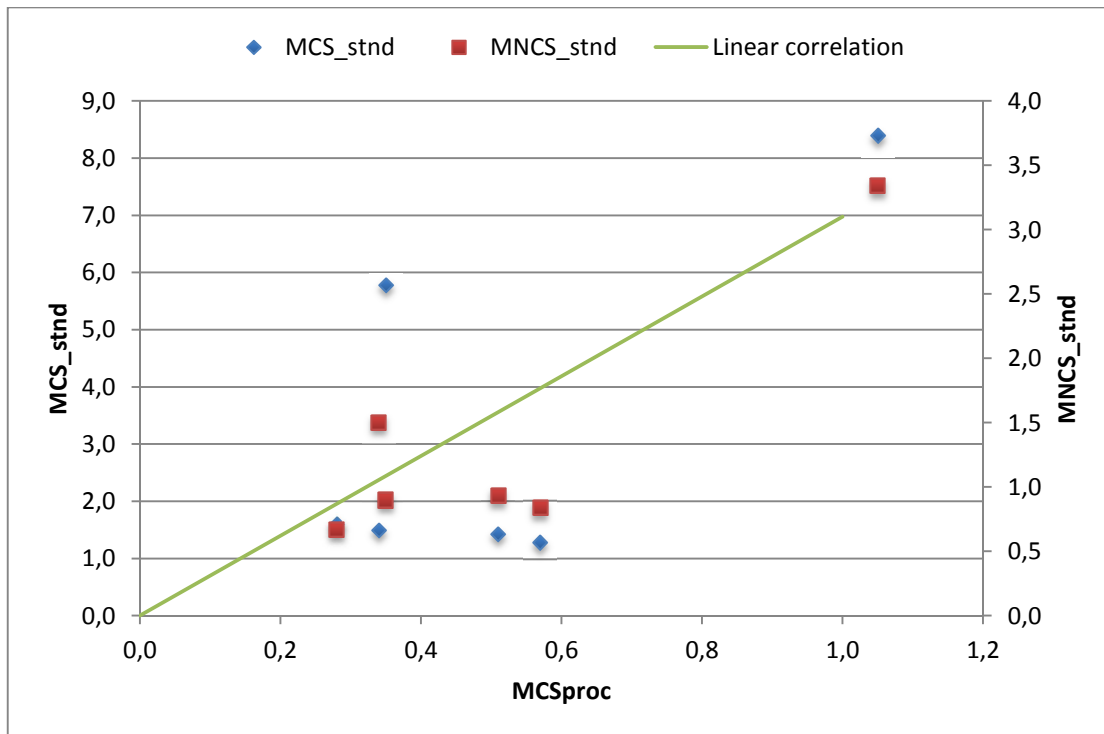
Within the Proceedings Citation Index (PCI) of the WoS, we calculated (similar to the standard approach) the number of citations per paper within a citation window of 4 years and disregarding self-citations (MCS<sub>proc</sub>). Moreover, we calculated MCS (number of citations received per paper) and MNCS (MCS normalized by field) with the standard analyses.

**Table 5: Impact statistics of 6 RCs with more than 25 proceedings papers (2007-2011)**

RC	P <sub>proc</sub>	TCS <sub>proc</sub>	MCS <sub>proc</sub>	MCS <sub>std</sub>	MNCS <sub>std</sub>	int <sub>cov</sub>
BISG*	40	14	0.35	5.77	0.90	0.85
CAS*	37	21	0.57	1.28	0.84	0.55
CMV*	95	100	1.05	8.39	3.34	0.63
DCE*	244	124	0.51	1.42	0.93	0.49
iUBI	64	22	0.34	1.50	1.50	0.35
OSSI	29	8	0.28	1.59	0.67	0.42

\* Also included in the standard analyses.

In the chart below (Figure 5) we depicted the correlation between MCS<sub>proc</sub> with the MCS<sub>std</sub> and MNCS<sub>std</sub>. The Green line indicates the perfect correlation. It is clear that there is no significant correlation. In other words, a higher MCS<sub>proc</sub> does not necessarily mean a higher MCS<sub>std</sub> or MNCS<sub>std</sub>.



**Figure 5: Correlation Proceedings impact with standard impact analyses (2007-2011) of 6 RCs with more than 25 proceedings papers**

The most significant result is the impact of CMV. We already saw in Section 3.2 that this RC is among the top at the University of Oulu. Also in this analysis its impact is much higher than for the others. Furthermore, the impact of CAS is even better for journals papers than for proceedings papers. For the other four the citations in proceedings don't seem to add much to their impact. It should be noted that DCE does receive a substantial amount of citations but with a large volume of published proceedings the average per paper (MCS\_proc) is still below the impact of CMV and CAS.

Finally it should be noted that the internal coverage of BISG is high. It means that most of their scholarly communication takes place within the realm of the WoS. The MNCS would in that case represent sufficiently its bibliometric performance. The impact of the proceedings of BISG does not indicate otherwise.

## 4 Conclusions

In this report we created a bibliometric picture as complete as possible of the 49 research communities (RCs) of the University of Oulu. For 32 RCs we could use the standardized toolbox to measure output and impact. The most prominent indicator used in this report regards (scientific) impact. This impact is measured by received citations. And because citation practices vary from field to field, we normalize the impact by field (Mean Normalized Citation Score, MNCS). In view of the broad variety of RCs at the University of Oulu, we applied a recently developed version of the MNCS, the source normalized MNCS. This version normalizes impact at a high level of 'field resolution' and hence makes it possible to compare the impact of RCs in such different fields.

In addition we evaluated the proceedings output and impact of 6 RCs.

For the 17 RCs with less than 25 papers articles or reviews covered by the WoS, in 2007-2011, we confined ourselves to a basic output analysis. The Oulu University Library carried out a detailed output analysis of these RCs.

The results of our standard analyses show outstanding impact results for CMV, CRV-Co, DynaHealth, MA and PopStatGen. Four of them (all but MA) got their papers published in high impact journals. Also OCCI managed to do that.

The proceedings of CMV also appear to have a relatively high impact. Still, the results of the proceedings papers for 6 selected RCs do not add much information to the bibliometric impact measurement.

## Annexes

## Annex A: Correcting for field-specific characteristics in citation impact measurements: Traditional normalization vs. source normalization

### Introduction

One of the biggest challenges in the measurement of citation impact is to make citations in different scientific fields comparable with each other. Given the huge differences between fields in publication and citation practices, this is far from straightforward. A single citation in a field such as mathematics may well be more valuable than ten citations in for instance biochemistry.

There are two approaches available for correcting, or normalizing, for field differences. In this note, we will briefly illustrate both approaches. We will refer to one approach as the traditional normalization. This approach, which in the past was used in most bibliometric analyses conducted by CWTS, relies on the idea of explicitly delineating scientific fields. For instance, each journal is assigned to one or more fields, and in this way the journal in which a publication has appeared determines the field (or the fields) to which the publication belongs. The citation count of a publication is normalized by comparing it with the average citation count of all publications in the field. The other approach is commonly referred to as source normalization. This is a more recently developed approach that has the advantage of being independent of any classification of publications or journals into fields. As we will illustrate below, the source normalization approach aims to correct for field differences by looking at publications' referencing behavior.

#### Example

As a simple illustration of the two normalization approaches, consider a research group that has five publications. Based on the journals in which these publications have appeared, the publications belong to two different fields. The main statistics for the five publications can be summarized as follows:

Publication	Field	Citations	Field mean citations
1	A	12	4
2	A	2	4
3	A	10	4
4	B	7	8
5	B	5	8

So publications 1, 2, and 3 have appeared in field A, in which publications on average are cited 4 times. Publications 4 and 5 have appeared in field B. This field has a higher citation density. In other words, publications have longer reference lists and therefore also receive more citations. On average, publications in field B are cited 8 times.

Using the traditional normalization approach, our research group performs well in field A but not so well in field B. In field A, its publications on average are cited  $(12 + 2 + 10) / (3 \times 4) = 2$  times above expectation. In field B, on the other hand, the publications of our research group have an average normalized citation score of  $(7 + 5) / (2 \times 8) = 0.75$ , indicating that the publications are cited 25% below the field average.

In the source normalization approach, normalization is done by looking at the length of the reference lists of citing publications. For instance, consider publication 2, which has been cited twice. If one of the citing publications has 10 references while the other has 5, the source normalized citation impact of publication 2 equals  $1 / 10 + 1 / 5 = 0.3$ . On average source normalized citation scores are close to 1, so a score of 0.3 can be interpreted as about 70% below average. In essence, source normalization starts from the idea that in a field in which publications are cited a lot, they must also have relatively long reference lists. By correcting for reference list length, one takes away the field-specific effects in citation impact measurements and one therefore obtains field normalized citation scores.

Using the traditional normalization approach, our research group was found to have a below average citation impact in field B. However, this could be an artifact of the way in which field B is defined. For instance, field B may consist of a number of subfields that each have different citation practices. (A good example are more basic and more clinically oriented subfields within the same medical specialty.) If publications 4 and 5 of our research group are in a subfield of field B with a relatively low citation density (i.e., relatively low numbers of citations), then these publications would be disadvantaged by the traditional normalization approach. This is because this approach compares publications 4 and 5 with all publications in field B, despite the differences in citation practices between field B's subfields. The source normalization approach, on the other hand, works at a more local level and does not look at field B as a whole. It is therefore likely to provide a fairer picture of the citation impact of publications 4 and 5. It may for instance be that these publications are cited by publications that each have 5 references, in which case we obtain normalized citation scores of  $7 \times (1 / 5) = 1.4$  and  $5 \times (1 / 5) = 1$ , indicating that publications 4 and 5 in fact have a citation impact above rather than below average (i.e., their average normalized citation score is above 1 instead of below).

## Conclusion

The traditional normalization approach has been in use for a long time and seems sufficiently accurate for performing between-field comparisons at the level of for instance entire university departments. However, for more refined bibliometric analyses, such as at the level of individual research groups, the traditional approach yields citation impact measurements that are highly sensitive to the exact way in which the field in which a group is active is defined. If the activity of a group is mainly in a subfield that has a higher citation density than other subfields within the same field, the citation impact of the group will be overestimated, while an underestimation will occur if a group is active in a relatively low citation density subfield.

The source normalization approach is completely independent of any classification of publications into fields. It therefore does not suffer from artifacts related to field definitions, making it considerably more accurate especially for analyses at the level of for instance an individual research group.



## **Annex B: Full bibliometric profiles of 32 selected University of Oulu Research Communities (2007-2011)**

Each profile consists of:

1. A trend analyses of all indicators
2. A research profile where an RC's output (in percentages) and impact is distributed over the most prominent subject categories
3. A collaboration profile where an RC's output (in percentages) and impact is distributed over the different types (non, national, international)

In the profile diagrams, the output distribution is in percentages and the impact is indicated by color-coding and between parentheses. We discern three levels of impact:

- High MNCS (above 1.2)
- Average MNCS (between 0.8 and 1.2)
- Low MNCS (below 0.8)

MNCS is the impact (citations per paper) normalized to the 'field'. This normalization is explained in Annex A.

**List of profiles**

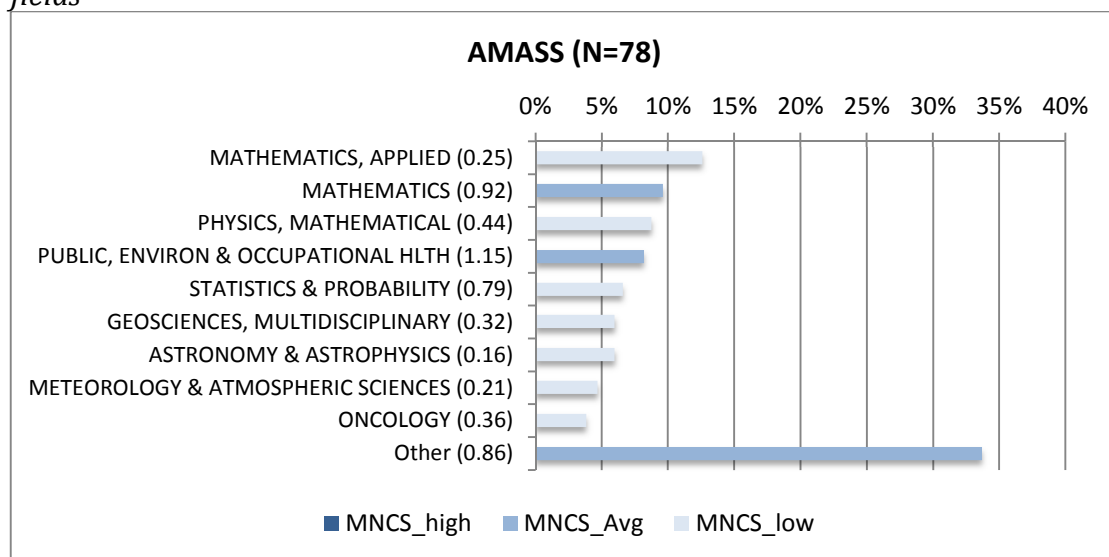
<i>Bibliometric performance report (output and impact) of Research Community AMASS</i>	<b>24</b>
<i>Bibliometric performance report (output and impact) of Research Community BARC</i>	<b>25</b>
<i>Bibliometric performance report (output and impact) of Research Community BISG</i>	<b>26</b>
<i>Bibliometric performance report (output and impact) of Research Community CAS</i>	<b>27</b>
<i>Bibliometric performance report (output and impact) of Research Community CASR</i>	<b>28</b>
<i>Bibliometric performance report (output and impact) of Research Community CMV</i>	<b>29</b>
<i>Bibliometric performance report (output and impact) of Research Community COMET</i>	<b>30</b>
<i>Bibliometric performance report (output and impact) of Research Community COMPANION</i>	<b>31</b>
<i>Bibliometric performance report (output and impact) of Research Community CVR-Co</i>	<b>32</b>
<i>Bibliometric performance report (output and impact) of Research Community DCE</i>	<b>33</b>
<i>Bibliometric performance report (output and impact) of Research Community DynaHEALTH</i>	<b>34</b>
<i>Bibliometric performance report (output and impact) of Research Community GlobalHealth</i>	<b>35</b>
<i>Bibliometric performance report (output and impact) of Research Community GPC-DEDE</i>	<b>36</b>
<i>Bibliometric performance report (output and impact) of Research Community IEM</i>	<b>37</b>
<i>Bibliometric performance report (output and impact) of Research Community iPoB</i>	<b>38</b>
<i>Bibliometric performance report (output and impact) of Research Community LUMINOUS</i>	<b>39</b>
<i>Bibliometric performance report (output and impact) of Research Community MA</i>	<b>40</b>
<i>Bibliometric performance report (output and impact) of Research Community MAD-2C</i>	<b>41</b>
<i>Bibliometric performance report (output and impact) of Research Community MOMA</i>	<b>42</b>
<i>Bibliometric performance report (output and impact) of Research Community MtM</i>	<b>43</b>
<i>Bibliometric performance report (output and impact) of Research Community NEBES</i>	<b>44</b>
<i>Bibliometric performance report (output and impact) of Research Community NorBE</i>	<b>45</b>
<i>Bibliometric performance report (output and impact) of Research Community NRNE</i>	<b>46</b>
<i>Bibliometric performance report (output and impact) of Research Community OASIS</i>	<b>47</b>
<i>Bibliometric performance report (output and impact) of Research Community OCCI</i>	<b>48</b>
<i>Bibliometric performance report (output and impact) of Research Community Phototransduction</i>	<b>49</b>
<i>Bibliometric performance report (output and impact) of Research Community PopStatGen</i>	<b>50</b>
<i>Bibliometric performance report (output and impact) of Research Community ProChemE</i>	<b>51</b>
<i>Bibliometric performance report (output and impact) of Research Community Proteus</i>	<b>52</b>
<i>Bibliometric performance report (output and impact) of Research Community PSH</i>	<b>53</b>
<i>Bibliometric performance report (output and impact) of Research Community SPARC</i>	<b>54</b>
<i>Bibliometric performance report (output and impact) of Research Community Tissue Homeostasis</i>	<b>55</b>

*Bibliometric performance report (output and impact) of Research Community AMASS*

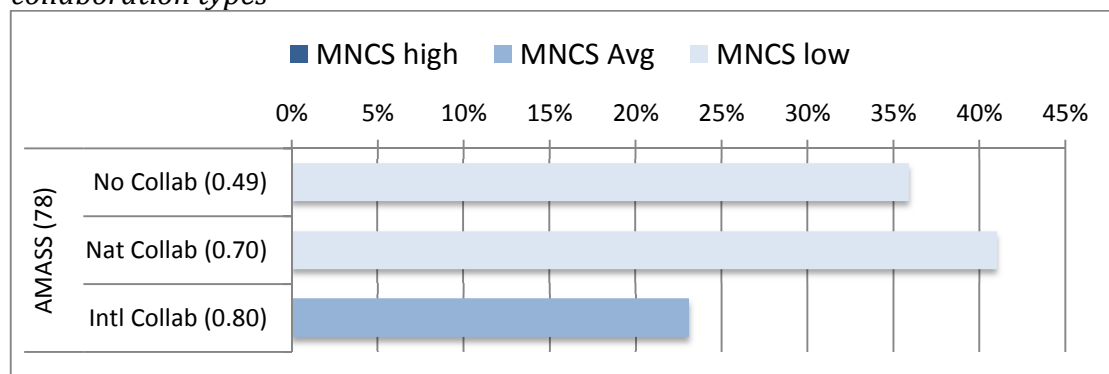
*Research performance overall and trend 2007-2011*

period	P	Int_cov	TCS	MCS	MNCS	PP_top 10%	MNJS	Prop Selfcits
<b>AMASS</b>								
<b>2007-2011</b>	<b>78</b>	<b>0.75</b>	<b>168</b>	<b>2.15</b>	<b>0.65</b>	<b>0.05</b>	<b>1.15</b>	<b>0.38</b>
2007-2008	37	0.79	102	2.76	0.63	0.03	1.24	0.41
2008-2009	39	0.78	84	2.15	0.63	0.03	1.12	0.44
2009-2010	26	0.72	56	2.15	0.85	0.08	1.09	0.22
2010-2011	29	0.72	40	1.38	0.52	0.07	1.11	0.31

*Research performance (output in % and impact by MNCS) distributed over WoS-fields*



*Research performance (output in % and impact as MNCS) distributed over collaboration types*

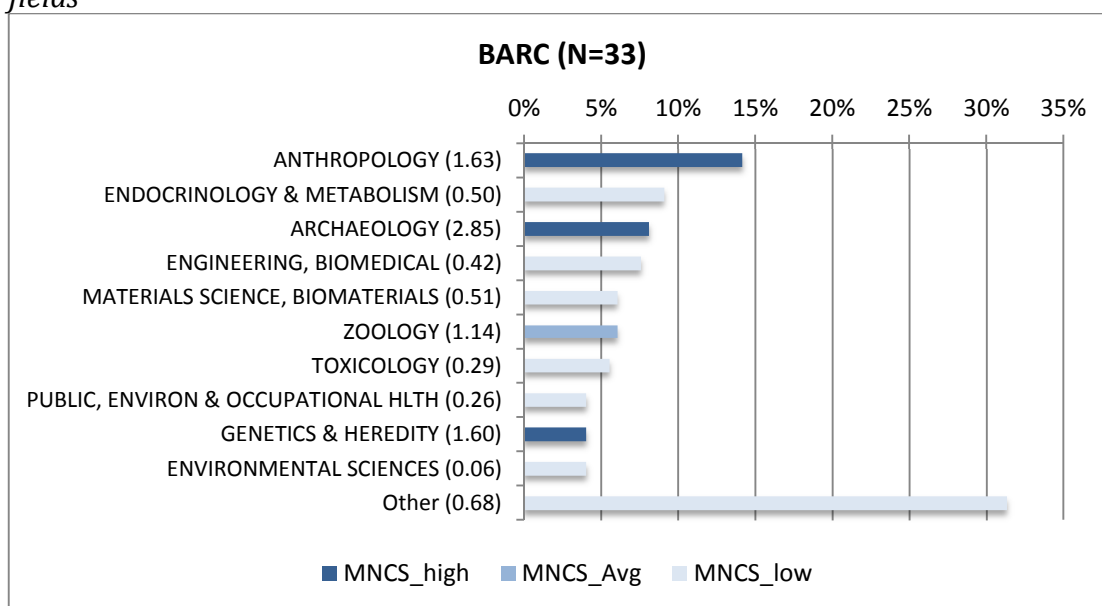


*Bibliometric performance report (output and impact) of Research Community BARC*

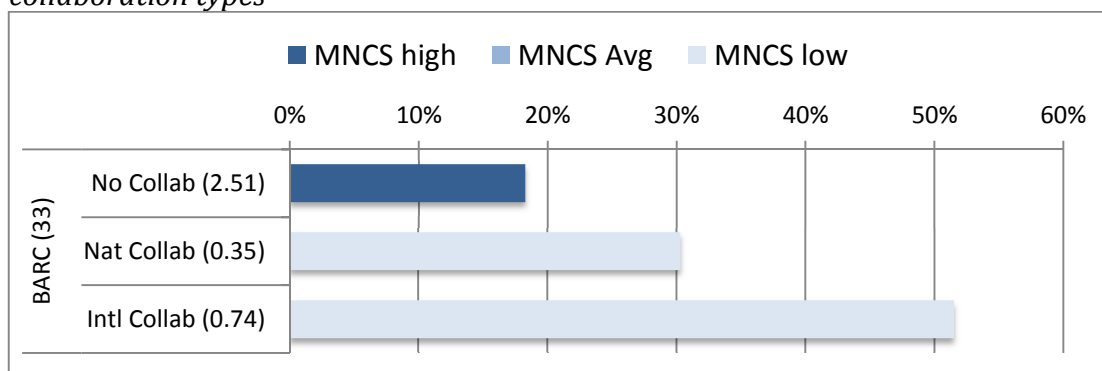
*Research performance overall and trend 2007-2011*

period	P	Int_cov	TCS	MCS	MNCS	PP_top 10%	MNJS	Prop Selfcits
<b>BARC</b>								
2007-2011	33	0.74	79	2.39	0.95	0.09	1.04	0.35
2007-2008	7	0.90	28	4.00	0.73	0.14	1.24	0.28
2008-2009	13	0.72	52	4.00	0.83	0.08	0.97	0.27
2009-2010	17	0.64	45	2.65	0.63	0.06	0.95	0.35
2010-2011	15	0.71	10	0.67	1.09	0.07	1.02	0.58

*Research performance (output in % and impact by MNCS) distributed over WoS-fields*



*Research performance (output in % and impact by MNCS) distributed over collaboration types*

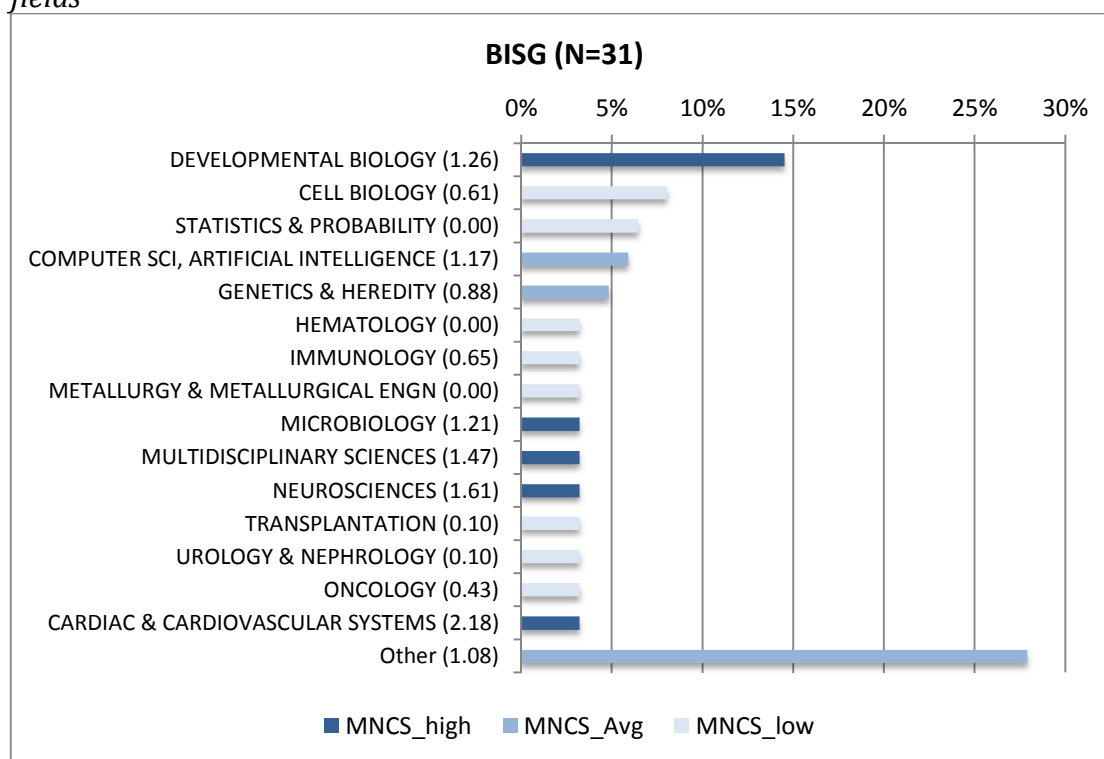


*Bibliometric performance report (output and impact) of Research Community BISG*

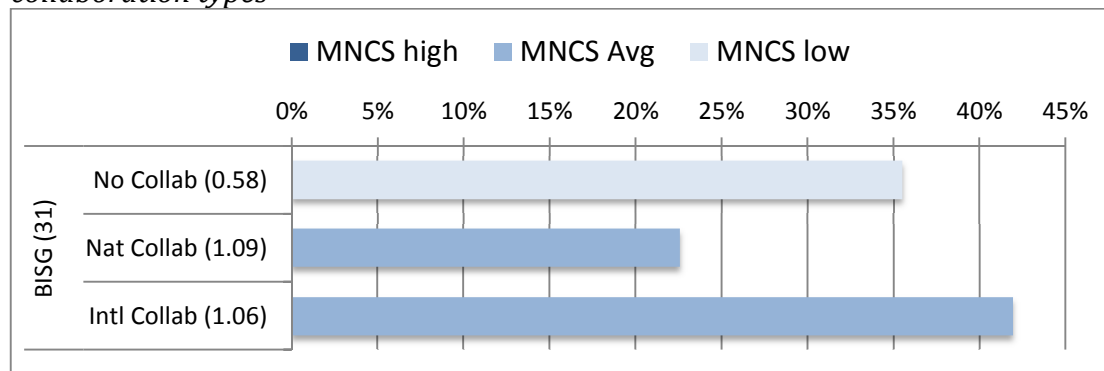
*Research performance overall and trend 2007-2011*

period	P	Int_cov	TCS	MCS	MNCS	PP_top 10%	MNJS	Prop Selfcits
<b>BISG</b>								
<b>2007-2011</b>	<b>31</b>	<b>0.85</b>	<b>179</b>	<b>5.77</b>	<b>0.90</b>	<b>0.10</b>	<b>1.25</b>	<b>0.15</b>
2007-2008	10	0.80	84	8.40	1.18	0.20	1.44	0.14
2008-2009	12	0.82	73	6.08	0.89	0.08	1.29	0.13
2009-2010	13	0.86	74	5.69	0.72	0.00	1.06	0.08
2010-2011	15	0.89	69	4.60	0.87	0.07	1.20	0.19

*Research performance (output in % and impact by MNCS) distributed over WoS-fields*



*Research performance (output in % and impact by MNCS) distributed over collaboration types*

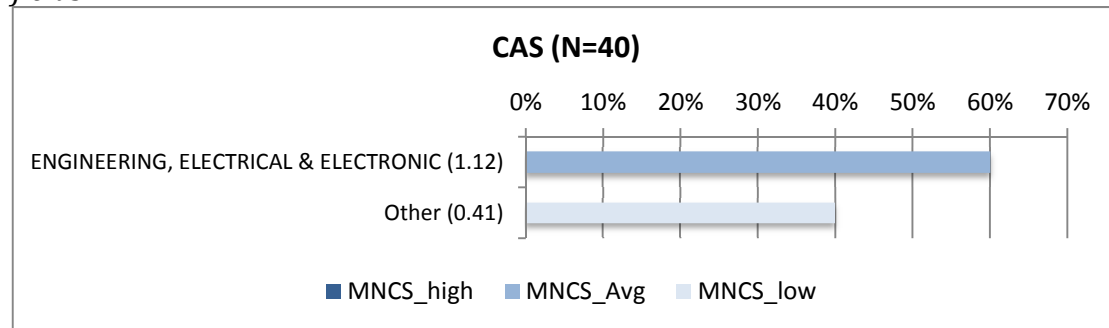


## Bibliometric performance report (output and impact) of Research Community CAS

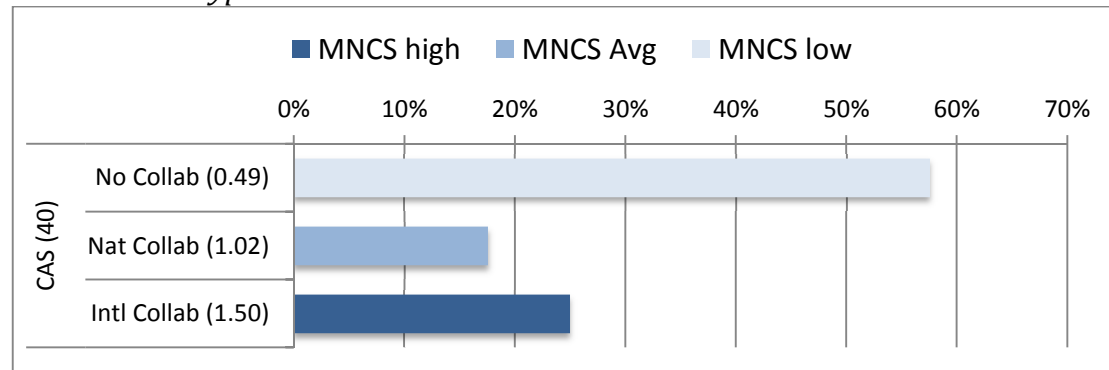
### Research performance overall and trend 2007-2011

period	P	Int_cov	TCS	MCS	MNCS	PP_top 10%	MNJS	Prop Selfcits
<b>CAS</b>								
<b>2007-2011</b>	<b>40</b>	<b>0.55</b>	<b>51</b>	<b>1.28</b>	<b>0.84</b>	<b>0.15</b>	<b>1.16</b>	<b>0.35</b>
2007-2008	14	0.53	12	0.86	0.56	0.07	1.00	0.20
2008-2009	17	0.59	33	1.94	0.91	0.24	1.36	0.30
2009-2010	19	0.56	38	2.00	1.27	0.26	1.38	0.34
2010-2011	16	0.54	12	0.75	0.87	0.13	0.97	0.48

### Research performance (output in % and impact by MNCS) distributed over WoS-fields



### Research performance (output in % and impact by MNCS) distributed over collaboration types

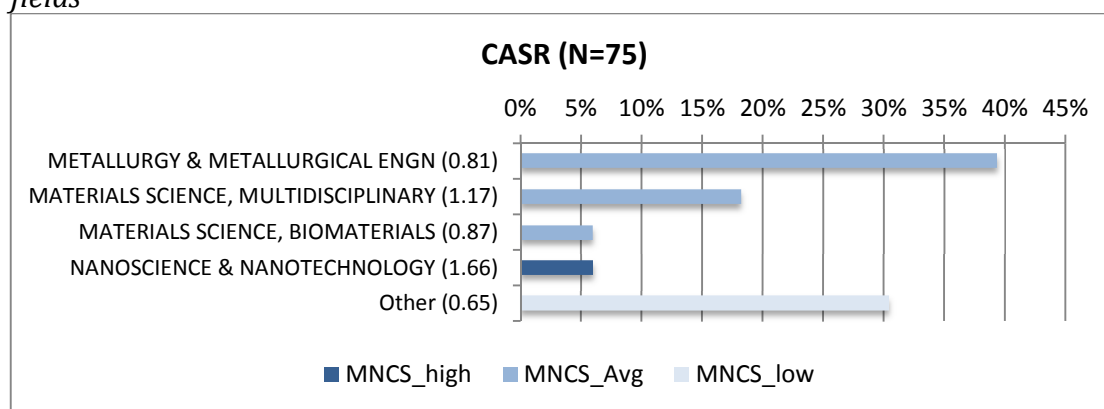


*Bibliometric performance report (output and impact) of Research Community CASR*

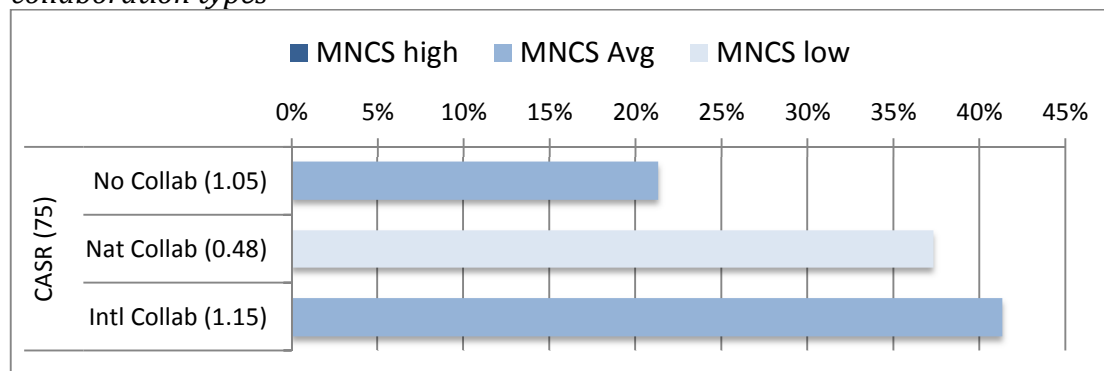
*Research performance overall and trend 2007-2011*

period	P	Int_cov	TCS	MCS	MNCS	PP_top 10%	MNJS	Prop Selfcits
<b>CASR</b>								
<b>2007-2011</b>	<b>75</b>	<b>0.71</b>	<b>164</b>	<b>2.19</b>	<b>0.88</b>	<b>0.13</b>	<b>0.99</b>	<b>0.49</b>
2007-2008	18	0.63	50	2.78	1.11	0.17	1.01	0.55
2008-2009	26	0.70	88	3.38	0.94	0.12	1.11	0.49
2009-2010	42	0.72	102	2.43	0.85	0.12	1.05	0.47
2010-2011	38	0.73	49	1.29	0.75	0.13	0.90	0.44

*Research performance (output in % and impact by MNCS) distributed over WoS-fields*



*Research performance (output in % and impact by MNCS) distributed over collaboration types*

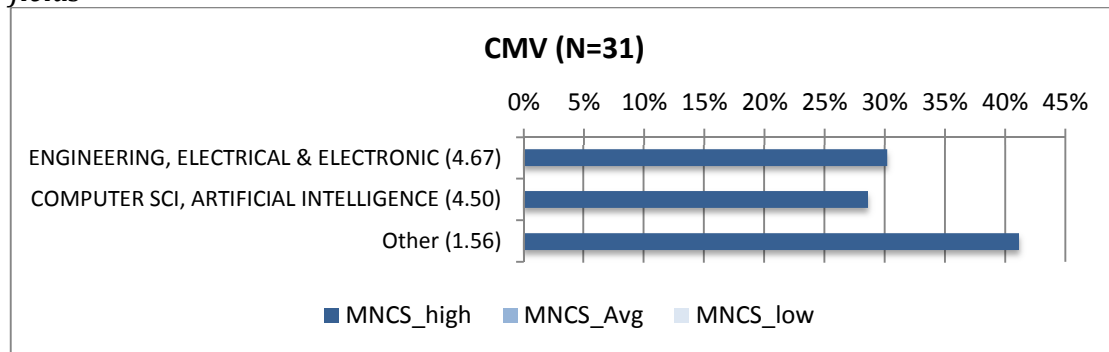


*Bibliometric performance report (output and impact) of Research Community CMV*

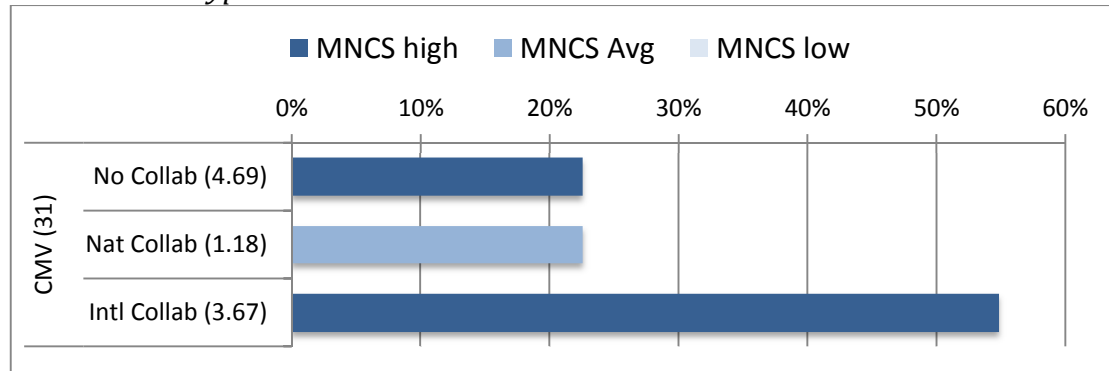
*Research performance overall and trend 2007-2011*

period	P	Int_cov	TCS	MCS	MNCS	PP_top 10%	MNJS	Prop Selfcits
<b>CMV</b>								
2007-2011	31	0.63	260	8.39	3.34	0.52	1.55	0.16
2007-2008	5	0.34	32	6.40	3.22	0.40	1.66	0.11
2008-2009	9	0.60	122	13.56	3.74	0.44	1.35	0.12
2009-2010	16	0.68	211	13.19	3.88	0.63	1.45	0.13
2010-2011	18	0.68	106	5.89	2.99	0.56	1.60	0.20

*Research performance (output in % and impact by MNCS) distributed over WoS-fields*



*Research performance (output in % and impact by MNCS) distributed over collaboration types*



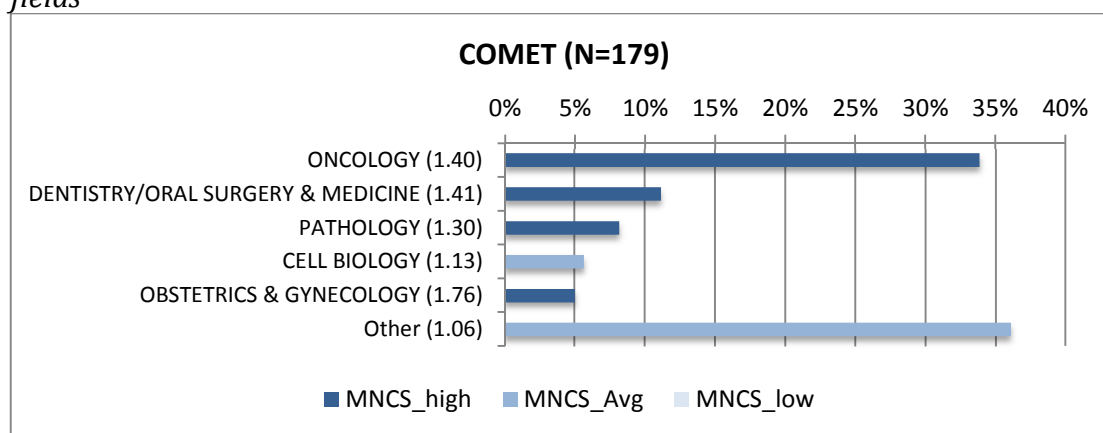


*Bibliometric performance report (output and impact) of Research Community COMET*

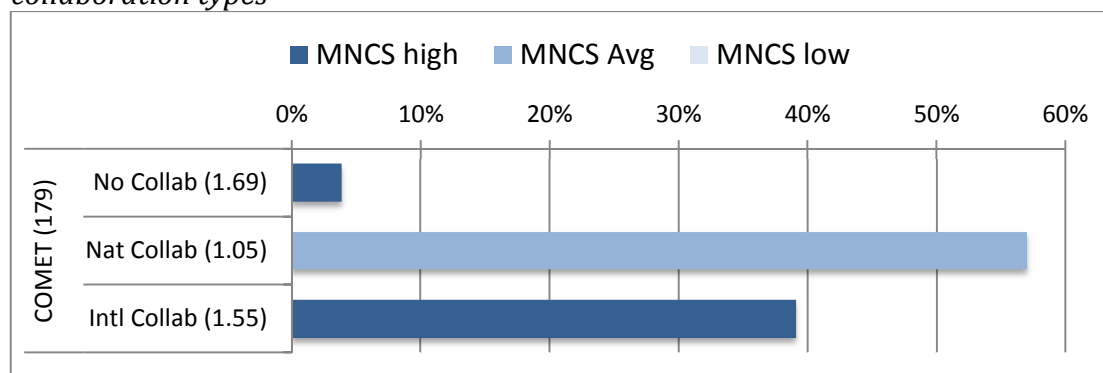
*Research performance overall and trend 2007-2011*

period	P	Int_cov	TCS	MCS	MNCS	PP_top 10%	MNJS	Prop Selfcits
<b>COMET</b>								
<b>2007-2011</b>	<b>179</b>	<b>0.94</b>	<b>1382</b>	<b>7.72</b>	<b>1.27</b>	<b>0.14</b>	<b>1.22</b>	<b>0.20</b>
2007-2008	72	0.95	827	11.49	1.32	0.17	1.20	0.15
2008-2009	59	0.95	607	10.29	1.30	0.15	1.21	0.18
2009-2010	60	0.94	409	6.82	1.18	0.13	1.25	0.25
2010-2011	83	0.94	312	3.76	1.22	0.11	1.16	0.28

*Research performance (output in % and impact by MNCS) distributed over WoS-fields*



*Research performance (output in % and impact by MNCS) distributed over collaboration types*

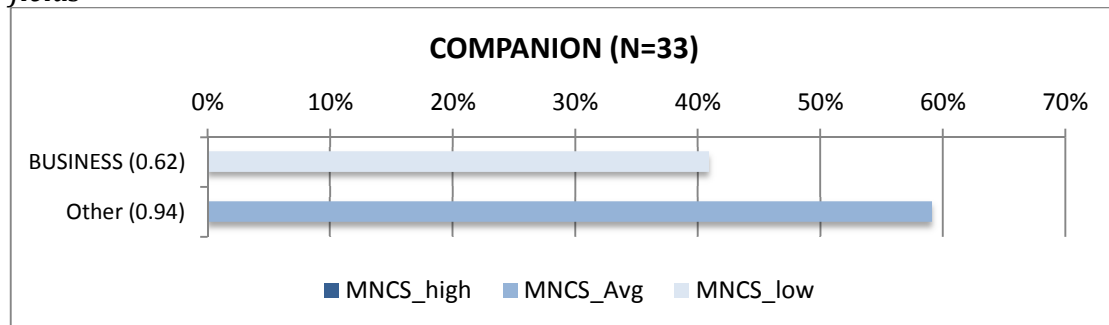


*Bibliometric performance report (output and impact) of Research Community COMPANION*

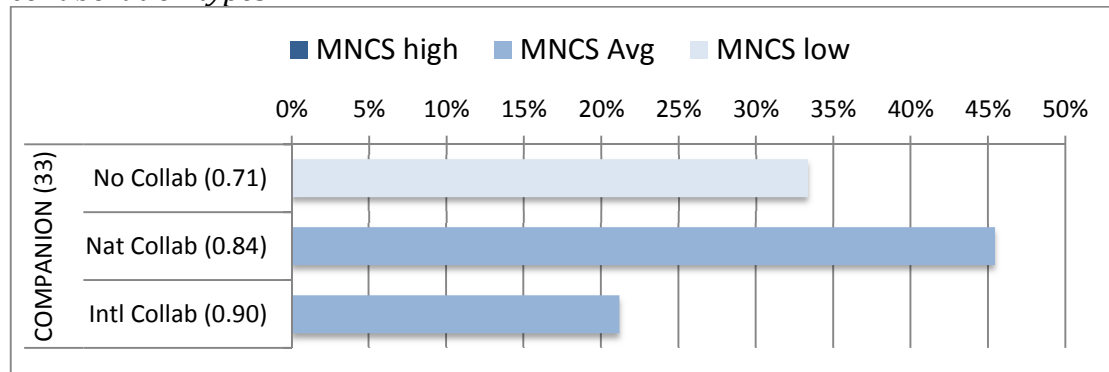
*Research performance overall and trend 2007-2011*

period	P	Int_cov	TCS	MCS	MNCS	PP_top 10%	MNJS	Prop Selfcits
<b>COMPANION</b>								
<b>2007-2011</b>	<b>33</b>	<b>0.51</b>	<b>73</b>	<b>2.21</b>	<b>0.81</b>	<b>0.09</b>	<b>0.96</b>	<b>0.16</b>
2007-2008	13	0.52	29	2.23	0.66	0.08	0.97	0.03
2008-2009	12	0.57	34	2.83	0.55	0.08	0.89	0.17
2009-2010	11	0.55	40	3.64	1.29	0.18	0.89	0.23
2010-2011	16	0.50	25	1.56	0.88	0.06	0.97	0.22

*Research performance (output in % and impact by MNCS) distributed over WoS-fields*



*Research performance (output in % and impact by MNCS) distributed over collaboration types*

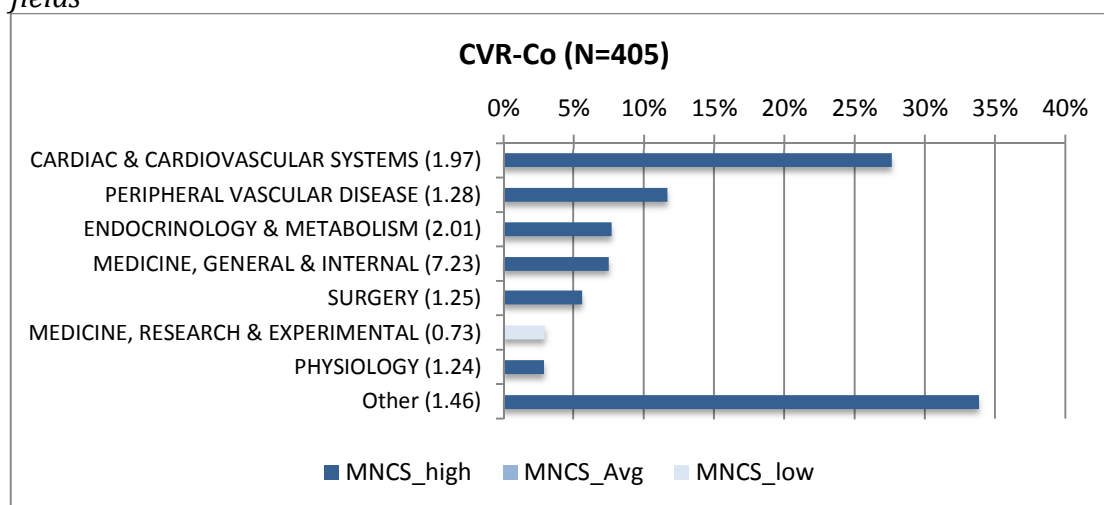


*Bibliometric performance report (output and impact) of Research Community CVR-Co*

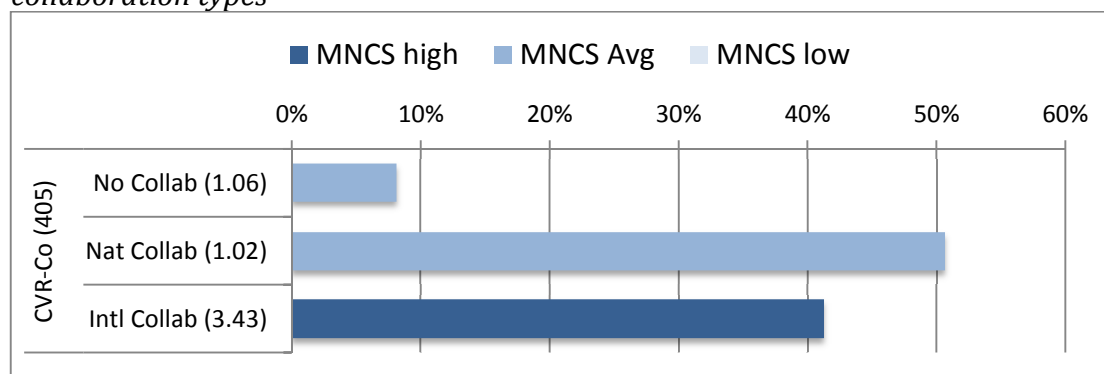
*Research performance overall and trend 2007-2011*

period	P	Int_cov	TCS	MCS	MNCS	PP_top 10%	MNJS	Prop Selfcits
<b>CVR-Co</b>								
<b>2007-2011</b>	<b>405</b>	<b>0.94</b>	<b>4845</b>	<b>11.96</b>	<b>2.02</b>	<b>0.18</b>	<b>1.70</b>	<b>0.20</b>
2007-2008	135	0.94	1462	10.83	1.36	0.12	1.64	0.16
2008-2009	164	0.94	2598	15.84	2.04	0.16	1.68	0.14
2009-2010	182	0.93	2880	15.82	2.26	0.19	1.73	0.23
2010-2011	175	0.94	1582	9.04	2.27	0.21	1.72	0.29

*Research performance (output in % and impact by MNCS) distributed over WoS-fields*



*Research performance (output in % and impact by MNCS) distributed over collaboration types*

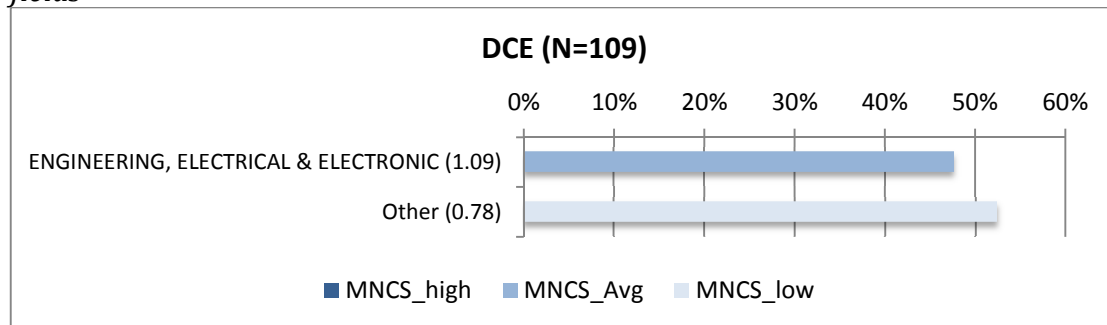


## Bibliometric performance report (output and impact) of Research Community DCE

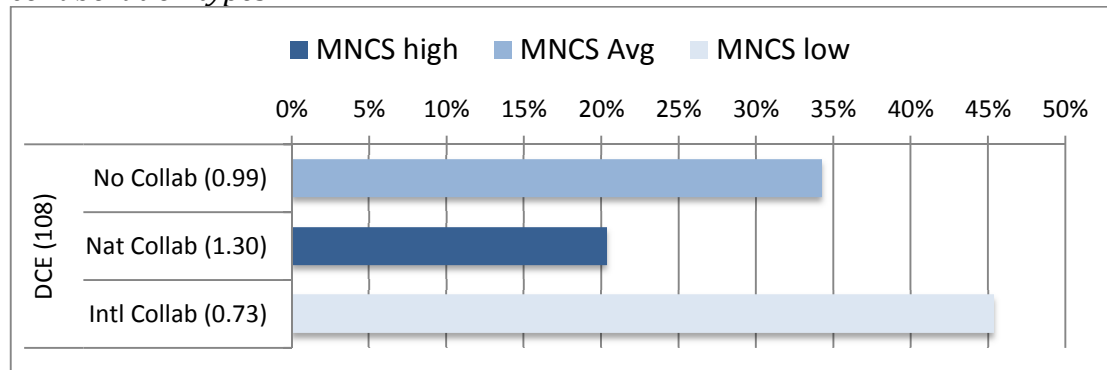
### Research performance overall and trend 2007-2011

period	P	Int_cov	TCS	MCS	MNCS	PP_top 10%	MNJS	Prop Selfcits
<b>DCE</b>								
<b>2007-2011</b>	<b>109</b>	<b>0.49</b>	<b>155</b>	<b>1.42</b>	<b>0.93</b>	<b>0.17</b>	<b>1.04</b>	<b>0.27</b>
2007-2008	33	0.56	68	2.06	0.88	0.18	1.27	0.32
2008-2009	32	0.49	76	2.38	1.05	0.22	0.95	0.23
2009-2010	38	0.45	63	1.66	1.06	0.24	0.84	0.19
2010-2011	57	0.45	40	0.70	0.87	0.14	0.97	0.30

### Research performance (output in % and impact by MNCS) distributed over WoS-fields



### Research performance (output in % and impact by MNCS) distributed over collaboration types

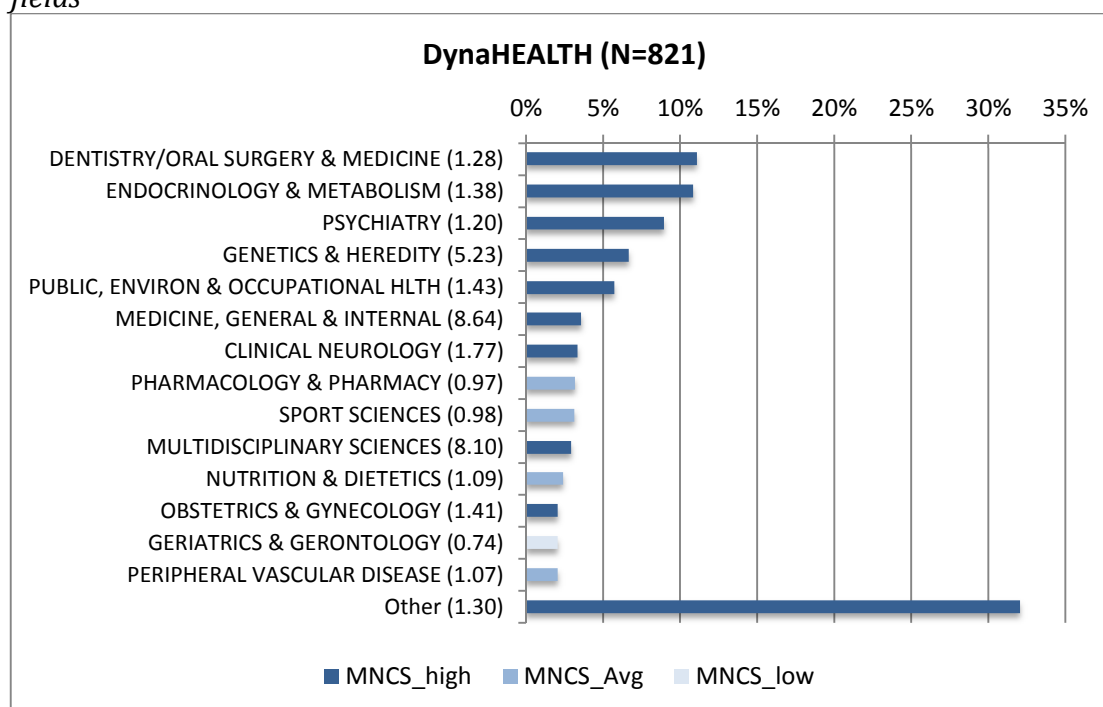


*Bibliometric performance report (output and impact) of Research Community DynaHEALTH*

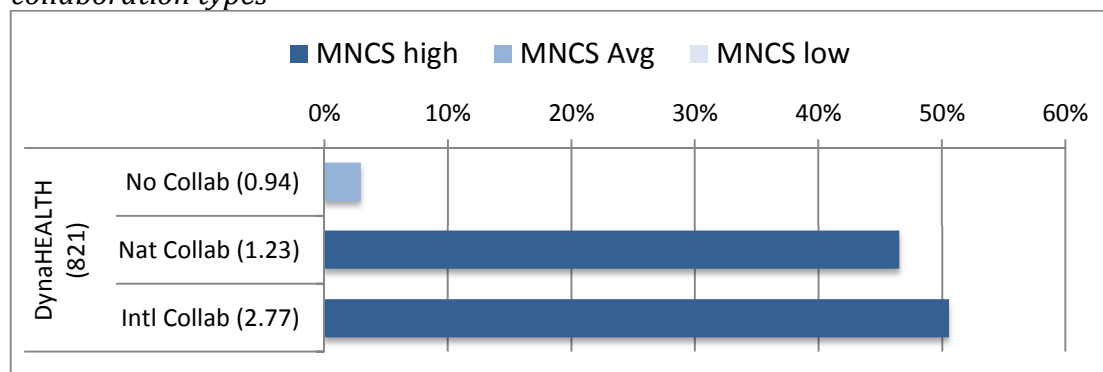
*Research performance overall and trend 2007-2011*

period	P	Int_cov	TCS	MCS	MNCS	PP_top 10%	MNJS	Prop Selfcits
<b>DynaHEALTH</b>								
2007-2011	821	0.90	10605	12.92	2.00	0.21	1.64	0.24
2007-2008	270	0.89	3643	13.49	1.68	0.18	1.42	0.20
2008-2009	329	0.91	5355	16.28	1.89	0.20	1.60	0.21
2009-2010	370	0.91	6212	16.79	2.30	0.23	1.83	0.26
2010-2011	366	0.90	3554	9.71	2.23	0.24	1.78	0.29

*Research performance (output in % and impact by MNCS) distributed over WoS-fields*



*Research performance (output in % and impact by MNCS) distributed over collaboration types*

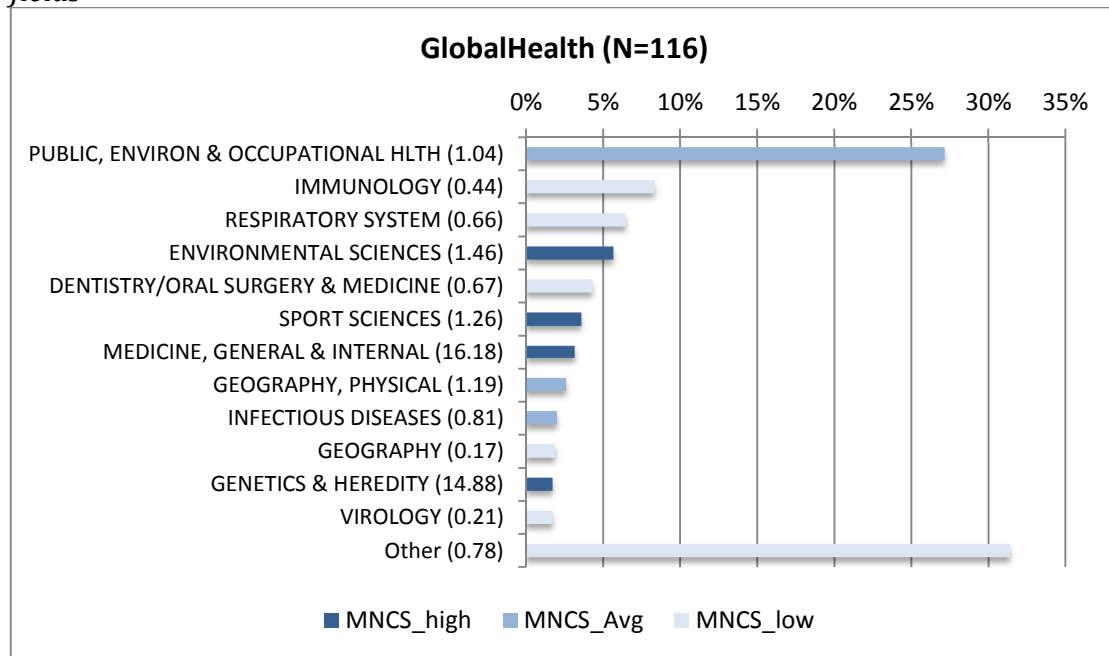


*Bibliometric performance report (output and impact) of Research Community GlobalHealth*

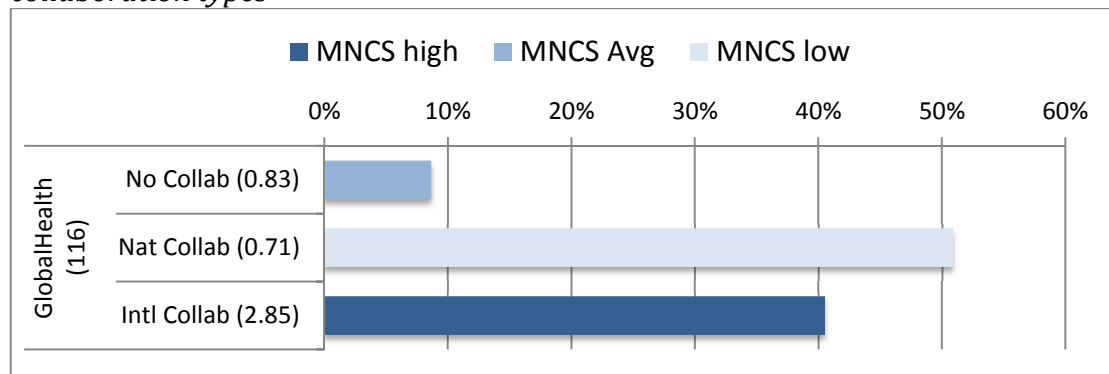
*Research performance overall and trend 2007-2011*

period	P	Int_cov	TCS	MCS	MNCS	PP_top 10%	MNJS	Prop Selfcits
<b>GlobalHealth</b>								
<b>2007-2011</b>	<b>116</b>	<b>0.77</b>	<b>692</b>	<b>5.97</b>	<b>1.59</b>	<b>0.12</b>	<b>1.27</b>	<b>0.34</b>
2007-2008	32	0.78	223	6.97	1.18	0.13	1.18	0.23
2008-2009	46	0.78	263	5.72	1.17	0.13	1.08	0.25
2009-2010	49	0.77	348	7.10	1.36	0.12	1.19	0.43
2010-2011	59	0.76	365	6.19	2.05	0.12	1.41	0.40

*Research performance (output in % and impact by MNCS) distributed over WoS-fields*



*Research performance (output in % and impact by MNCS) distributed over collaboration types*

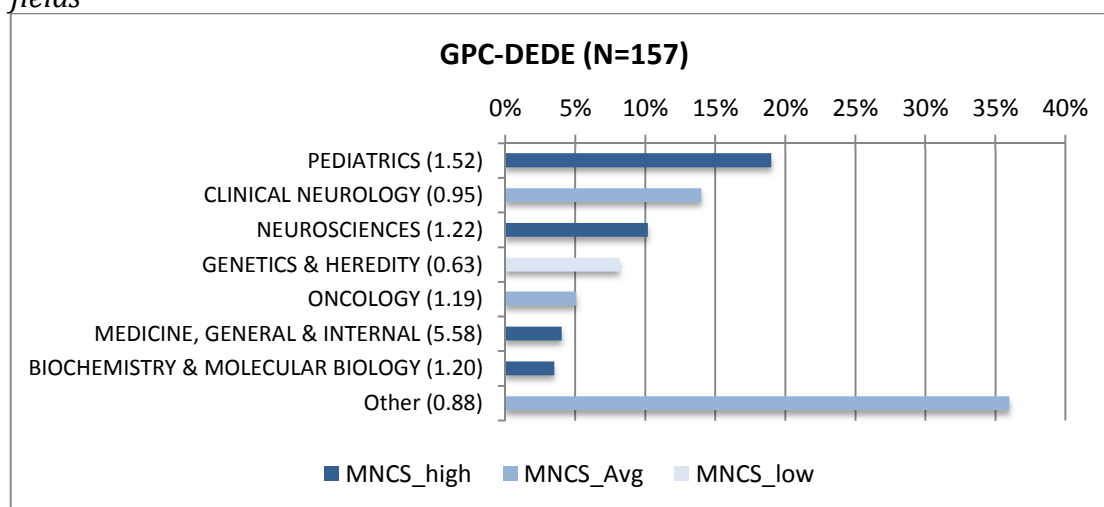


*Bibliometric performance report (output and impact) of Research Community GPC-DEDE*

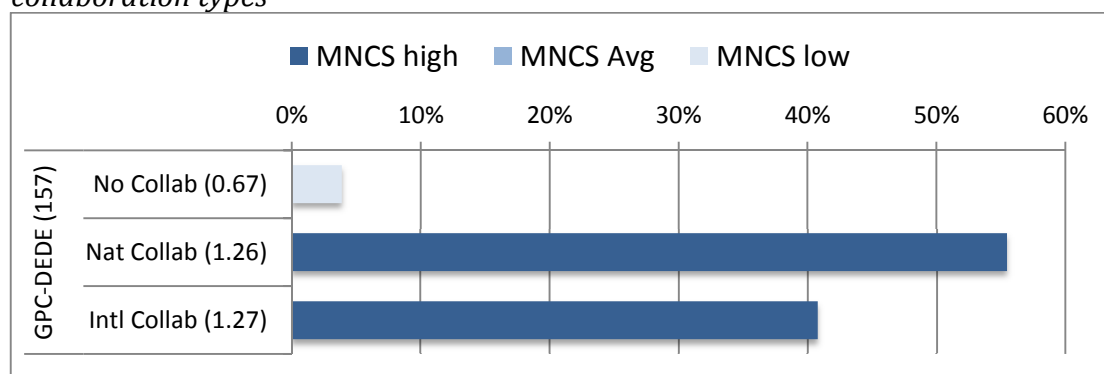
*Research performance overall and trend 2007-2011*

period	P	Int_cov	TCS	MCS	MNCS	PP_top 10%	MNJS	Prop Selfcits
<b>GPC-DEDE</b>								
<b>2007-2011</b>	<b>157</b>	<b>0.91</b>	<b>1175</b>	<b>7.48</b>	<b>1.24</b>	<b>0.15</b>	<b>1.40</b>	<b>0.22</b>
2007-2008	52	0.92	417	8.02	0.97	0.10	1.27	0.24
2008-2009	56	0.93	732	13.07	1.79	0.20	1.48	0.18
2009-2010	73	0.91	677	9.27	1.48	0.18	1.57	0.20
2010-2011	72	0.91	286	3.97	1.02	0.17	1.36	0.27

*Research performance (output in % and impact by MNCS) distributed over WoS-fields*



*Research performance (output in % and impact by MNCS) distributed over collaboration types*

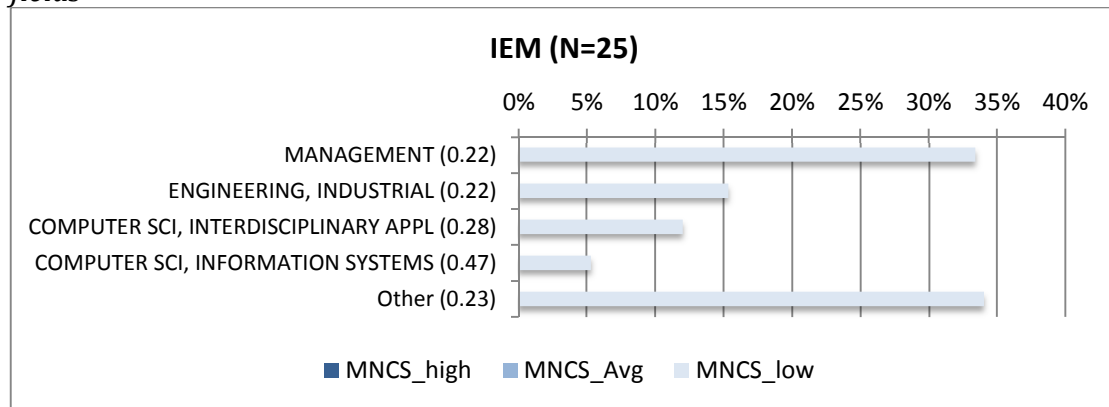


*Bibliometric performance report (output and impact) of Research Community IEM*

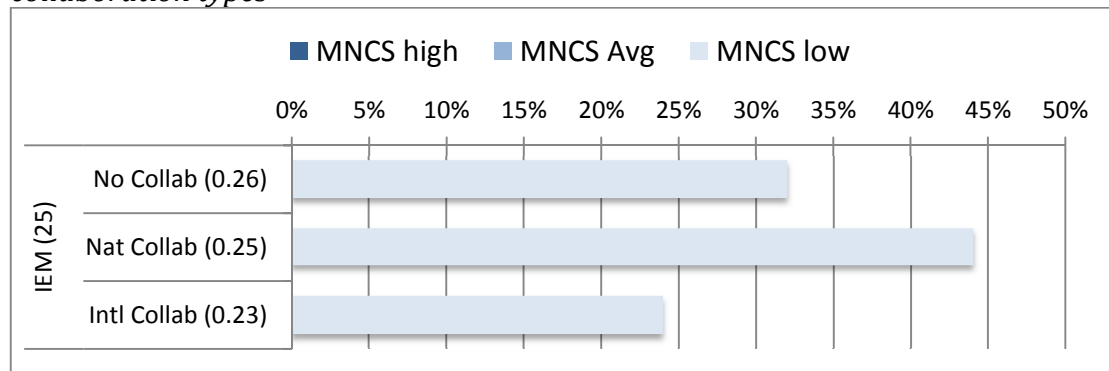
*Research performance overall and trend 2007-2011*

period	P	Int_cov	TCS	MCS	MNCS	PP_top 10%	MNJS	Prop Selfcits
<b>IEM</b>								
<b>2007-2011</b>	<b>25</b>	<b>0.41</b>	<b>30</b>	<b>1.20</b>	<b>0.24</b>	<b>0.00</b>	<b>0.88</b>	<b>0.30</b>
2007-2008	3	0.43	14	4.67	1.00	0.00	1.09	0.13
2008-2009	9	0.46	16	1.78	0.37	0.00	0.91	0.20
2009-2010	16	0.40	16	1.00	0.19	0.00	0.78	0.33
2010-2011	15	0.38	9	0.60	0.11	0.00	0.82	0.47

*Research performance (output in % and impact by MNCS) distributed over WoS-fields*



*Research performance (output in % and impact by MNCS) distributed over collaboration types*



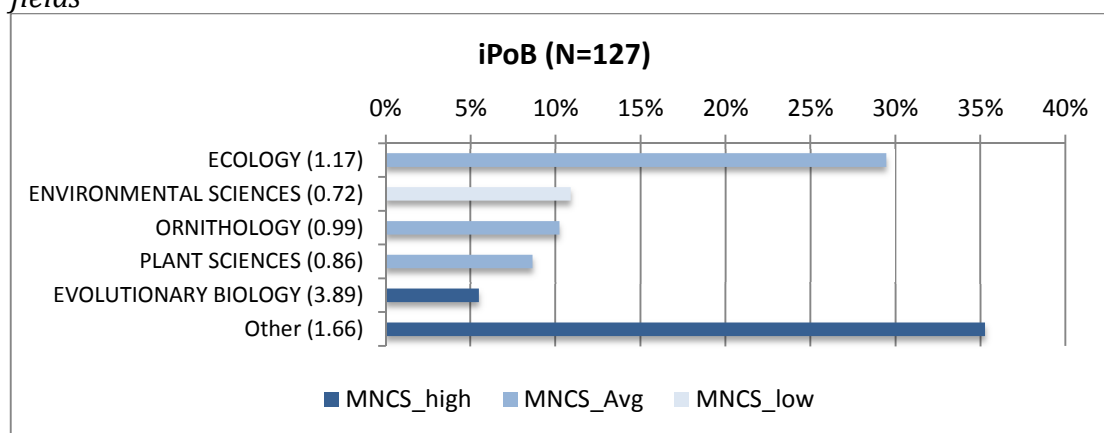


*Bibliometric performance report (output and impact) of Research Community iPoB*

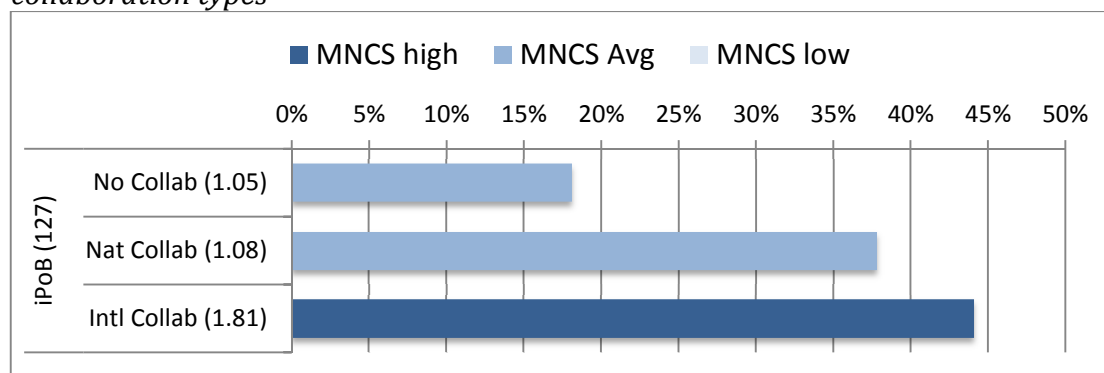
*Research performance overall and trend 2007-2011*

period	P	Int_cov	TCS	MCS	MNCS	PP_top 10%	MNJS	Prop Selfcits
<b>iPoB</b>								
<b>2007-2011</b>	<b>127</b>	<b>0.80</b>	<b>535</b>	<b>4.21</b>	<b>1.40</b>	<b>0.13</b>	<b>1.29</b>	<b>0.30</b>
2007-2008	40	0.78	201	5.03	1.05	0.13	1.30	0.29
2008-2009	45	0.78	200	4.44	0.92	0.04	1.23	0.24
2009-2010	52	0.81	269	5.17	1.28	0.08	1.24	0.29
2010-2011	59	0.81	196	3.32	1.86	0.19	1.30	0.36

*Research performance (output in % and impact by MNCS) distributed over WoS-fields*



*Research performance (output in % and impact by MNCS) distributed over collaboration types*

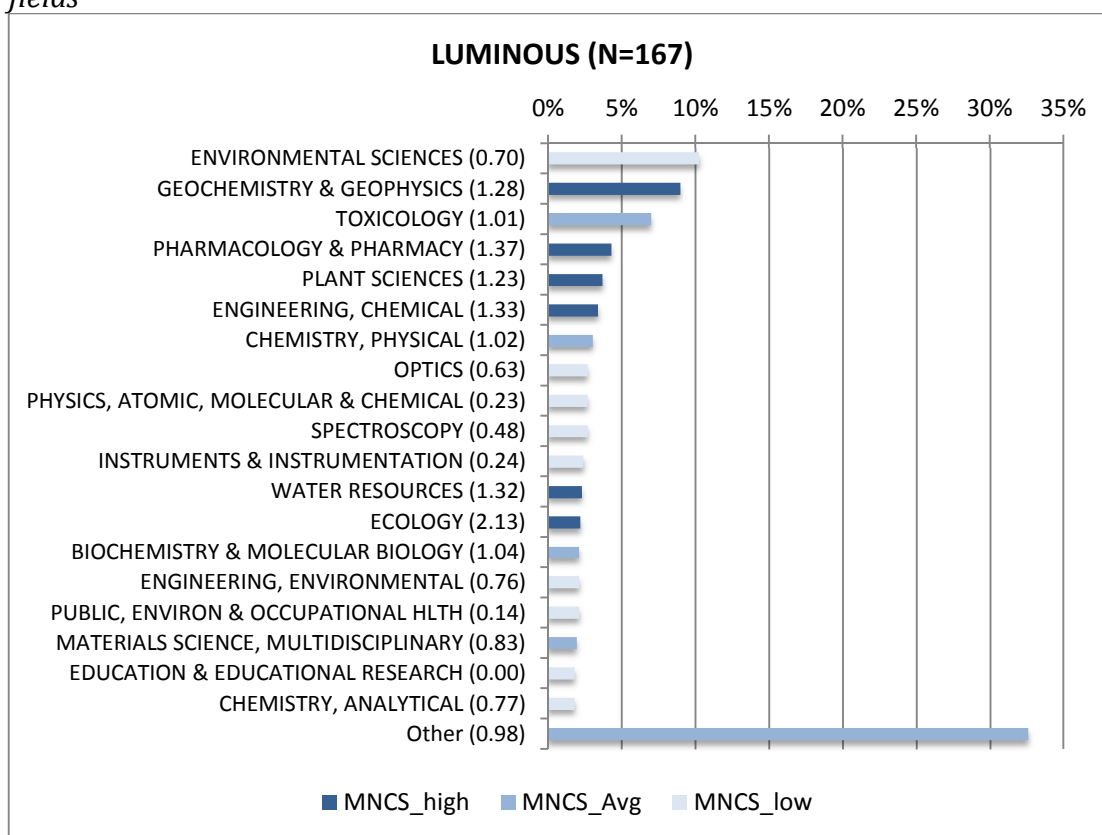


*Bibliometric performance report (output and impact) of Research Community LUMINOUS*

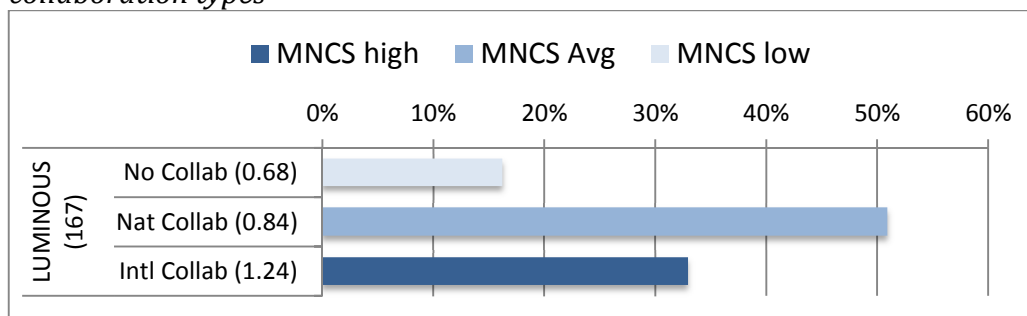
*Research performance overall and trend 2007-2011*

period	P	Int_cov	TCS	MCS	MNCS	PP_top 10%	MNJS	Prop Selfcits
<b>LUMINOUS</b>								
2007-2011	167	0.74	666	3.99	0.95	0.12	1.04	0.27
2007-2008	71	0.72	294	4.14	0.88	0.07	1.00	0.29
2008-2009	82	0.76	405	4.94	1.06	0.12	1.04	0.24
2009-2010	71	0.74	329	4.63	1.04	0.17	1.09	0.25
2010-2011	55	0.71	131	2.38	0.81	0.13	1.03	0.30

*Research performance (output in % and impact by MNCS) distributed over WoS-fields*



*Research performance (output in % and impact by MNCS) distributed over collaboration types*

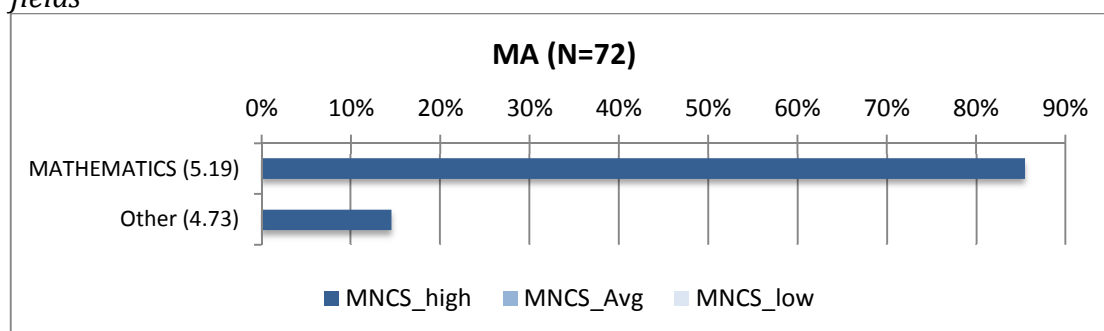


*Bibliometric performance report (output and impact) of Research Community MA*

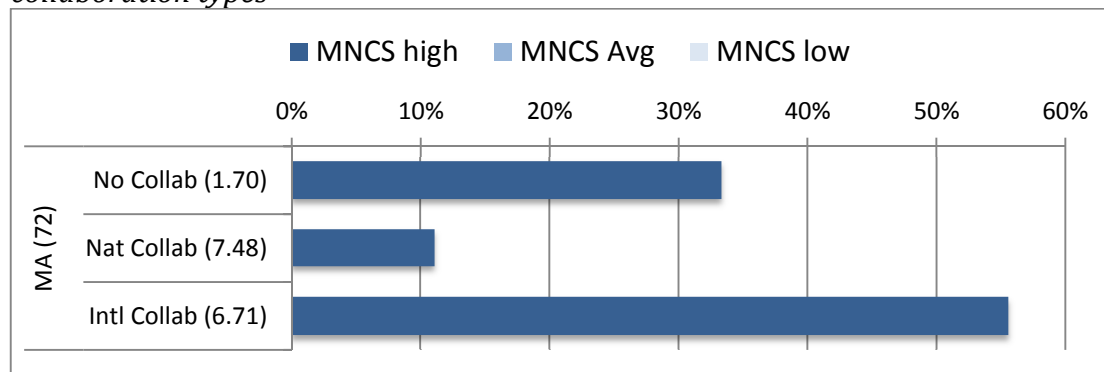
*Research performance overall and trend 2007-2011*

period	P	Int_cov	TCS	MCS	MNCS	PP_top 10%	MNJS	Prop Selfcits
<b>MA</b>								
2007-2011	72	0.68	277	3.85	5.12	0.36	1.15	0.33
2007-2008	22	0.66	95	4.32	3.25	0.55	1.17	0.34
2008-2009	17	0.70	105	6.18	3.51	0.47	1.08	0.33
2009-2010	31	0.70	125	4.03	3.13	0.29	1.06	0.34
2010-2011	38	0.69	129	3.39	7.22	0.29	1.17	0.34

*Research performance (output in % and impact by MNCS) distributed over WoS-fields*



*Research performance (output in % and impact by MNCS) distributed over collaboration types*

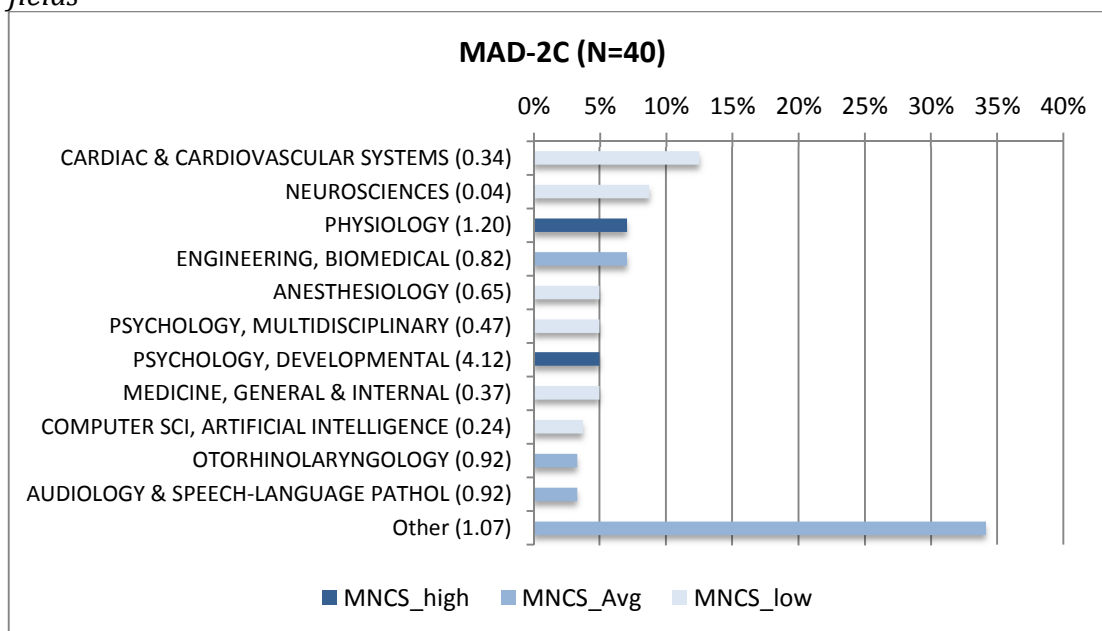


*Bibliometric performance report (output and impact) of Research Community MAD-2C*

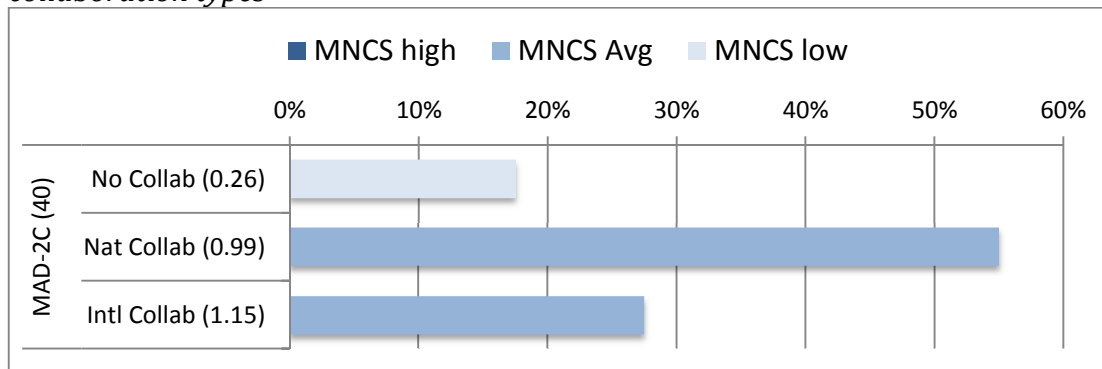
*Research performance overall and trend 2007-2011*

period	P	Int_cov	TCS	MCS	MNCS	PP_top 10%	MNJS	Prop Selfcits
<b>MAD-2C</b>								
<b>2007-2011</b>	<b>40</b>	<b>0.78</b>	<b>101</b>	<b>2.53</b>	<b>0.91</b>	<b>0.15</b>	<b>1.06</b>	<b>0.33</b>
2007-2008	12	0.76	35	2.92	0.86	0.17	1.04	0.35
2008-2009	18	0.78	46	2.56	0.68	0.06	1.08	0.33
2009-2010	17	0.77	47	2.76	0.74	0.06	0.99	0.32
2010-2011	18	0.81	40	2.22	1.17	0.22	1.05	0.31

*Research performance (output in % and impact by MNCS) distributed over WoS-fields*



*Research performance (output in % and impact by MNCS) distributed over collaboration types*

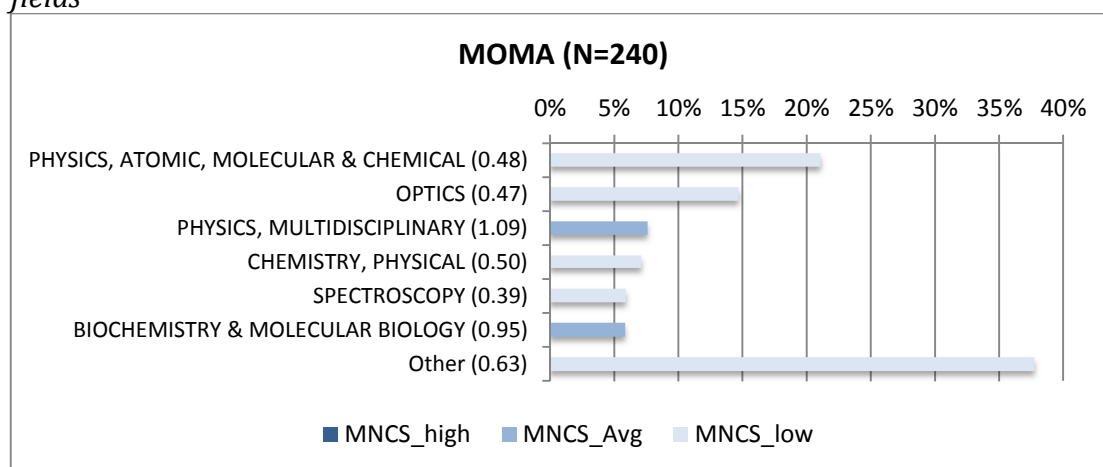


*Bibliometric performance report (output and impact) of Research Community MOMA*

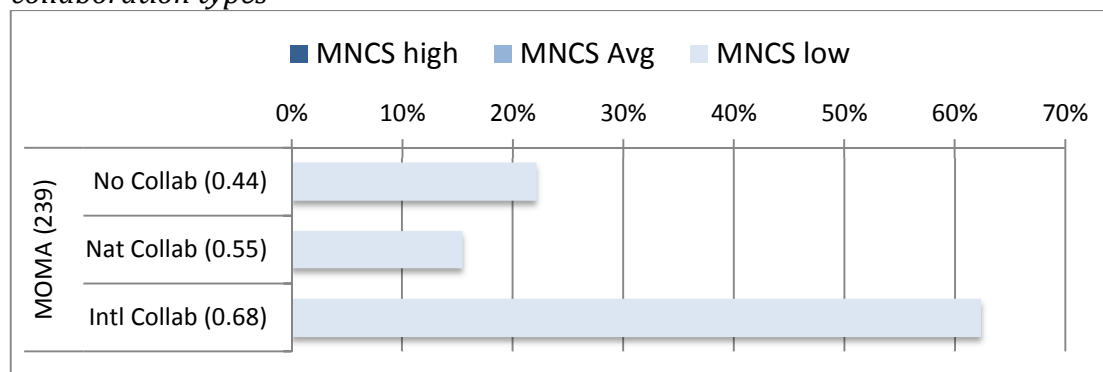
*Research performance overall and trend 2007-2011*

period	P	Int_cov	TCS	MCS	MNCS	PP_top 10%	MNJS	Prop Selfcits
<b>MOMA</b>								
2007-2011	240	0.89	533	2.22	0.61	0.05	1.06	0.52
2007-2008	72	0.89	175	2.43	0.43	0.01	0.87	0.53
2008-2009	87	0.90	276	3.17	0.60	0.05	1.16	0.45
2009-2010	109	0.89	284	2.61	0.62	0.04	1.21	0.52
2010-2011	119	0.89	202	1.70	0.69	0.06	1.06	0.55

*Research performance (output in % and impact by MNCS) distributed over WoS-fields*



*Research performance (output in % and impact by MNCS) distributed over collaboration types*

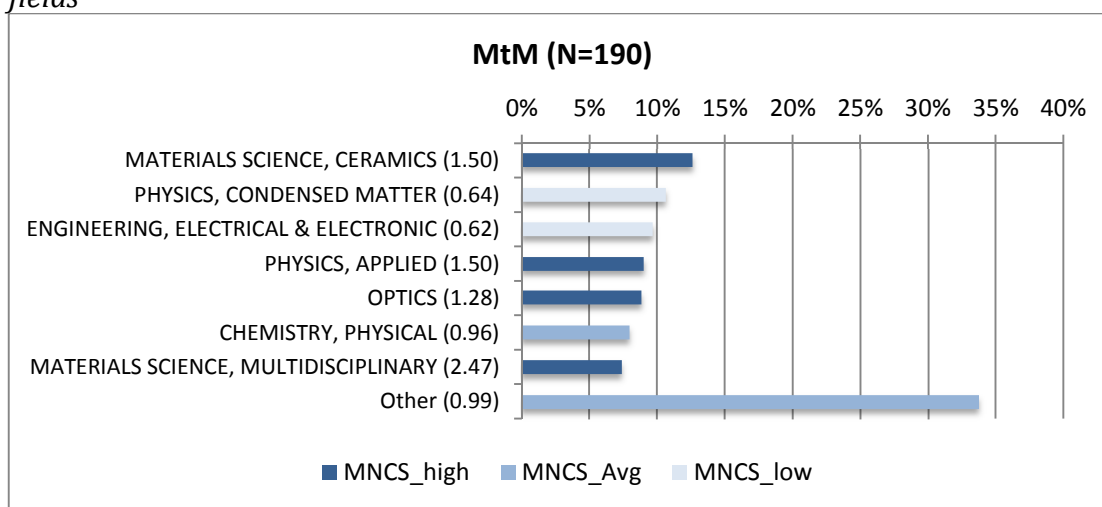


*Bibliometric performance report (output and impact) of Research Community MtM*

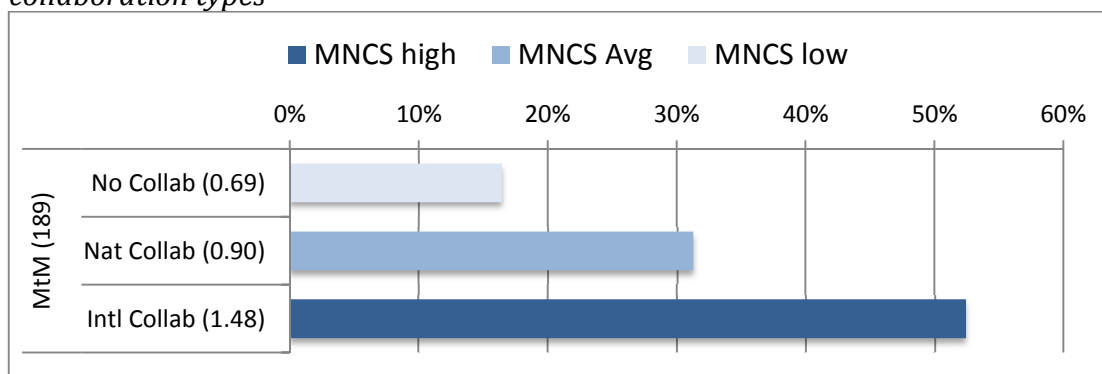
*Research performance overall and trend 2007-2011*

period	P	Int_cov	TCS	MCS	MNCS	PP_top 10%	MNJS	Prop Selfcits
<b>MtM</b>								
<b>2007-2011</b>	<b>190</b>	<b>0.80</b>	<b>767</b>	<b>4.04</b>	<b>1.16</b>	<b>0.16</b>	<b>0.97</b>	<b>0.28</b>
2007-2008	52	0.76	340	6.54	1.73	0.21	1.12	0.27
2008-2009	73	0.78	358	4.90	1.20	0.12	1.01	0.28
2009-2010	88	0.81	326	3.70	0.88	0.10	0.92	0.29
2010-2011	94	0.82	261	2.78	1.07	0.18	0.93	0.27

*Research performance (output in % and impact by MNCS) distributed over WoS-fields*



*Research performance (output in % and impact by MNCS) distributed over collaboration types*

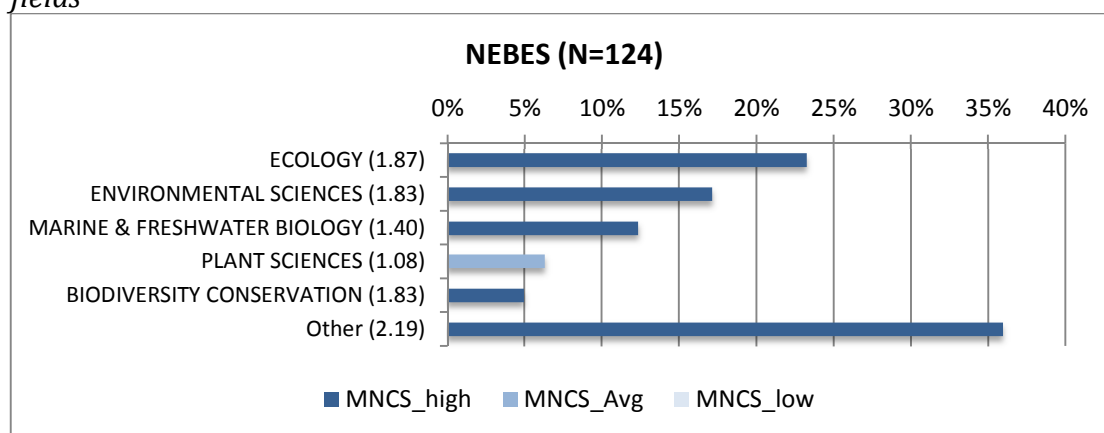


*Bibliometric performance report (output and impact) of Research Community NEBES*

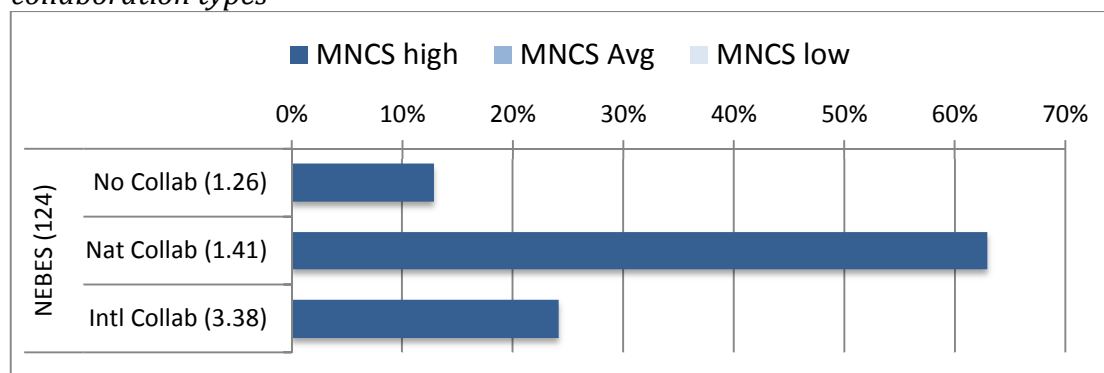
*Research performance overall and trend 2007-2011*

period	P	Int_cov	TCS	MCS	MNCS	PP_top 10%	MNJS	Prop Selfcits
<b>NEBES</b>								
<b>2007-2011</b>	<b>124</b>	<b>0.72</b>	<b>803</b>	<b>6.48</b>	<b>1.87</b>	<b>0.23</b>	<b>1.43</b>	<b>0.26</b>
2007-2008	43	0.71	294	6.84	1.37	0.26	1.34	0.28
2008-2009	51	0.73	399	7.82	1.65	0.25	1.31	0.24
2009-2010	54	0.71	394	7.30	1.86	0.24	1.46	0.26
2010-2011	56	0.71	272	4.86	2.22	0.21	1.49	0.29

*Research performance (output in % and impact by MNCS) distributed over WoS-fields*



*Research performance (output in % and impact by MNCS) distributed over collaboration types*

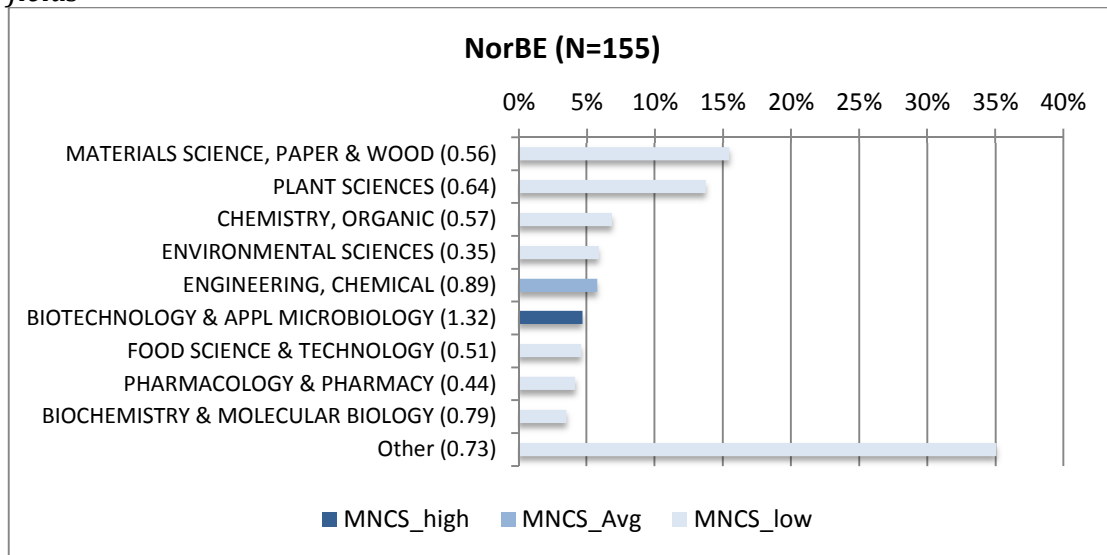


*Bibliometric performance report (output and impact) of Research Community NorBE*

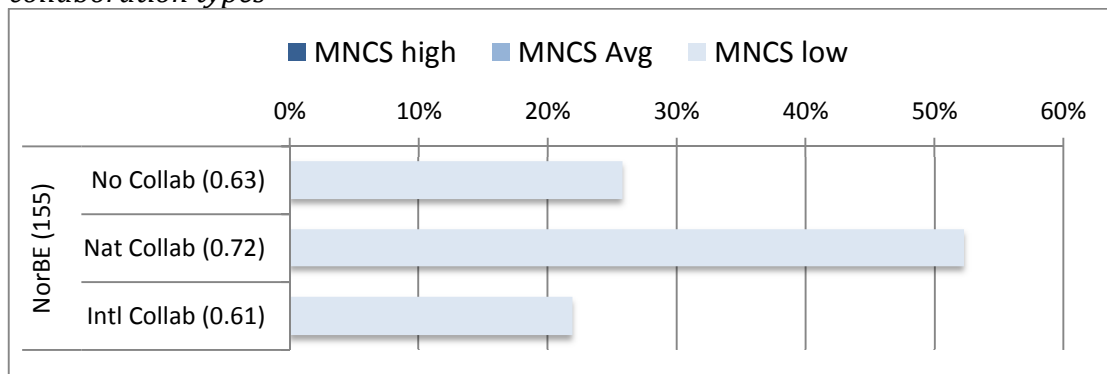
*Research performance overall and trend 2007-2011*

period	P	Int_cov	TCS	MCS	MNCS	PP_top 10%	MNJS	Prop Selfcits
<b>NorBE</b>								
<b>2007-2011</b>	<b>155</b>	<b>0.82</b>	<b>406</b>	<b>2.62</b>	<b>0.67</b>	<b>0.06</b>	<b>0.96</b>	<b>0.34</b>
2007-2008	61	0.79	169	2.77	0.67	0.05	0.91	0.37
2008-2009	57	0.83	220	3.86	0.85	0.09	1.00	0.32
2009-2010	57	0.84	197	3.46	0.77	0.07	1.00	0.29
2010-2011	66	0.82	123	1.86	0.63	0.06	0.99	0.36

*Research performance (output in % and impact by MNCS) distributed over WoS-fields*



*Research performance (output in % and impact by MNCS) distributed over collaboration types*



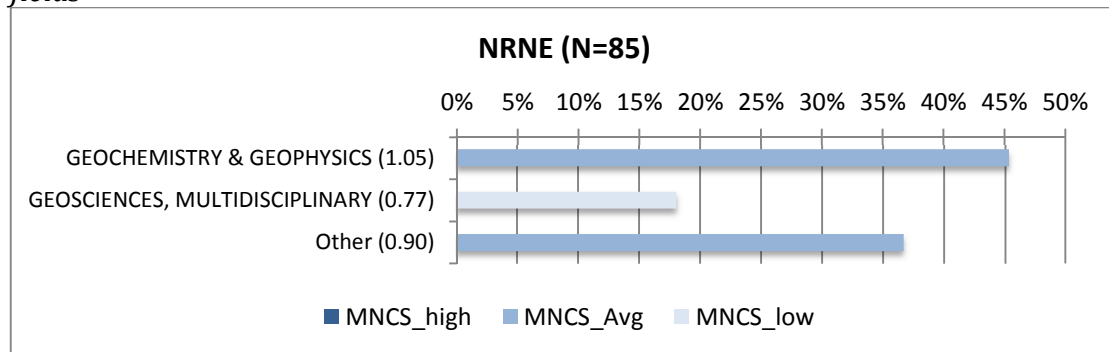


*Bibliometric performance report (output and impact) of Research Community NRNE*

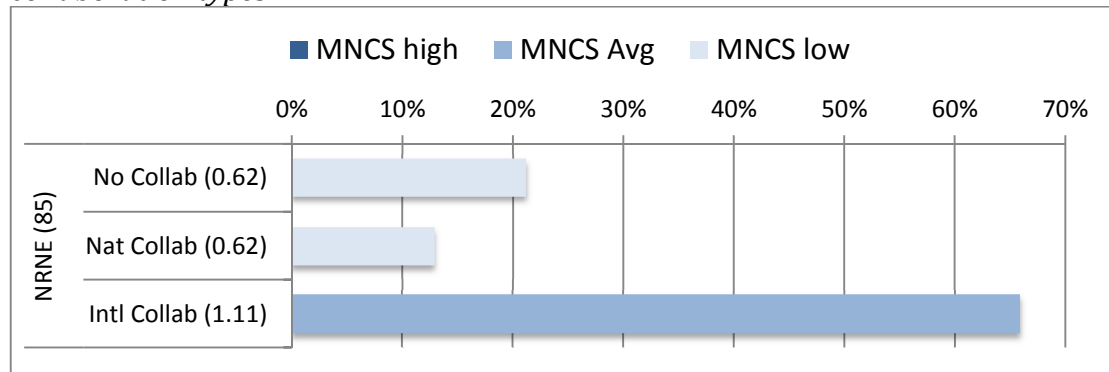
*Research performance overall and trend 2007-2011*

period	P	Int_cov	TCS	MCS	MNCS	PP_top 10%	MNJS	Prop Selfcits
<b>NRNE</b>								
<b>2007-2011</b>	<b>85</b>	<b>0.66</b>	<b>294</b>	<b>3.46</b>	<b>0.94</b>	<b>0.12</b>	<b>1.27</b>	<b>0.35</b>
2007-2008	29	0.62	98	3.38	0.72	0.10	1.17	0.33
2008-2009	38	0.65	183	4.82	1.01	0.13	1.26	0.31
2009-2010	41	0.68	177	4.32	1.15	0.12	1.33	0.36
2010-2011	36	0.68	74	2.06	0.87	0.11	1.25	0.42

*Research performance (output in % and impact by MNCS) distributed over WoS-fields*



*Research performance (output in % and impact by MNCS) distributed over collaboration types*

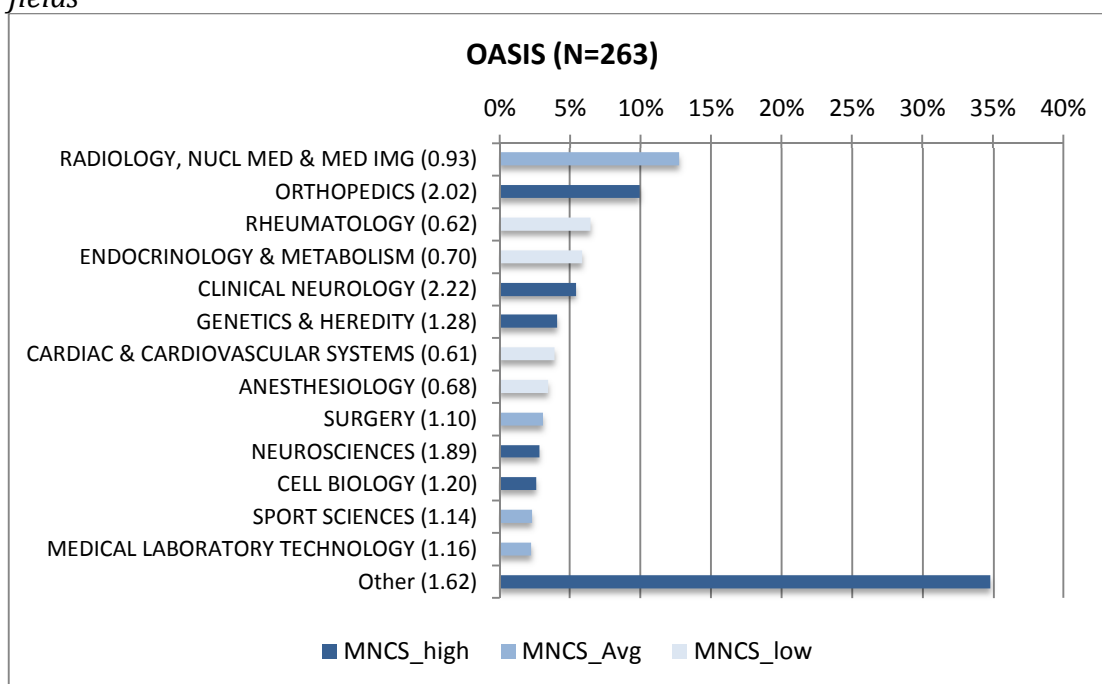


*Bibliometric performance report (output and impact) of Research Community OASIS*

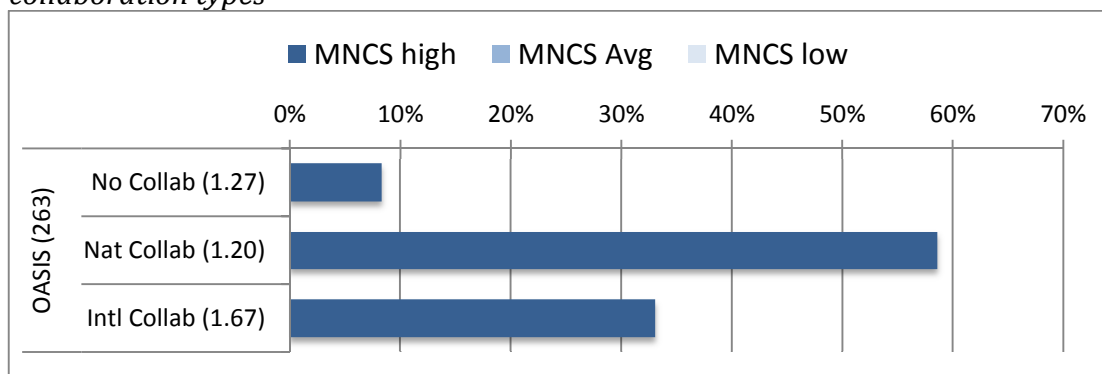
*Research performance overall and trend 2007-2011*

period	P	Int_cov	TCS	MCS	MNCS	PP_top 10%	MNJS	Prop Selfcits
<b>OASIS</b>								
<b>2007-2011</b>	<b>263</b>	<b>0.92</b>	<b>1638</b>	<b>6.23</b>	<b>1.36</b>	<b>0.16</b>	<b>1.20</b>	<b>0.21</b>
2007-2008	98	0.92	856	8.73	1.40	0.18	1.34	0.19
2008-2009	100	0.92	812	8.12	1.24	0.16	1.23	0.21
2009-2010	100	0.92	646	6.46	1.24	0.16	1.15	0.22
2010-2011	109	0.91	391	3.59	1.47	0.15	1.10	0.21

*Research performance (output in % and impact by MNCS) distributed over WoS-fields*



*Research performance (output in % and impact by MNCS) distributed over collaboration types*

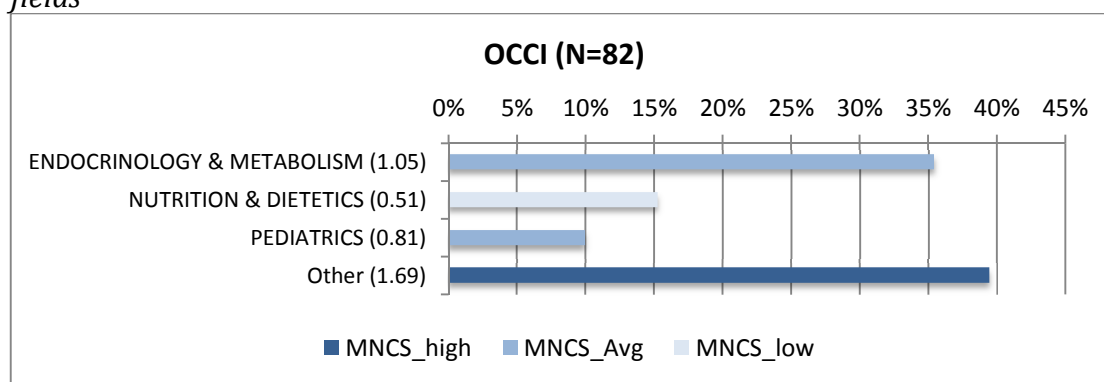


*Bibliometric performance report (output and impact) of Research Community OCCI*

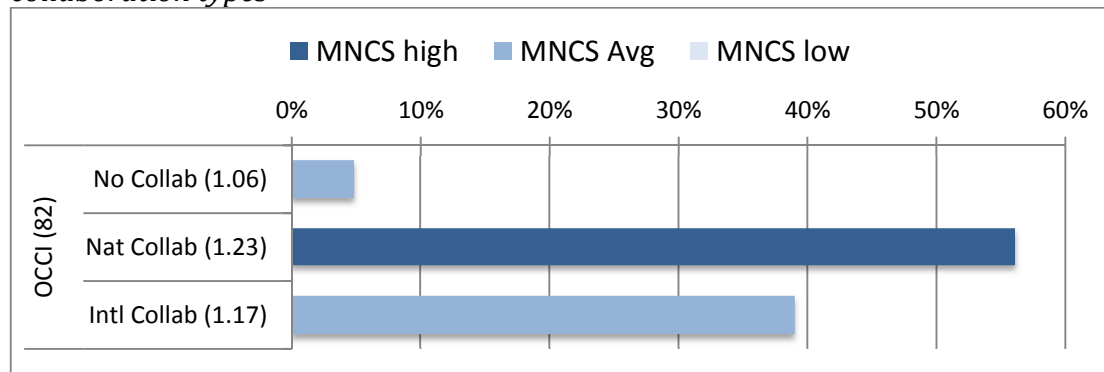
*Research performance overall and trend 2007-2011*

period	P	Int_cov	TCS	MCS	MNCS	PP_top 10%	MNJS	Prop Selfcits
<b>OCCI</b>								
2007-2011	82	0.90	714	8.71	1.20	0.15	1.73	0.20
2007-2008	23	0.93	271	11.78	1.13	0.17	2.02	0.24
2008-2009	26	0.91	316	12.15	1.19	0.15	1.79	0.19
2009-2010	37	0.89	353	9.54	1.29	0.11	1.71	0.17
2010-2011	45	0.89	270	6.00	1.24	0.16	1.67	0.19

*Research performance (output in % and impact by MNCS) distributed over WoS-fields*



*Research performance (output in % and impact by MNCS) distributed over collaboration types*

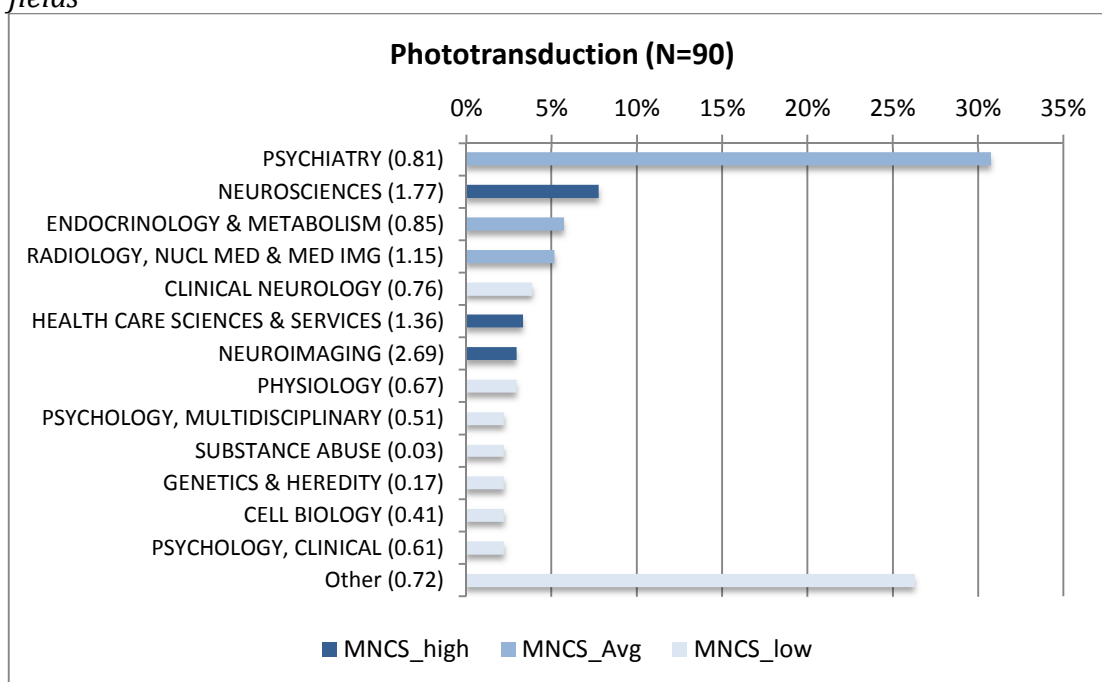


*Bibliometric performance report (output and impact) of Research Community Phototransduction*

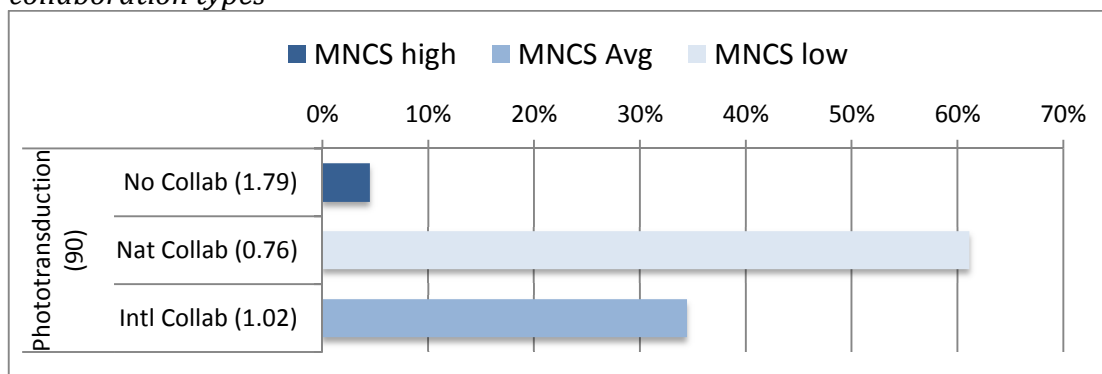
*Research performance overall and trend 2007-2011*

period	P	Int_cov	TCS	MCS	MNCS	PP_top 10%	MNJS	Prop Selfcits
<b>Phototransduction</b>								
2007-2011	90	0.88	461	5.12	0.90	0.12	1.09	0.18
2007-2008	35	0.88	244	6.97	0.79	0.06	1.07	0.16
2008-2009	34	0.88	249	7.32	0.82	0.09	1.17	0.17
2009-2010	32	0.89	174	5.44	0.89	0.16	1.08	0.19
2010-2011	39	0.88	131	3.36	1.07	0.21	1.09	0.21

*Research performance (output in % and impact by MNCS) distributed over WoS-fields*



*Research performance (output in % and impact by MNCS) distributed over collaboration types*

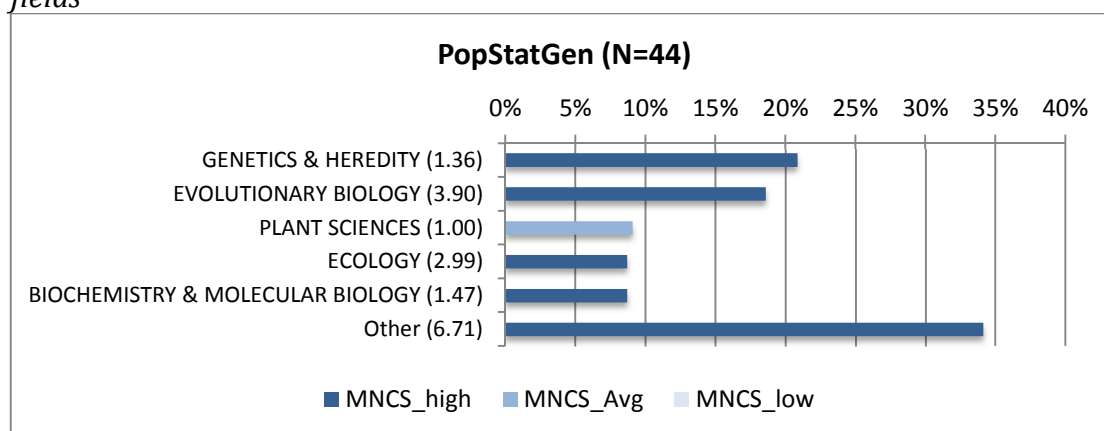


*Bibliometric performance report (output and impact) of Research Community PopStatGen*

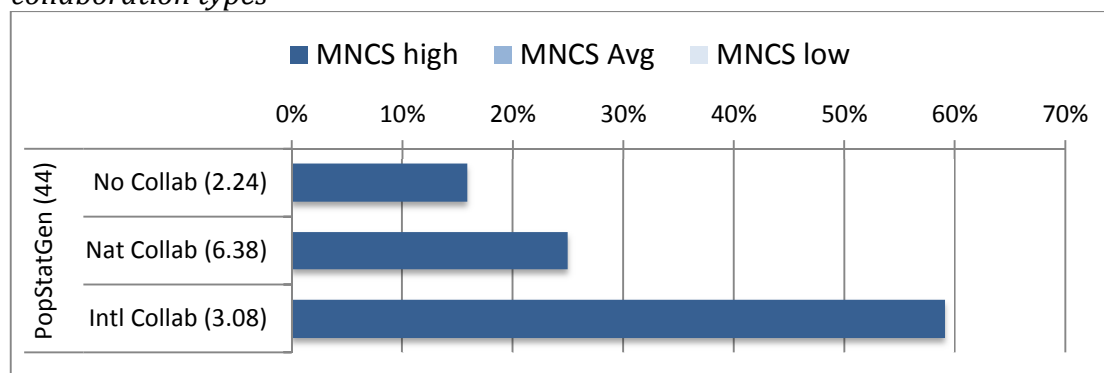
*Research performance overall and trend 2007-2011*

period	P	Int_cov	TCS	MCS	MNCS	PP_top 10%	MNJS	Prop Selfcits
<b>PopStatGen</b>								
2007-2011	44	0.83	553	12.57	3.77	0.39	1.77	0.24
2007-2008	19	0.86	235	12.37	1.53	0.32	1.72	0.18
2008-2009	18	0.88	170	9.44	1.14	0.17	1.34	0.23
2009-2010	14	0.86	273	19.50	6.21	0.43	2.18	0.30
2010-2011	18	0.78	236	13.11	7.03	0.50	1.95	0.31

*Research performance (output in % and impact by MNCS) distributed over WoS-fields*



*Research performance (output in % and impact by MNCS) distributed over collaboration types*

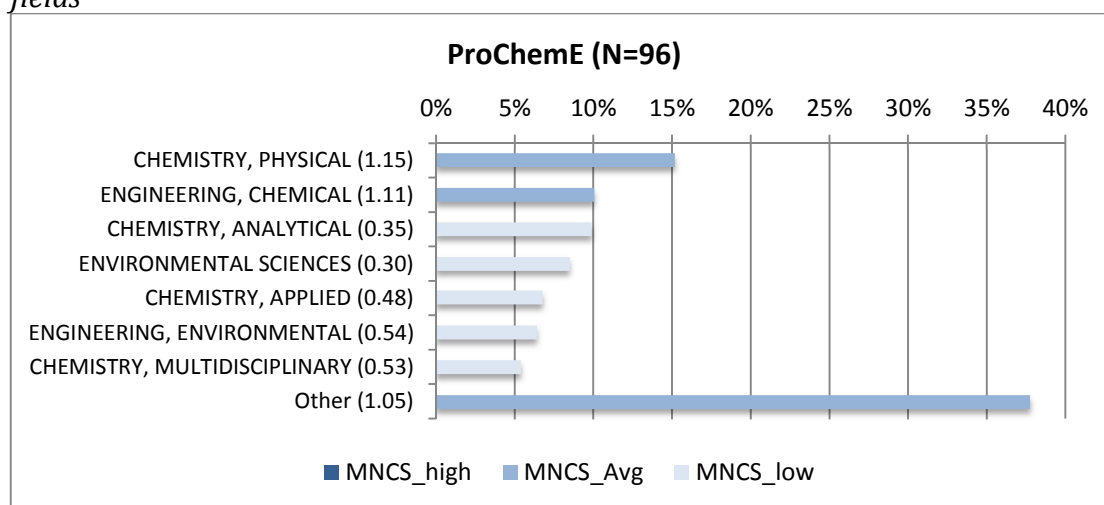


## Bibliometric performance report (output and impact) of Research Community ProChemE

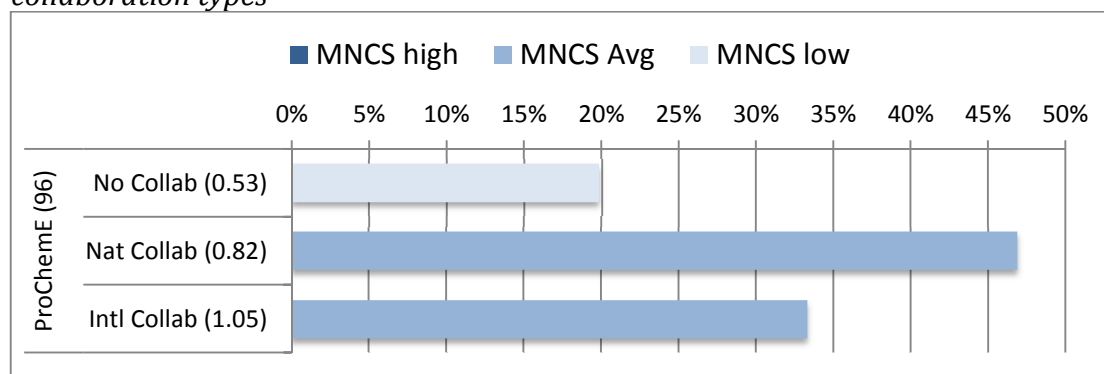
### Research performance overall and trend 2007-2011

period	P	Int_cov	TCS	MCS	MNCS	PP_top 10%	MNJS	Prop Selfcits
<b>ProChemE</b>								
2007-2011	96	0.79	308	3.21	0.84	0.10	1.06	0.25
2007-2008	32	0.69	65	2.03	0.38	0.00	0.79	0.35
2008-2009	38	0.76	148	3.89	0.67	0.05	0.90	0.20
2009-2010	42	0.84	179	4.26	0.88	0.10	1.21	0.20
2010-2011	39	0.84	129	3.31	1.26	0.21	1.33	0.25

### Research performance (output in % and impact by MNCS) distributed over WoS-fields



### Research performance (output in % and impact by MNCS) distributed over collaboration types

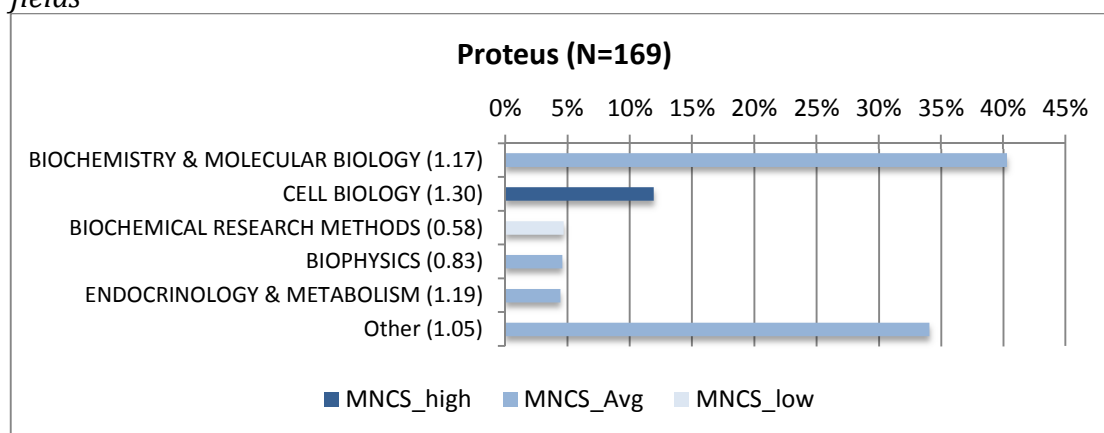


*Bibliometric performance report (output and impact) of Research Community Proteus*

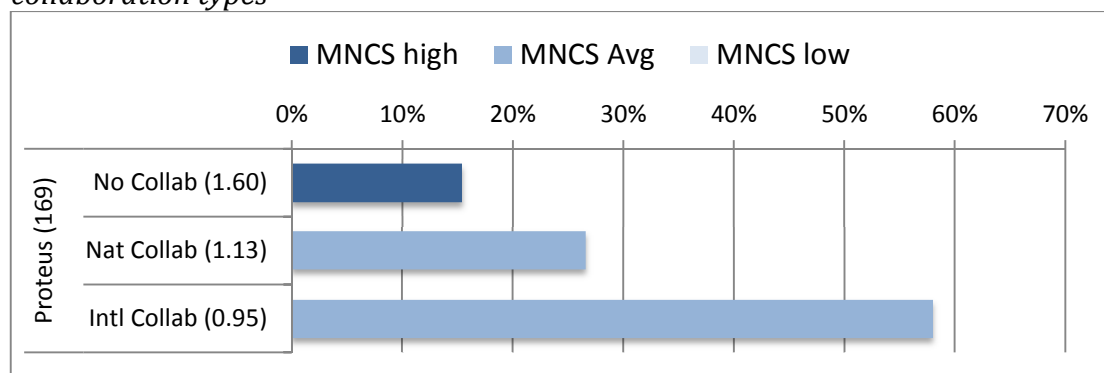
*Research performance overall and trend 2007-2011*

period	P	Int_cov	TCS	MCS	MNCS	PP_top 10%	MNJS	Prop Selfcits
<b>Proteus</b>								
<b>2007-2011</b>	<b>169</b>	<b>0.96</b>	<b>1439</b>	<b>8.51</b>	<b>1.10</b>	<b>0.14</b>	<b>1.30</b>	<b>0.23</b>
2007-2008	69	0.96	695	10.07	1.00	0.12	1.30	0.25
2008-2009	68	0.97	713	10.49	1.06	0.07	1.35	0.23
2009-2010	73	0.97	657	9.00	1.19	0.14	1.36	0.21
2010-2011	64	0.95	325	5.08	1.15	0.19	1.34	0.22

*Research performance (output in % and impact by MNCS) distributed over WoS-fields*



*Research performance (output in % and impact by MNCS) distributed over collaboration types*

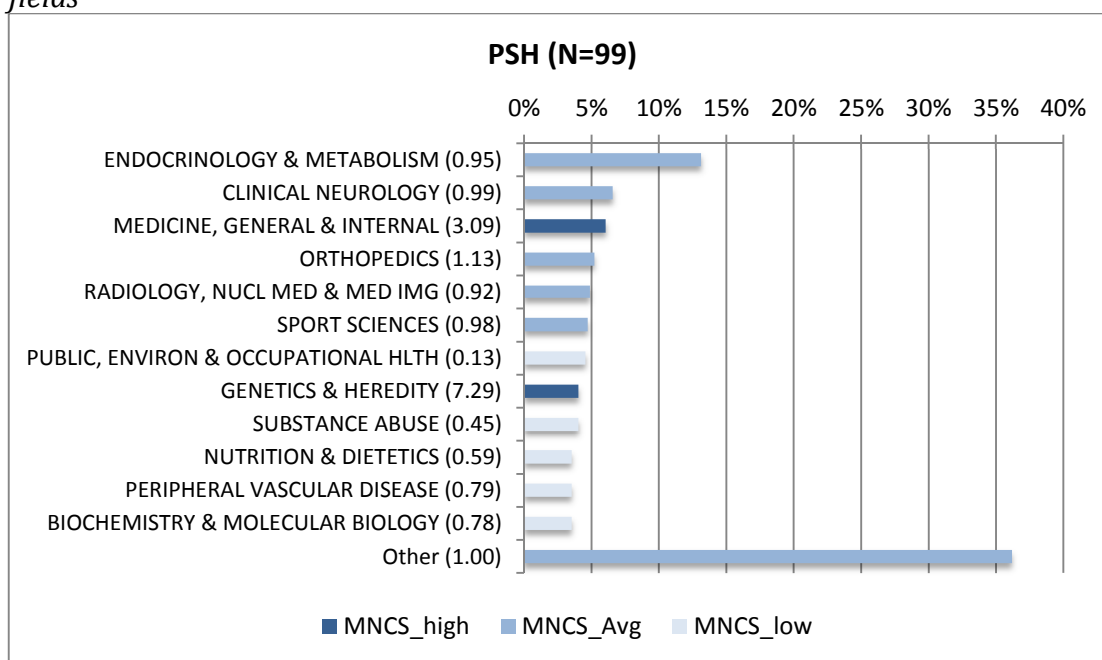


*Bibliometric performance report (output and impact) of Research Community PSH*

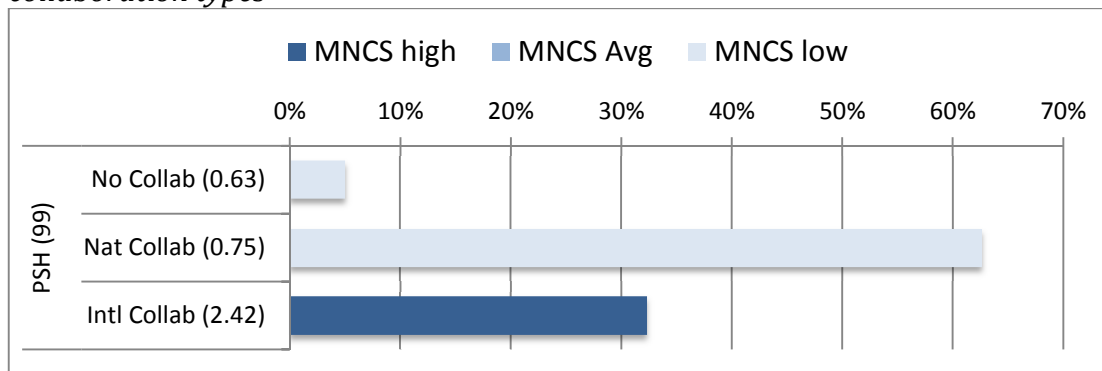
*Research performance overall and trend 2007-2011*

period	P	Int_cov	TCS	MCS	MNCS	PP_top 10%	MNJS	Prop Selfcits
<b>PSH</b>								
2007-2011	99	0.89	848	8.57	1.28	0.08	1.43	0.29
2007-2008	27	0.90	426	15.78	1.99	0.19	1.69	0.18
2008-2009	32	0.91	207	6.47	0.96	0.09	1.16	0.22
2009-2010	50	0.90	354	7.08	1.08	0.04	1.31	0.39
2010-2011	51	0.87	333	6.53	1.19	0.04	1.45	0.38

*Research performance (output in % and impact by MNCS) distributed over WoS-fields*



*Research performance (output in % and impact by MNCS) distributed over collaboration types*



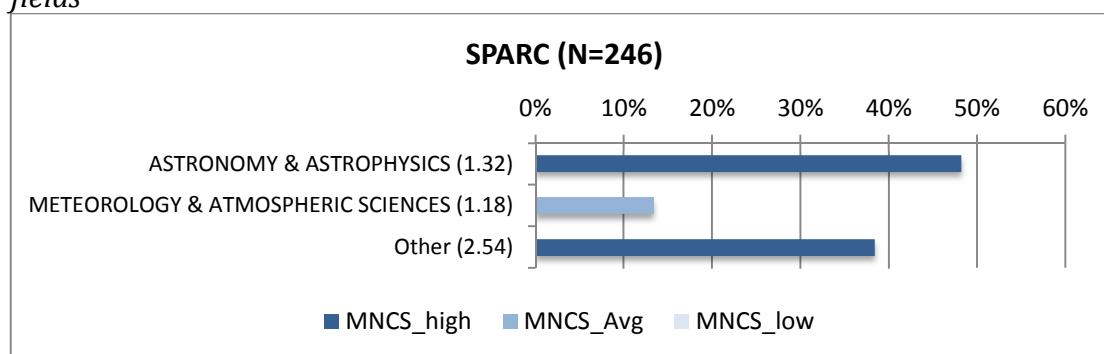


*Bibliometric performance report (output and impact) of Research Community SPARC*

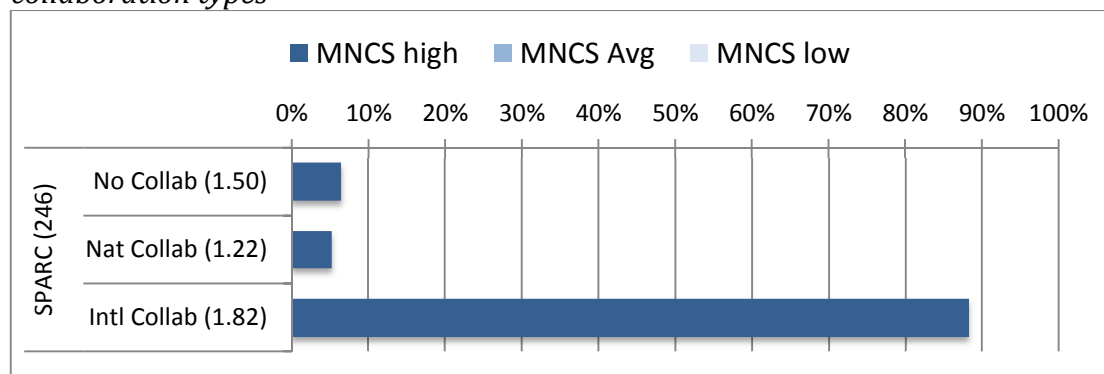
*Research performance overall and trend 2007-2011*

period	P	Int_cov	TCS	MCS	MNCS	PP_top 10%	MNJS	Prop Selfcits
<b>SPARC</b>								
<b>2007-2011</b>	<b>246</b>	<b>0.86</b>	<b>1504</b>	<b>6.11</b>	<b>1.77</b>	<b>0.18</b>	<b>1.09</b>	<b>0.42</b>
2007-2008	99	0.85	559	5.65	1.40	0.18	1.12	0.39
2008-2009	89	0.86	491	5.52	1.34	0.15	1.02	0.39
2009-2010	90	0.86	618	6.87	1.45	0.10	1.05	0.44
2010-2011	109	0.86	720	6.61	2.31	0.21	1.10	0.45

*Research performance (output in % and impact by MNCS) distributed over WoS-fields*



*Research performance (output in % and impact by MNCS) distributed over collaboration types*

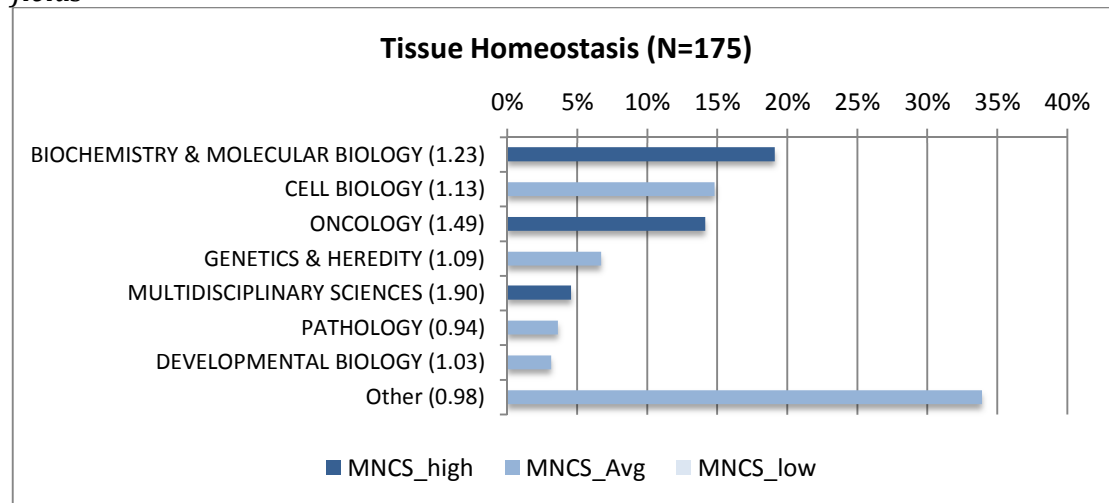


## Bibliometric performance report (output and impact) of Research Community Tissue Homeostasis

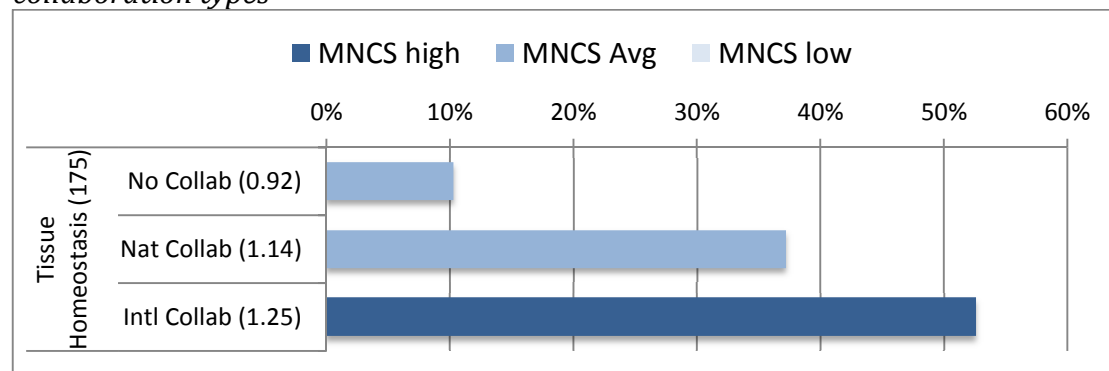
### Research performance overall and trend 2007-2011

period	P	Int_cov	TCS	MCS	MNCS	PP_top 10%	MNJS	Prop Selfcits
<b>Tissue Homeostasis</b>								
<b>2007-2011</b>	<b>175</b>	<b>0.96</b>	<b>1527</b>	<b>8.73</b>	<b>1.17</b>	<b>0.12</b>	<b>1.48</b>	<b>0.21</b>
2007-2008	70	0.96	855	12.21	1.18	0.13	1.61	0.19
2008-2009	69	0.96	700	10.14	1.09	0.13	1.49	0.20
2009-2010	71	0.95	507	7.14	0.91	0.10	1.33	0.24
2010-2011	70	0.97	357	5.10	1.21	0.10	1.43	0.28

### Research performance (output in % and impact by MNCS) distributed over WoS-fields



### Research performance (output in % and impact by MNCS) distributed over collaboration types



## Appendix 3.

# Oulu University Library report of additional bibliometric analysis

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## Introduction

For the 17 research communities (RCs) that had less than 25 publications in Web of Science and therefore did not fulfill the criteria of the CWTS analyses, Oulu University Library (OULib) carried out the following analyses:

- 1) Publishing activity
  - a. The number of all publications by type
  - b. The number of scientific publications by type and year
  - c. Percentage of different languages in scientific publications
- 2) Quality of publications
  - a. Finnish Publication Forum rating for journals and publication series
  - b. Finnish Publication Forum rating for book publishers
  - c. Finnish Publication Forum rating by language
- 3) Impact of publications
  - a. Citation indicators of scientific publications in the Scopus database.

Additional analyses were only carried out for scientific publications. Scientific publications include classes A, B and C in the national classification for publications of the Ministry of Education and Culture (see Table 1 on page 3 of the main bibliometric report).

## Publishing activity

The total number of publications includes all publications of the RCs except theses, dissertations and conference abstracts. For scientific publications not only the number of publications but also publishing in different languages was analyzed.

Similar publication types used in the Ministry of Education and Culture classification (see Table 1 on page 3 of the main bibliometric report) were grouped in the analysis as shown in Table 1 below.

Table 1. Publication types used in the analysis vs. the Ministry of Education and Culture classification of publications.

Publication types used in analysis	Ministry of Education and Culture classification	
	Scientific	Non-scientific
Compilation	A3, B2	E1
Conference publication	A4, B3	D3
Introduction to edited book	C2	
Newspaper		E1
Other magazine		D1, E1
Other monograph		D4, D5, E2
Other recording		I1
Radio- and television program		I1
Scientific journal	A1, A2, B1	
Scientific monograph	C1	
Vocational, textbook material		D2

## Quality of publications

The quality of publications was described by using the Finnish Publication Forum rating<sup>1</sup> which was developed for evaluating the quality of scientific publications. The Publication Forum rating is coordinated by the Federation of Finnish Learned Societies. It is based on the classification of the quality of 1) scientific journals and publication series and 2) book publishers. The rating of publication channels is conducted by 23 field-specific expert panels. The ratings will be reviewed every three years, the next time in 2014. Journals and series are rated on a three-level scale: 1 = basic; 2 = leading; 3 = top. Book publishers are rated on a two-level scale: 1 = basic; 2 = leading.

The rating of a scientific journal, series or book publisher is only a rough indicator of quality, and therefore the rating is best suited for macro-level analyses of publication production. The Publication Forum rating is not suited for interdisciplinary comparisons. Therefore the results should be interpreted with special care.

## Impact of publications

Citation data from the Scopus database was used to describe the impact of publications of RCs. The Scopus database by Elsevier is the largest abstract and citation database, covering over 20,500 titles, of which 19,500 are peer reviewed journals in physical sciences and engineering, life sciences, health sciences, social sciences and humanities. Citation data from Scopus also includes conference proceedings articles. As is the case with Web of Science, the coverage of Scopus is also lacking in some research fields.

Impact indicators in this study are not normalized for field differences and therefore should only be used for comparisons between groups that are active in the same field.

---

<sup>1</sup> <http://www.tsv.fi/julkaisufoorumi/english.html?lang=en>

## Bibliometric reports of individual RCs

# Oulu University Library bibliometric report of ACG - Accounting Decisions and Corporate Governance

## Publishing activity

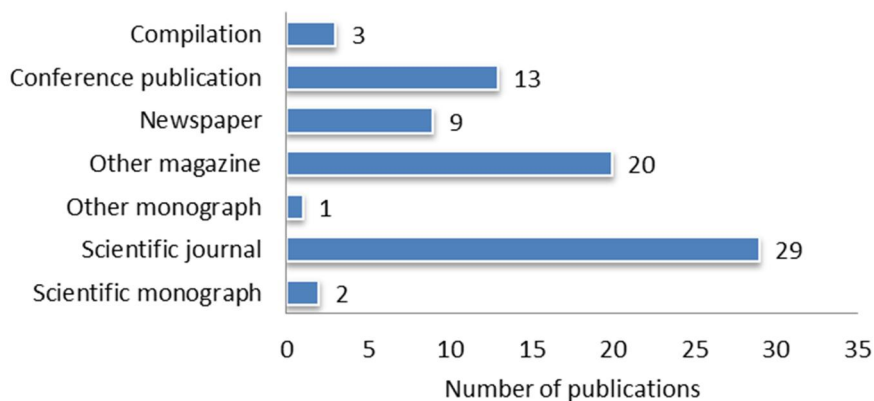


Figure 1. Number of all publications by type for years 2007–2011 (n=77).

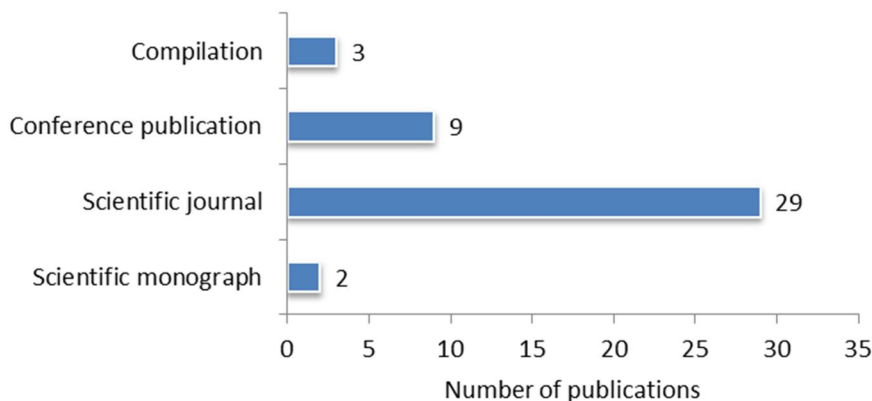


Figure 2. Number of scientific publications by type for years 2007–2011 (n=43).

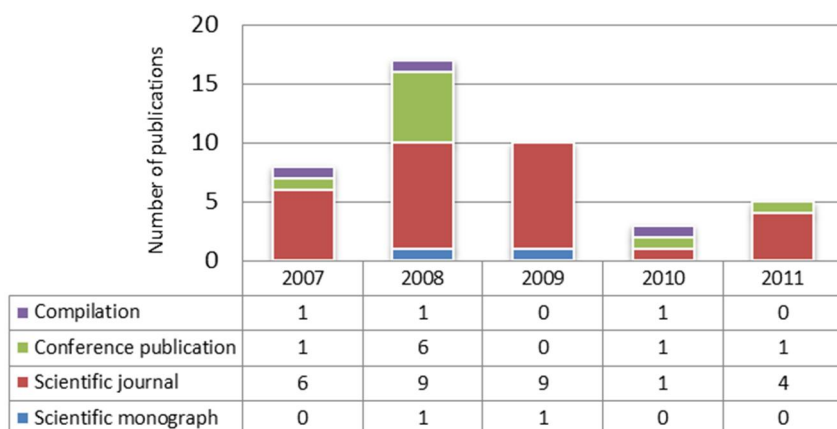


Figure 3. Number of scientific publications by type and year for years 2007–2011 (n=43).

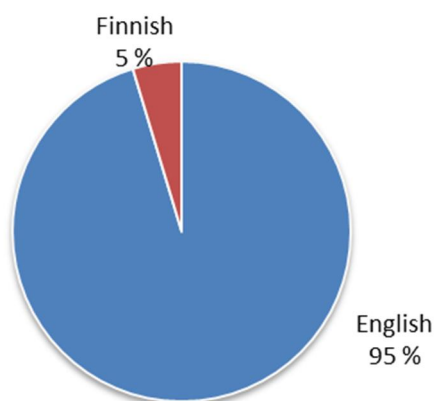


Figure 4. Percentage of different languages in scientific publications for years 2007–2011 (n=43).

### Quality of publications

The Publication Forum rating of a scientific publication is determined primarily by the level of the publication series in the journal and publication series list. If the publication series is not mentioned, the level of monographs, compilations and conference publications is determined by the level mentioned in the book publisher list.

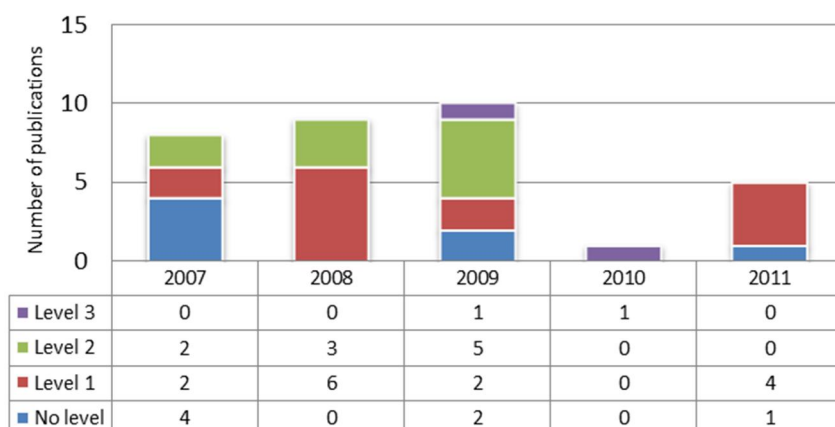


Figure 5. Number of scientific publications and the Publication Forum rating of journal and publication series for years 2007–2011 (n=33). The levels are 1 = basic, 2 = leading and 3 = top.

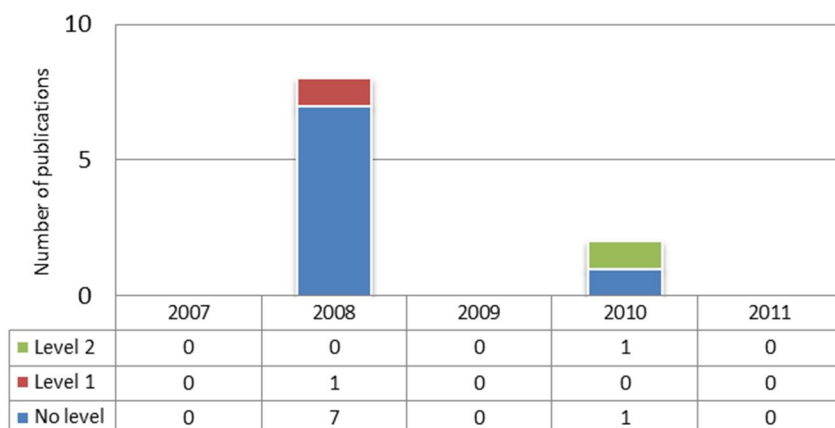


Figure 6. Number of scientific publications and the Publication Forum rating of book publishers for years 2007–2011 (n=10). The levels are 1 = basic and 2 = leading.



Table 3. Publication Forum rating of journal and publication series vs. language for years 2007–2011 (n=33). The levels are 1 = basic, 2 = leading and 3 = top.

Language	Publication Forum journal and series rating				
	No level	Level 1	Level 2	Level 3	Total
English	7	14	10	2	33
Total	7	14	10	2	33

Table 4. Publication Forum rating of book publishers vs. language for years 2007–2011 (n=10). The levels are 1 = basic and 2 = leading.

Language	Publication Forum book publisher rating			
	No level	Level 1	Level 2	Total
English	7	0	1	8
Finnish	1	1	0	2
Total	8	1	1	10

### Impact of publications

The number of citations was counted up to and including the year 2012, which favours older publications. Self-citations of all authors are excluded. In the Scopus database this means that citing and cited documents do not have any common authors.

Table 5. Citation indicators of scientific publications in the Scopus database.

Document type	P <sub>Sci</sub>	P <sub>Sco</sub>	TCS	MCS	% uncited
Compilation	3	0	-	-	-
Conference publication	9	0	-	-	-
Scientific journal	29	21	73	3,5	28,6
Scientific monograph	2	0	-	-	-
All scientific publications	43	21	73	3,5	28,6

P<sub>Sci</sub> = Number of scientific publications, P<sub>Sco</sub> = Number of publications in Scopus database, TCS = Number of citations, MCS = Number of citations per publication, % uncited = Percentage of uncited publications

## Oulu University Library bibliometric report of

## AgeAds - The Age of Adjustments? Critical and historical perspectives on governing citizens, wellbeing and environment

## Publishing activity

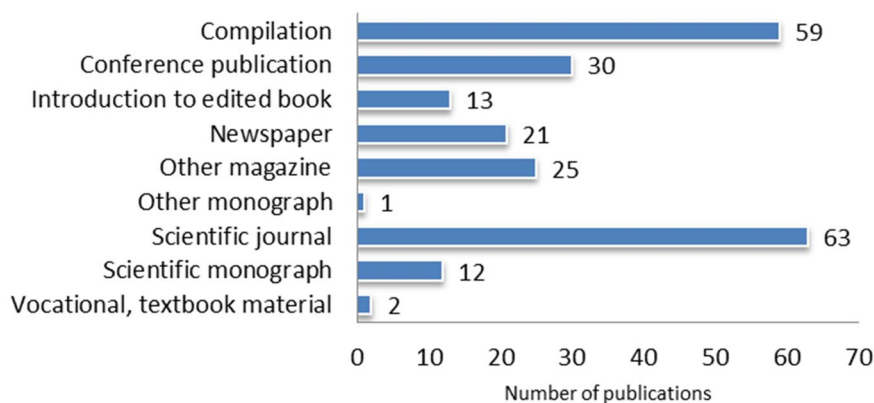


Figure 1. Number of all publications by type for years 2007–2011 (n=226).

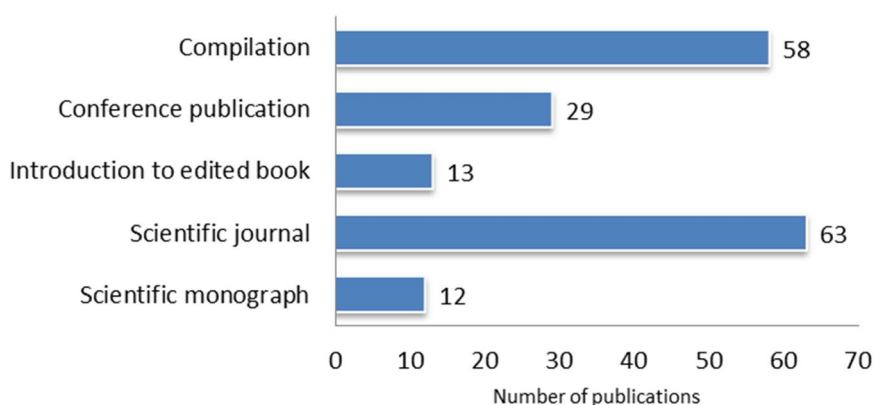


Figure 2. Number of scientific publications by type for years 2007–2011 (n=175).

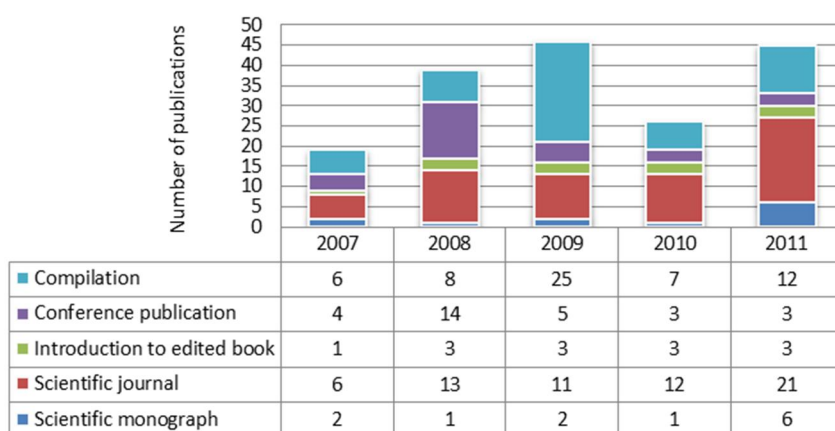


Figure 3. Number of scientific publications by type and year for years 2007–2011 (n=175).

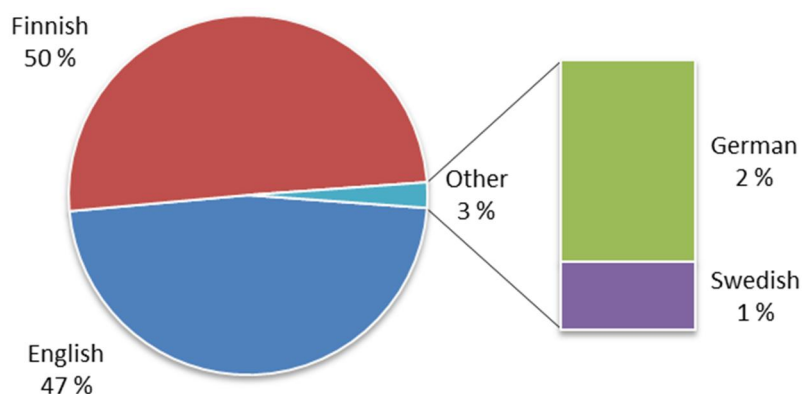


Figure 4. Percentage of different languages in scientific publications for years 2007–2011 (n=175).

### Quality of publications

The Publication Forum rating of a scientific publication is determined primarily by the level of the publication series in the journal and publication series list. If the publication series is not mentioned, the level of monographs, compilations and conference publications is determined by the level mentioned in the book publisher list.

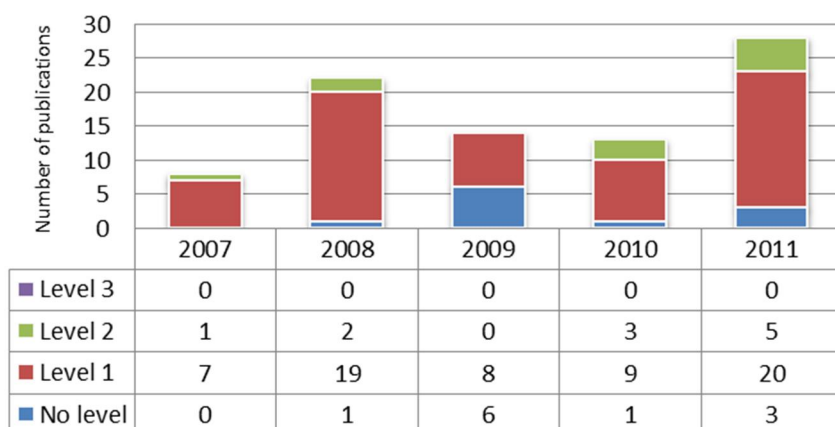


Figure 5. Number of scientific publications and the Publication Forum rating of journal and publication series for years 2007–2011 (n=85). The levels are 1 = basic, 2 = leading and 3 = top.

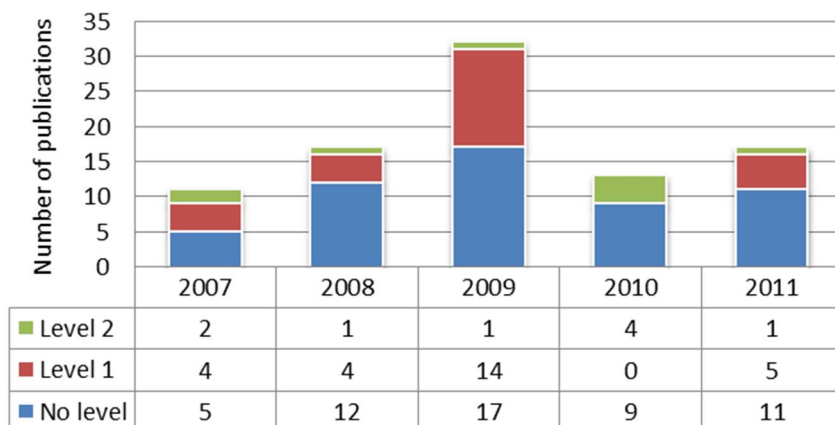


Figure 6. Number of scientific publications and the Publication Forum rating of book publishers for years 2007–2011 (n=90). The levels are 1 = basic and 2 = leading.

Table 3. Publication Forum rating of journal and publication series vs. language for years 2007–2011 (n=85). The levels are 1 = basic, 2 = leading and 3 = top.

Language	Publication Forum journal and series rating				Total
	No level	Level 1	Level 2	Level 3	
English	4	31	1	0	36
Finnish	7	32	10	0	48
German	0	1	0	0	1
Total	11	64	11	0	85

Table 4. Publication Forum rating of book publishers vs. language for years 2007–2011 (n=90). The levels are 1 = basic and 2 = leading.

Language	Publication Forum book publisher rating			Total
	No level	Level 1	Level 2	
English	19	23	5	47
Finnish	33	4	3	40
German	1	0	1	2
Swedish	1	0	0	1
Total	54	27	9	90

### Impact of publications

The number of citations was counted up to and including the year 2012, which favours older publications. Self-citations of all authors are excluded. In the Scopus database this means that citing and cited documents do not have any common authors.

Table 5. Citation indicators of scientific publications in the Scopus database.

Document type	P <sub>Sci</sub>	P <sub>Sco</sub>	TCS	MCS	% uncited
Compilation	58	0	-	-	-
Conference publication	29	0	-	-	-
Introduction to edited book	13	0	-	-	-
Scientific journal	63	14	36	2,6	35,7
Scientific monograph	12	0	-	-	-
All scientific publications	175	14	36	2,6	35,7

P<sub>sci</sub> = Number of scientific publications, P<sub>sc</sub> = Number of publications in Scopus database, TCS = Number of citations, MCS = Number of citations per publication, % uncited = Percentage of uncited publications

## Oulu University Library bibliometric report of CLRC - Child Language Research Center

### Publishing activity

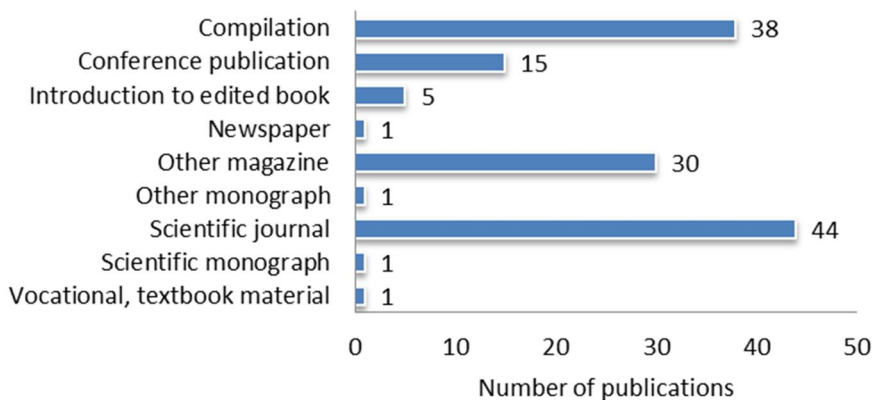


Figure 1. Number of all publications by type for years 2007–2011 (n=136).

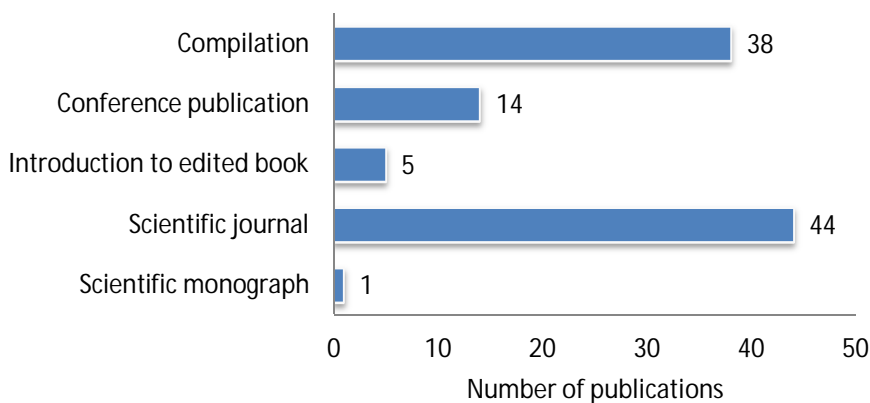


Figure 2. Number of scientific publications by type for years 2007–2011 (n=102).

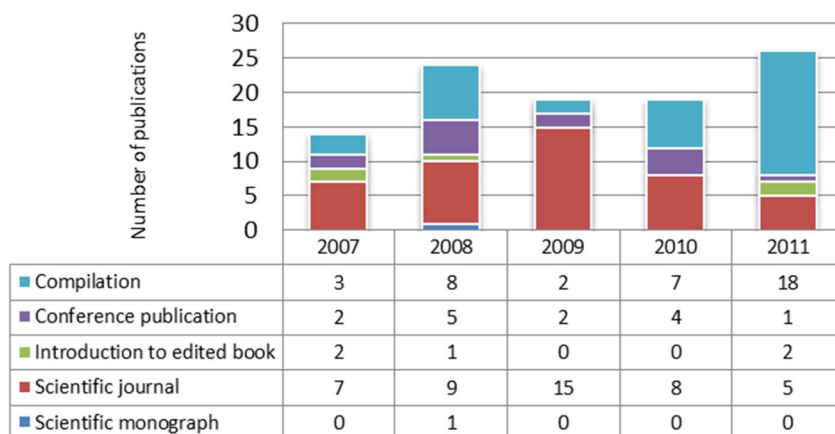


Figure 3. Number of scientific publications by type and year for years 2007–2011 (n=102).

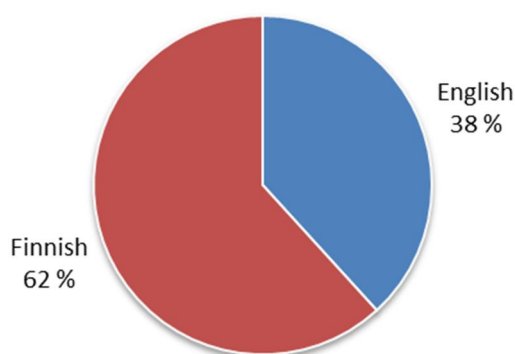


Figure 4. Percentage of different languages in scientific publications for years 2007–2011 (n=102).

### Quality of publications

The Publication Forum rating of a scientific publication is determined primarily by the level of the publication series in the journal and publication series list. If the publication series is not mentioned, the level of monographs, compilations and conference publications is determined by the level mentioned in the book publisher list.

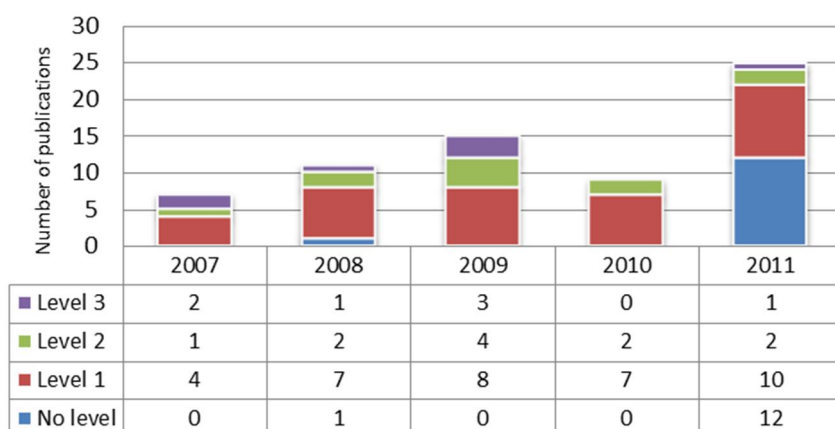


Figure 5. Number of scientific publications and the Publication Forum rating of journal and publication series for years 2007–2011 (n=67). The levels are 1 = basic, 2 = leading and 3 = top.

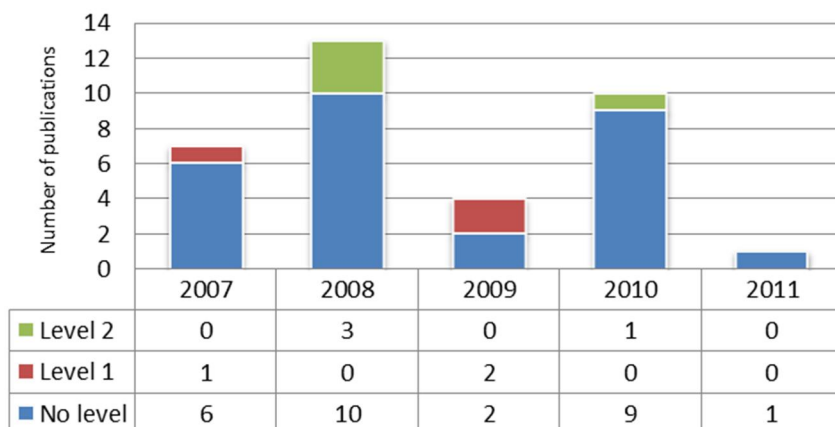


Figure 6. Number of scientific publications and the Publication Forum rating of book publishers for years 2007–2011 (n=35). The levels are 1 = basic and 2 = leading.

Table 3. Publication Forum rating of journal and publication series vs. language for years 2007–2011 (n=67). The levels are 1 = basic, 2 = leading and 3 = top.

Language	Publication Forum journal and series rating				
	No level	Level 1	Level 2	Level 3	Total
English	1	10	4	7	22
Finnish	11	26	7	0	45
Total	12	36	11	7	67

Table 4. Publication Forum rating of book publishers vs. language for years 2007–2011 (n=35). The levels are 1 = basic and 2 = leading.

Language	Publication Forum book publisher rating			
	No level	Level 1	Level 2	Total
English	12	1	4	17
Finnish	16	2	0	18
Total	28	3	4	35

### Impact of publications

The number of citations was counted up to and including the year 2012, which favours older publications. Self-citations of all authors are excluded. In the Scopus database this means that citing and cited documents do not have any common authors.

Table 5. Citation indicators of scientific publications in the Scopus database.

Document type	P <sub>sci</sub>	P <sub>sc</sub>	TCS	MCS	% uncited
Compilation	38	0	-	-	-
Conference publication	14	0	-	-	-
Introduction to edited book	5	0	-	-	-
Scientific journal	44	21	78	3,7	28,6
Scientific monograph	1	0	-	-	-
All scientific publications	102	21	78	3,7	28,6

P<sub>sci</sub> = Number of scientific publications, P<sub>sc</sub> = Number of publications in Scopus database, TCS = Number of citations, MCS = Number of citations per publication, % uncited = Percentage of uncited publications

## Oulu University Library bibliometric report of

## COACT - Complexity of (inter)action: Towards an understanding of skilled multimodal participation

## Publishing activity

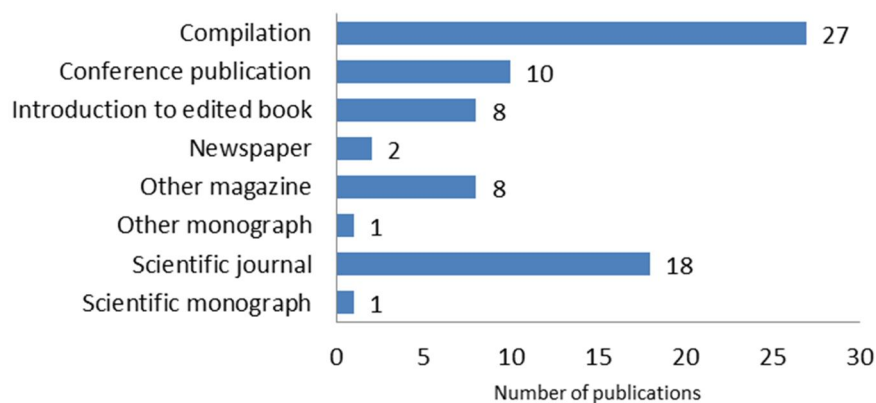


Figure 1. Number of all publications by type for years 2007–2011 (n=75).

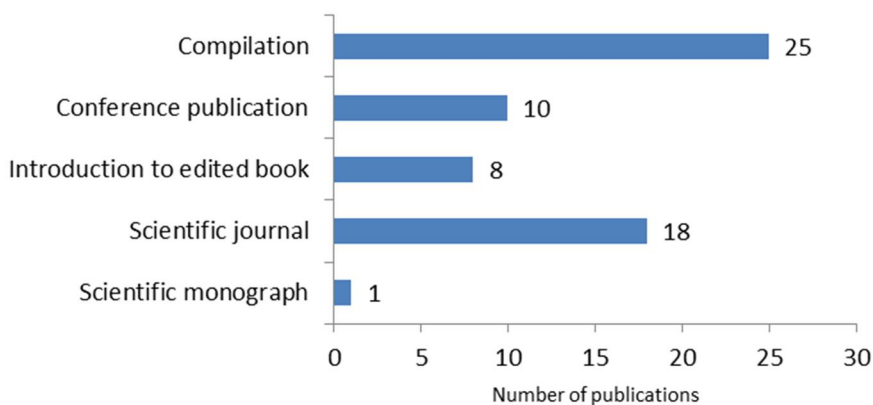


Figure 2. Number of scientific publications by type for years 2007–2011 (n=62).

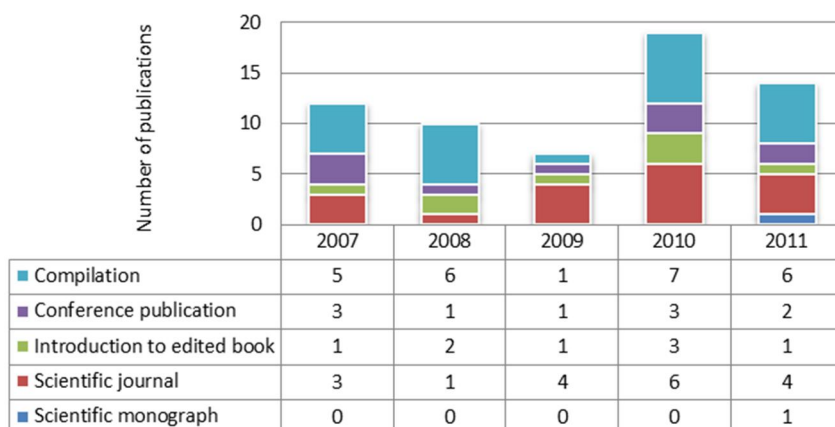


Figure 3. Number of scientific publications by type and year for years 2007–2011 (n=62).



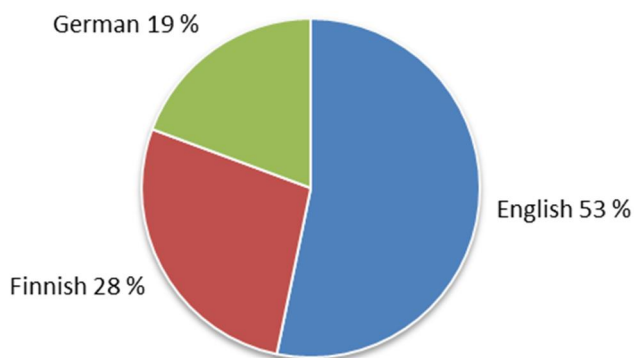


Figure 4. Percentage of different languages in scientific publications for years 2007–2011 (n=62).

### Quality of publications

The Publication Forum rating of a scientific publication is determined primarily by the level of the publication series in the journal and publication series list. If the publication series is not mentioned, the level of monographs, compilations and conference publications is determined by the level mentioned in the book publisher list.

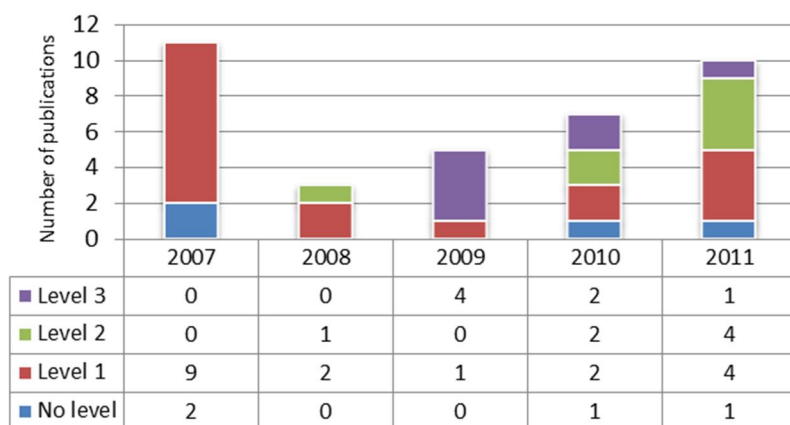


Figure 5. Number of scientific publications and the Publication Forum rating of journal and publication series for years 2007–2011 (n=36). The levels are 1 = basic, 2 = leading and 3 = top.

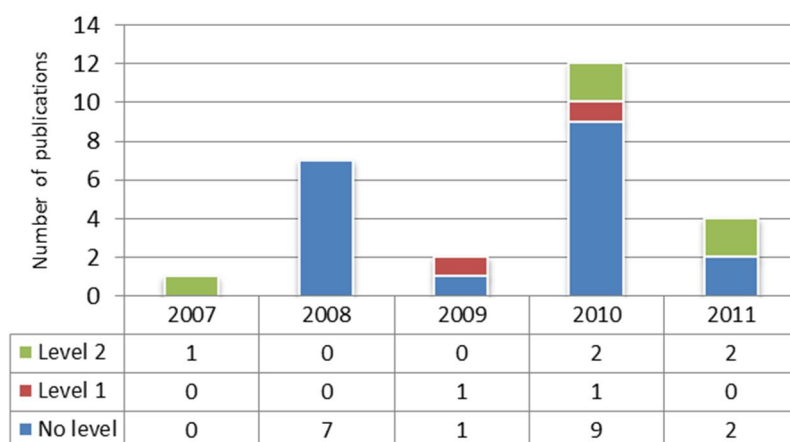


Figure 6. Number of scientific publications and the Publication Forum rating of book publishers for years 2007–2011 (n=26). The levels are 1 = basic and 2 = leading.

Table 3. Publication Forum rating of journal and publication series vs. language for years 2007–2011 (n=36). The levels are 1 = basic, 2 = leading and 3 = top.

Language	Publication Forum journal and series rating				Total
	No level	Level 1	Level 2	Level 3	
English	1	13	3	7	24
Finnish	2	0	4	0	6
German	1	5	0	0	6
Total	4	18	7	7	36

Table 4. Publication Forum rating of book publishers vs. language for years 2007–2011 (n=26). The levels are 1 = basic and 2 = leading.

Language	Publication Forum book publisher rating			Total
	No level	Level 1	Level 2	
English	6	2	1	9
Finnish	7	0	4	11
German	6	0	0	6
Total	19	2	5	26

### Impact of publications

The number of citations was counted up to and including the year 2012, which favours older publications. Self-citations of all authors are excluded. In the Scopus database this means that citing and cited documents do not have any common authors.

Table 5. Citation indicators of scientific publications in the Scopus database.

Document type	P <sub>Sci</sub>	P <sub>Sco</sub>	TCS	MCS	% uncited
Compilation	25	0	-	-	-
Conference publication	10	1	0	0,0	100,0
Introduction to edited book	8	0	-	-	-
Scientific journal	18	8	32	4,0	25,0
Scientific monograph	1	0	-	-	-
All scientific publications	62	9	32	3,6	33,3

P<sub>Sci</sub> = Number of scientific publications, P<sub>Sco</sub> = Number of publications in Scopus database, TCS = Number of citations, MCS = Number of citations per publication, % uncited = Percentage of uncited publications

## Oulu University Library bibliometric report of

CREMA - Community of Research in Education, Music, and the Arts  
Publishing activity

## Publishing activity

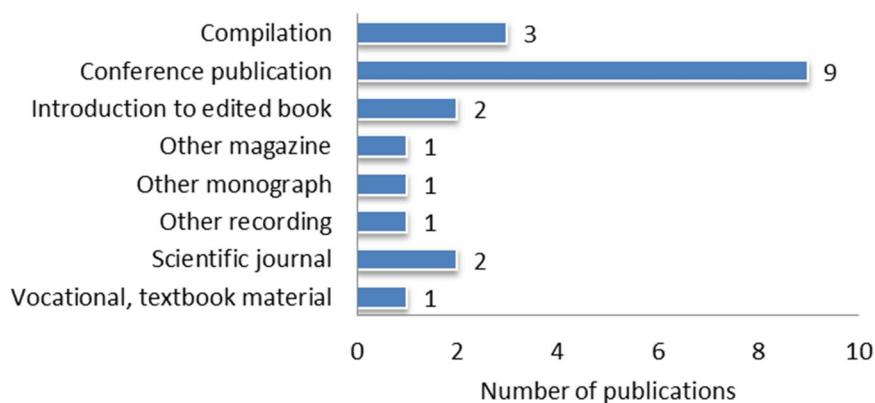


Figure 1. Number of all publications by type for years 2007–2011 (n=20).

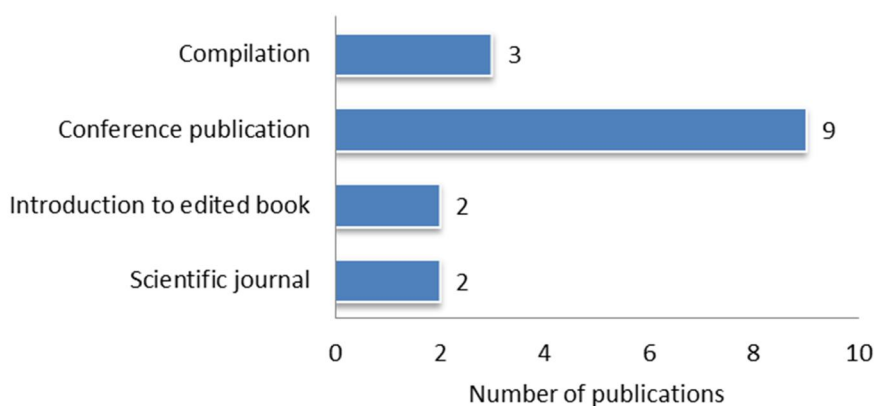


Figure 2. Number of scientific publications by type for years 2007–2011 (n=16).

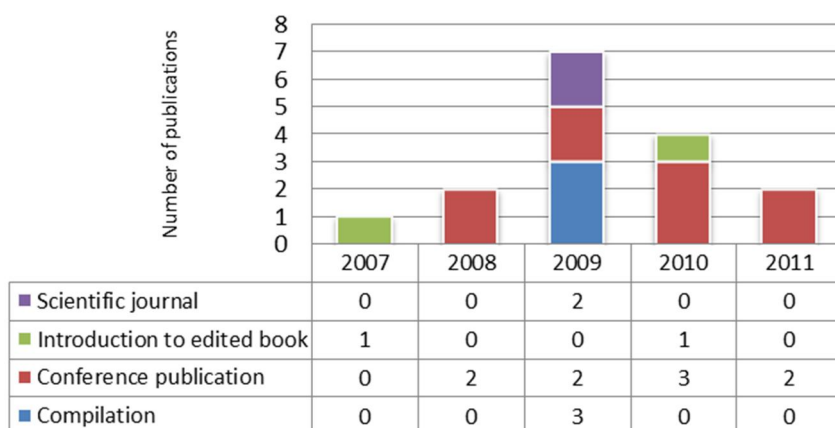


Figure 3. Number of scientific publications by type and year for years 2007–2011 (n=16).

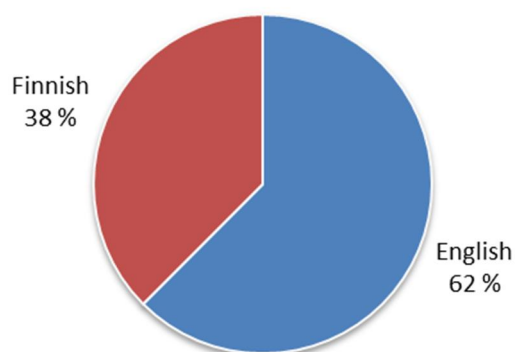


Figure 4. Percentage of different languages in scientific publications for years 2007–2011 (n=16).

### Quality of publications

The Publication Forum rating of a scientific publication is determined primarily by the level of the publication series in the journal and publication series list. If the publication series is not mentioned, the level of monographs, compilations and conference publications is determined by the level mentioned in the book publisher list.

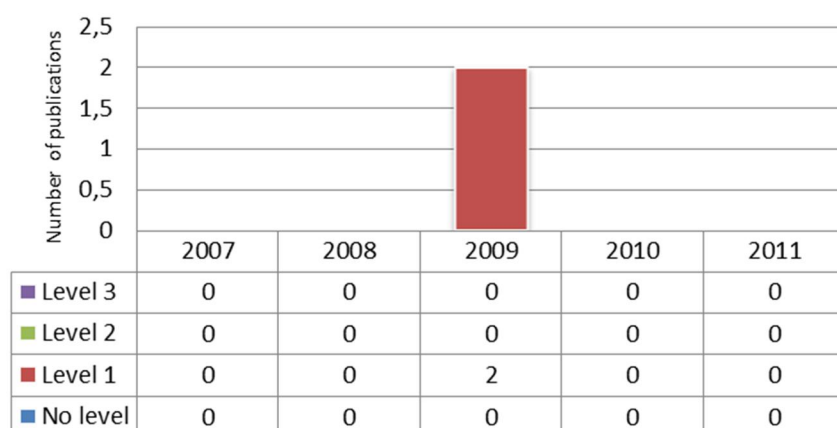


Figure 5. Number of scientific publications and the Publication Forum rating of journal and publication series for years 2007–2011 (n=2). The levels are 1 = basic, 2 = leading and 3 = top.

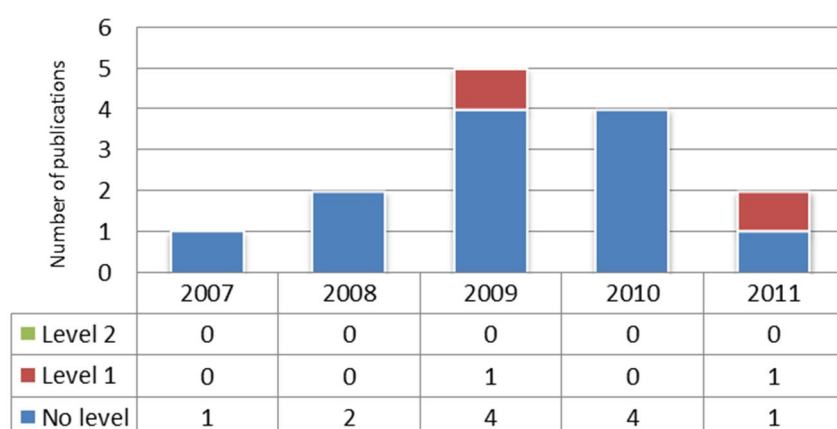


Figure 6. Number of scientific publications and the Publication Forum rating of book publishers for years 2007–2011 (n=14). The levels are 1 = basic and 2 = leading.

Table 3. Publication Forum rating of journal and publication series vs. language for years 2007–2011 (n=2). The levels are 1 = basic, 2 = leading and 3 = top.

Language	Publication Forum journal and series rating				Total
	No level	Level 1	Level 2	Level 3	
Finnish	0	2	0	0	2
Total	0	2	0	0	2

Table 4. Publication Forum rating of book publishers vs. language for years 2007–2011 (n=14). The levels are 1 = basic and 2 = leading.

Language	Publication Forum book publisher rating			
	No level	Level 1	Level 2	Total
English	8	2	0	10
Finnish	4	0	0	4
Total	12	2	0	14

### Impact of publications

The number of citations was counted up to and including the year 2012, which favours older publications. Self-citations of all authors are excluded. In the Scopus database this means that citing and cited documents do not have any common authors.

Table 5. Citation indicators of scientific publications in the Scopus database.

Document type	P <sub>Sci</sub>	P <sub>Sco</sub>	TCS	MCS	% uncited
Compilation	3	0	-	-	-
Conference publication	9	1	0	0,0	100,0
Introduction to edited book	2	0	-	-	-
Scientific journal	2	0	-	-	-
All scientific publications	16	1	0	0	100

P<sub>sci</sub> = Number of scientific publications, P<sub>sc</sub> = Number of publications in Scopus database, TCS = Number of citations, MCS = Number of citations per publication, % uncited = Percentage of uncited publications

## Oulu University Library bibliometric report of EduPhil- Educational Theory and Philosophy

### Publishing activity

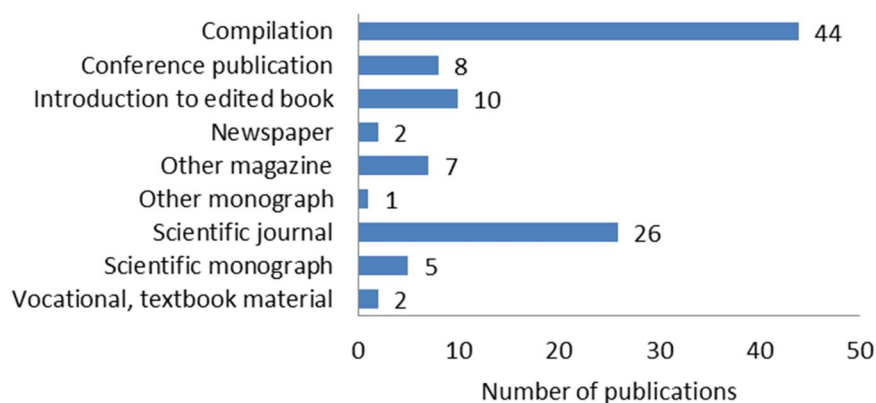


Figure 1. Number of all publications by type for years 2007–2011 (n=105).

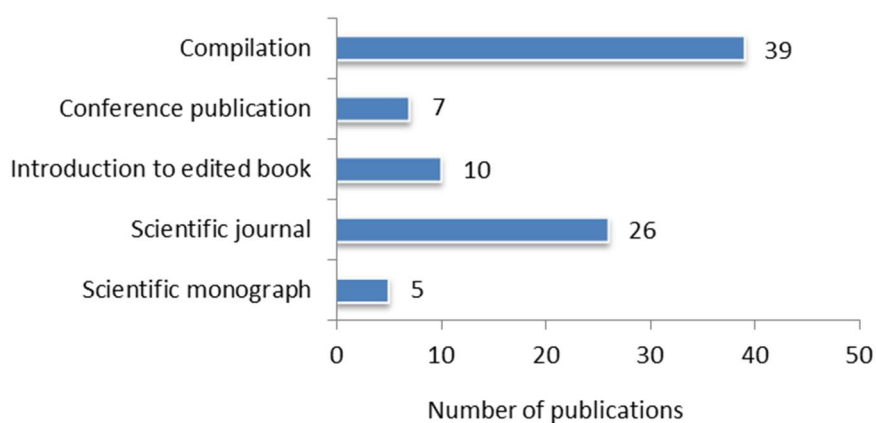


Figure 2. Number of scientific publications by type for years 2007–2011 (n=87).

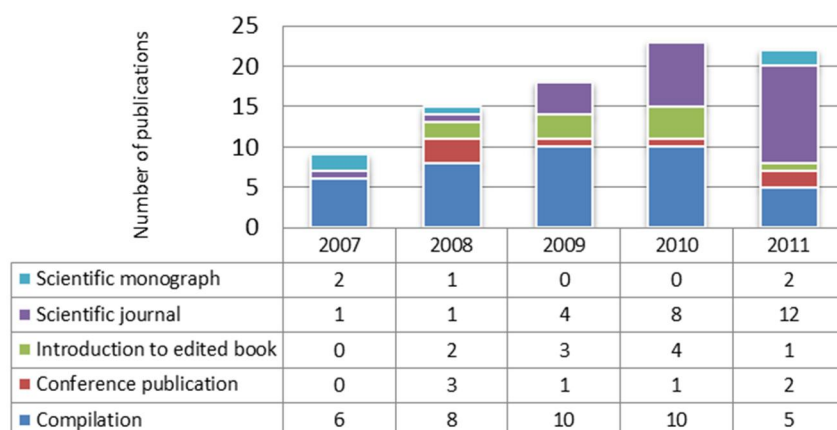


Figure 3. Number of scientific publications by type and year for years 2007–2011 (n=87).

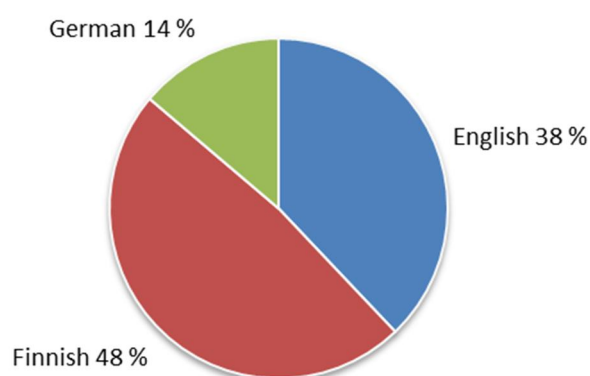


Figure 4. Percentage of different languages in scientific publications for years 2007–2011 (n=87).

### Quality of publications

The Publication Forum rating of a scientific publication is determined primarily by the level of the publication series in the journal and publication series list. If the publication series is not mentioned, the level of monographs, compilations and conference publications is determined by the level mentioned in the book publisher list.

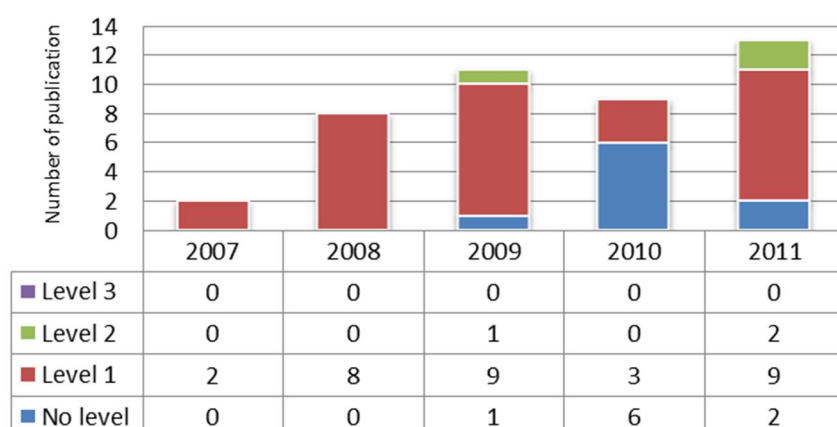


Figure 5. Number of scientific publications and the Publication Forum rating of journal and publication series for years 2007–2011 (n=43). The levels are 1 = basic, 2 = leading and 3 = top.

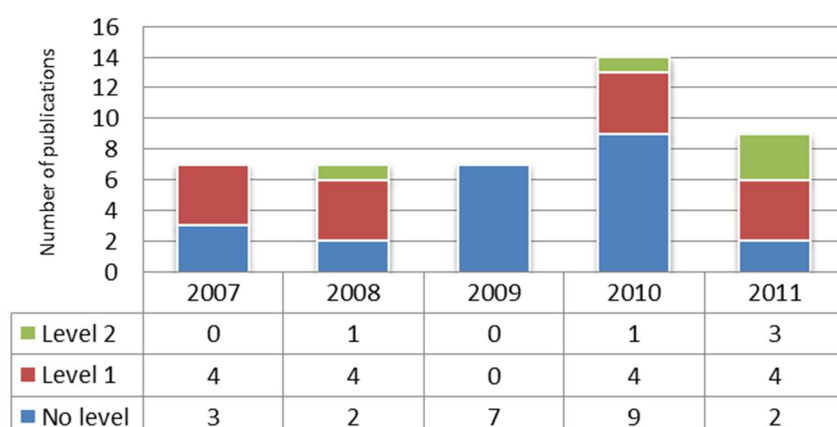


Figure 6. Number of scientific publications and the Publication Forum rating of book publishers for years 2007–2011 (n=44). The levels are 1 = basic and 2 = leading.

Table 3. Publication Forum rating of journal and publication series vs. language for years 2007–2011 (n=43). The levels are 1 = basic, 2 = leading and 3 = top.

Language	Publication Forum journal and series rating				
	No level	Level 1	Level 2	Level 3	Total
English	8	11	2	0	21
Finnish	0	17	1	0	18
German	1	3	0	0	4
Total	9	31	3	0	43

Table 4. Publication Forum rating of book publishers vs. language for years 2007–2011 (n=44). The levels are 1 = basic and 2 = leading.

Language	Publication Forum book publisher rating			
	No level	Level 1	Level 2	Total
English	5	5	2	12
Finnish	14	8	2	24
German	4	3	1	8
Total	23	16	5	44

### Impact of publications

The number of citations was counted up to and including the year 2012, which favours older publications. Self-citations of all authors are excluded. In the Scopus database this means that citing and cited documents do not have any common authors.

Table 5. Citation indicators of scientific publications in the Scopus database.

Document type	P <sub>Sci</sub>	P <sub>Sco</sub>	TCS	MCS	% uncited
Compilation	39	0	-	-	-
Conference publication	7	0	-	-	-
Introduction to edited book	10	1	0	0,0	100,0
Scientific journal	26	7	3	0,4	85,7
Scientific monograph	5	0	-	-	-
All scientific publications	87	8	3	0,4	87,5

P<sub>sci</sub> = Number of scientific publications, P<sub>Sco</sub> = Number of publications in Scopus database, TCS = Number of citations, MCS = Number of citations per publication, % uncited = Percentage of uncited publications



Oulu University Library bibliometric report of  
GSC - Gastrointestinal Surgery Community

Publishing activity

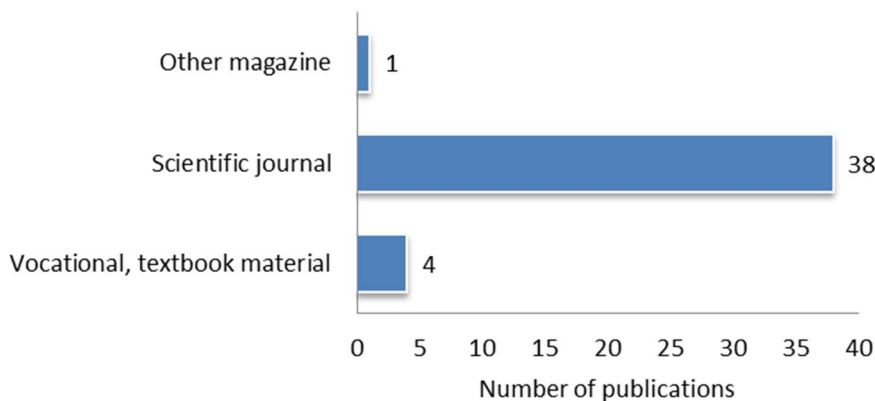


Figure 1. Number of all publications by type for years 2007–2011 (n=43).

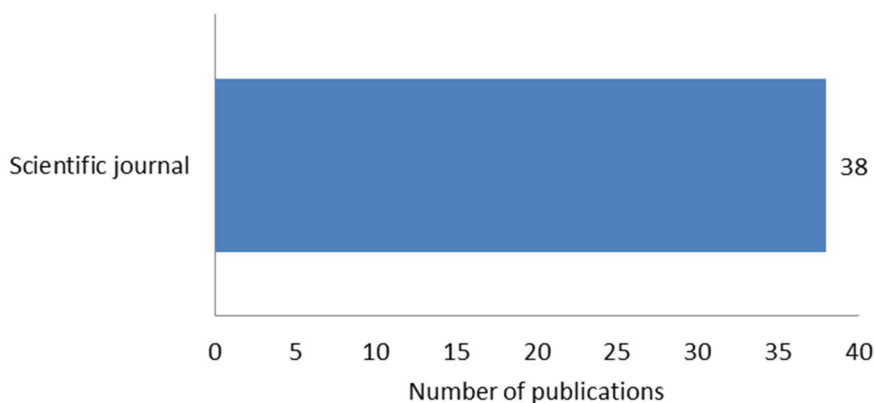


Figure 2. Number of scientific publications by type for years 2007–2011 (n=38).

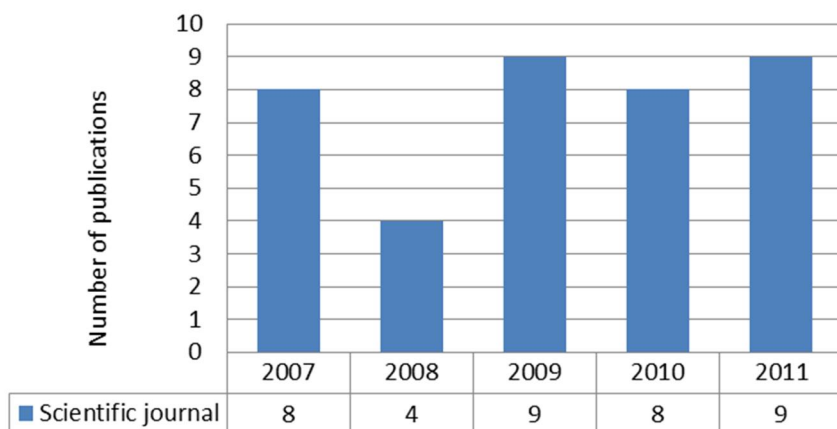


Figure 3. Number of scientific publications by type and year for years 2007–2011 (n=38).

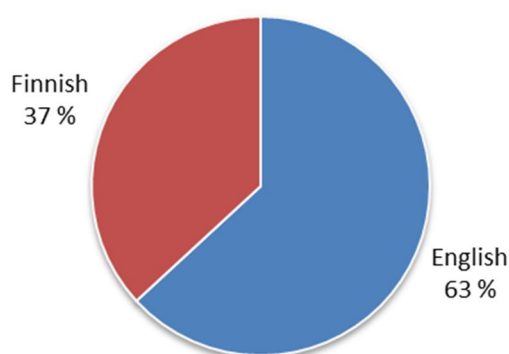


Figure 4. Percentage of different languages in scientific publications for years 2007–2011 (n=38).

### Quality of publications

The Publication Forum rating of a scientific publication is determined primarily by the level of the publication series in the journal and publication series list. If the publication series is not mentioned, the level of monographs, compilations and conference publications is determined by the level mentioned in the book publisher list.

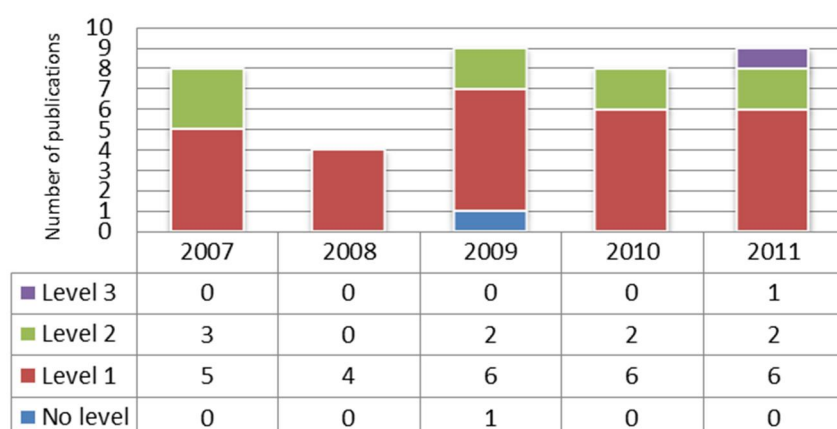


Figure 5. Number of scientific publications and the Publication Forum rating of journal and publication series for years 2007–2011 (n=38). The levels are 1 = basic, 2 = leading and 3 = top.

Table 3. Publication Forum rating of journal and publication series vs. language for years 2007–2011 (n=38). The levels are 1 = basic, 2 = leading and 3 = top.

Language	Publication Forum journal and series rating				Total
	No level	Level 1	Level 2	Level 3	
English	1	13	9	1	24
Finnish	0	14	0	0	14
Total	1	27	9	1	38

## Impact of publications

The number of citations was counted up to and including the year 2012, which favours older publications. Self-citations of all authors are excluded. In the Scopus database this means that citing and cited documents do not have any common authors.

Table 4. Citation indicators of scientific publications in the Scopus database.

Document type	P <sub>Sci</sub>	P <sub>Sco</sub>	TCS	MCS	% uncited
Scientific journal	38	30	102	3,4	30,0
All scientific publications	38	30	102	3,4	30,0

P<sub>sci</sub> = Number of scientific publications, P<sub>Sco</sub> = Number of publications in Scopus database, TCS = Number of citations, MCS = Number of citations per publication, % uncited = Percentage of uncited publications

## Oulu University Library bibliometric report of HEAT - Heterogeneity in Economic Applications and Theory

### Publishing activity

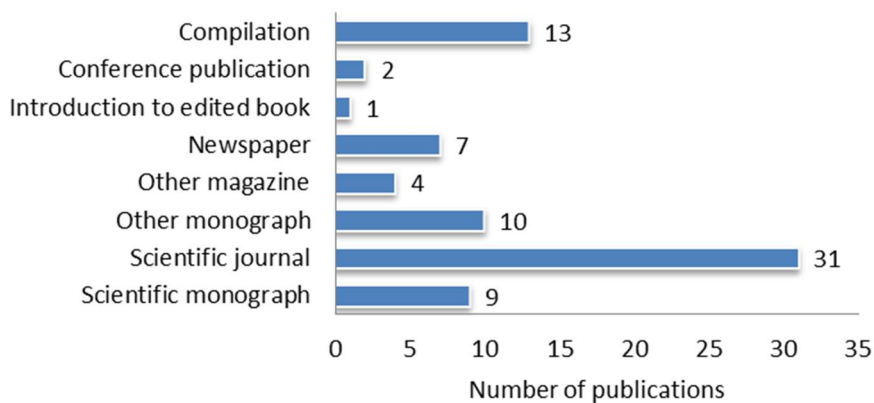


Figure 1. Number of all publications by type for years 2007–2011 (n=77).

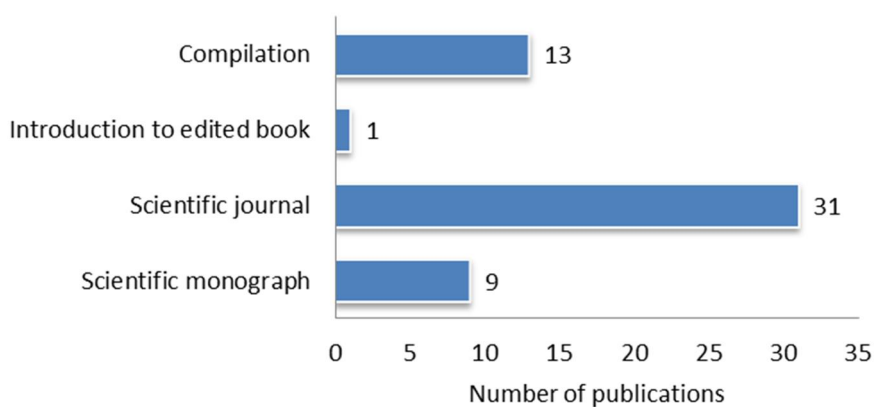


Figure 2. Number of scientific publications by type for years 2007–2011 (n=54).

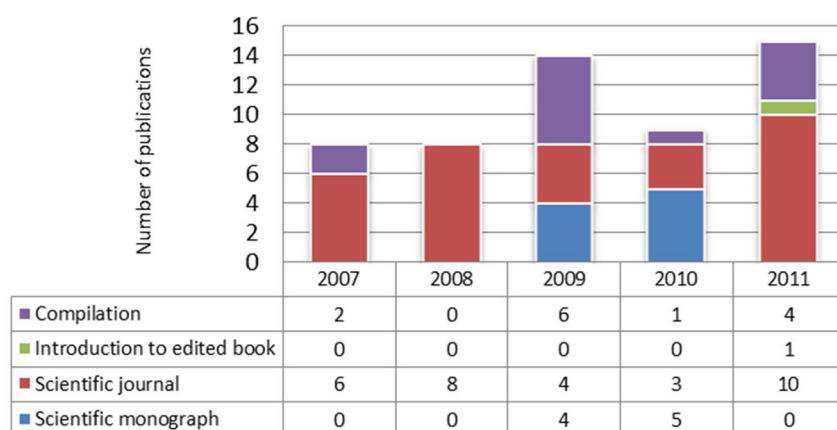


Figure 3. Number of scientific publications by type and year for years 2007–2011 (n=54).

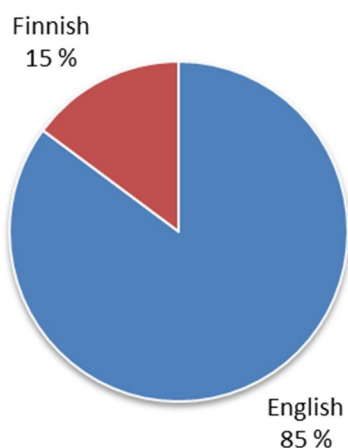


Figure 4. Percentage of different languages in scientific publications for years 2007–2011 (n=54).

### Quality of publications

The Publication Forum rating of a scientific publication is determined primarily by the level of the publication series in the journal and publication series list. If the publication series is not mentioned, the level of monographs, compilations and conference publications is determined by the level mentioned in the book publisher list.

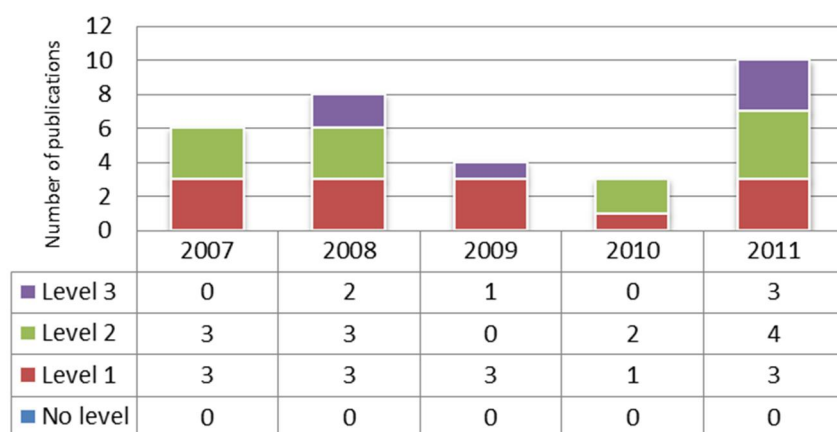


Figure 5. Number of scientific publications and the Publication Forum rating of journal and publication series for years 2007–2011 (n=31). The levels are 1 = basic, 2 = leading and 3 = top.

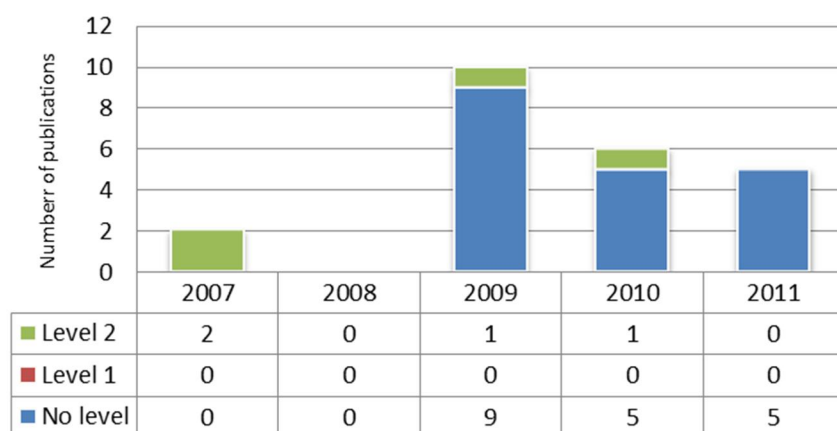


Figure 6. Number of scientific publications and the Publication Forum rating of book publishers for years 2007–2011 (n=23). The levels are 1 = basic and 2 = leading.

Table 3. Publication Forum rating of journal and publication series vs. language for years 2007–2011 (n=31). The levels are 1 = basic, 2 = leading and 3 = top.

Language	Publication Forum journal and series rating				
	No level	Level 1	Level 2	Level 3	Total
English	0	12	12	6	30
Finnish	0	1	0	0	1
Total	0	13	12	6	31

Table 4. Publication Forum rating of book publishers vs. language for years 2007–2011 (n=23). The levels are 1 = basic and 2 = leading.

Language	Publication Forum book publisher rating			
	No level	Level 1	Level 2	Total
English	12	0	4	16
Finnish	7	0	0	7
Total	19	0	4	23

### Impact of publications

The number of citations was counted up to and including the year 2012, which favours older publications. Self-citations of all authors are excluded. In the Scopus database this means that citing and cited documents do not have any common authors.

Table 5. Citation indicators of scientific publications in the Scopus database.

Document type	P <sub>Sci</sub>	P <sub>Sco</sub>	TCS	MCS	% uncited
Compilation	13	0	-	-	-
Introduction to edited book	1	0	-	-	-
Scientific journal	31	27	114	4,2	33,3
Scientific monograph	9	0	-	-	-
All scientific publications	54	27	114	4,2	33,3

P<sub>sci</sub> = Number of scientific publications, P<sub>sc</sub> = Number of publications in Scopus database, TCS = Number of citations, MCS = Number of citations per publication, % uncited = Percentage of uncited publications

# Oulu University Library bibliometric report of INSPIRES - Institutions and Practices of New Literacies

## Publishing activity

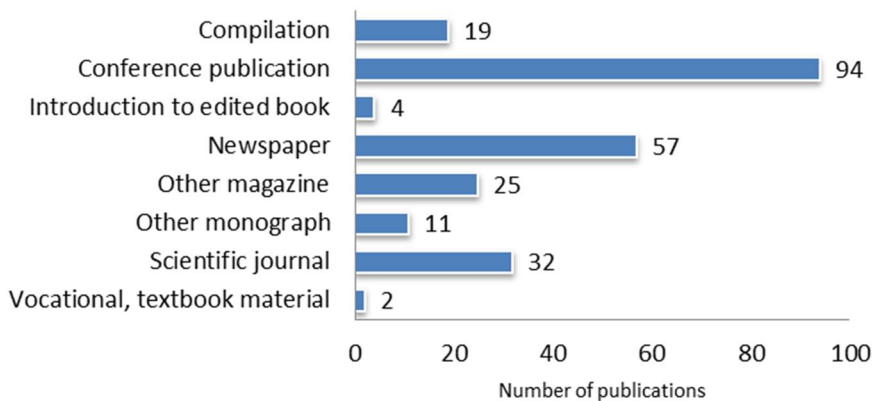


Figure 1. Number of all publications by type for years 2007–2011 (n=244).

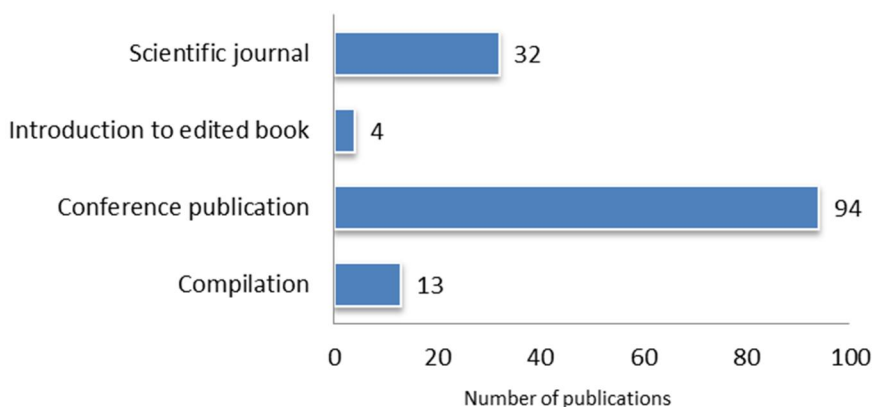


Figure 2. Number of scientific publications by type for years 2007–2011 (n=143).

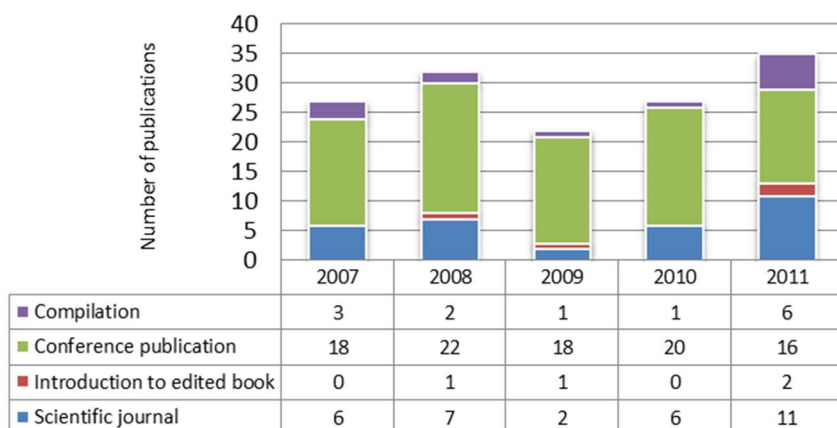


Figure 3. Number of scientific publications by type and year for years 2007–2011 (n=143).

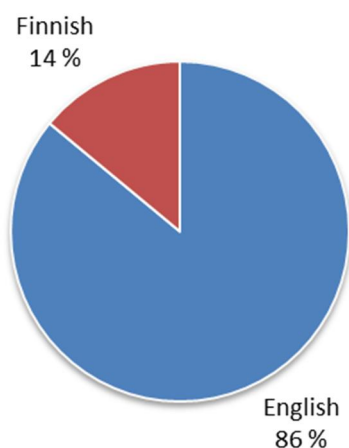


Figure 4. Percentage of different languages in scientific publications for years 2007–2011 (n=143).

### Quality of publications

The Publication Forum rating of a scientific publication is determined primarily by the level of the publication series in the journal and publication series list. If the publication series is not mentioned, the level of monographs, compilations and conference publications is determined by the level mentioned in the book publisher list.

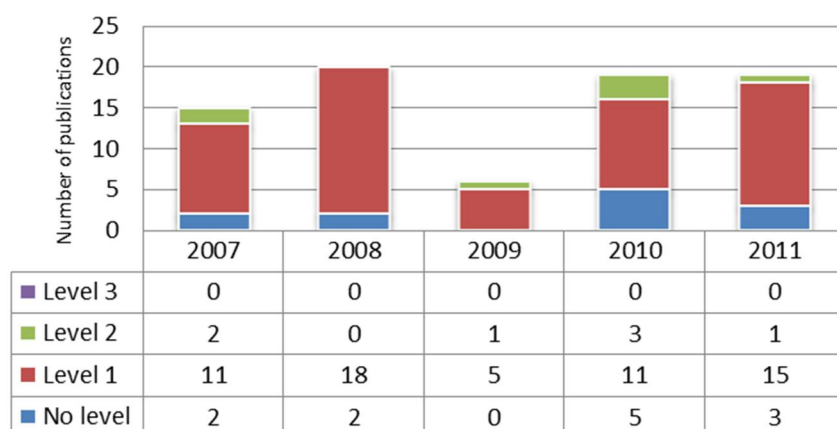


Figure 5. Number of scientific publications and the Publication Forum rating of journal and publication series for years 2007–2011 (n=79). The levels are 1 = basic, 2 = leading and 3 = top.

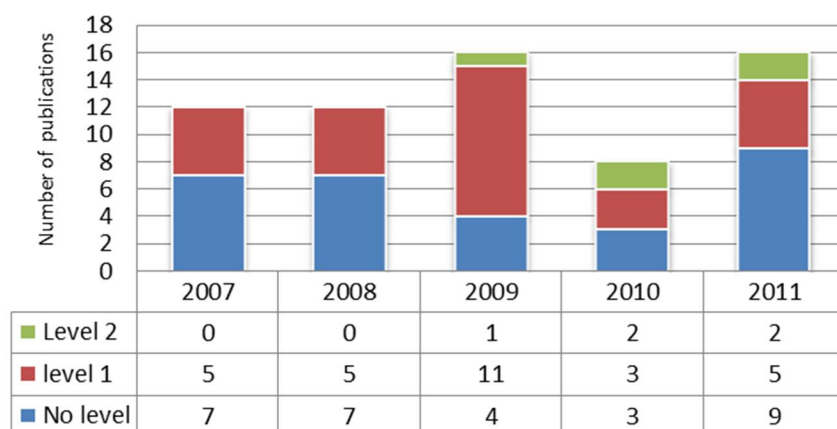


Figure 6. Number of scientific publications and the Publication Forum rating of book publishers for years 2007–2011 (n=64). The levels are 1 = basic and 2 = leading.



Table 3. Publication Forum rating of journal and publication series vs. language for years 2007–2011 (n=79). The levels are 1 = basic, 2 = leading and 3 = top.

Language	Publication Forum journal and series rating				Total
	No level	Level 1	Level 2	Level 3	
English	9	52	7	0	68
Finnish	3	8	0	0	11
Total	12	60	7	0	79

Table 4. Publication Forum rating of book publishers vs. language for years 2007–2011 (n=64). The levels are 1 = basic and 2 = leading.

Language	Publication Forum book publisher rating			Total
	No level	Level 1	Level 2	
English	23	28	4	55
Finnish	7	1	1	9
Total	30	29	5	64

### Impact of publications

The number of citations was counted up to and including the year 2012, which favours older publications. Self-citations of all authors are excluded. In the Scopus database this means that citing and cited documents do not have any common authors.

Table 5. Citation indicators of scientific publications in the Scopus database.

Document type	P <sub>Sci</sub>	P <sub>Sco</sub>	TCS	MCS	% uncited
Compilation	13	0	-	-	-
Conference publication	94	46	37	0,8	63,0
Introduction to edited book	4	1	0	0,0	100,0
Scientific journal	32	14	51	3,6	35,7
All scientific publications	143	61	88	1,4	57,4

P<sub>sci</sub> = Number of scientific publications, P<sub>sc</sub> = Number of publications in Scopus database, TCS = Number of citations, MCS = Number of citations per publication, % uncited = Percentage of uncited publications

## Oulu University Library bibliometric report of

## iUBI - UBIquitous Interactions

## Publishing activity

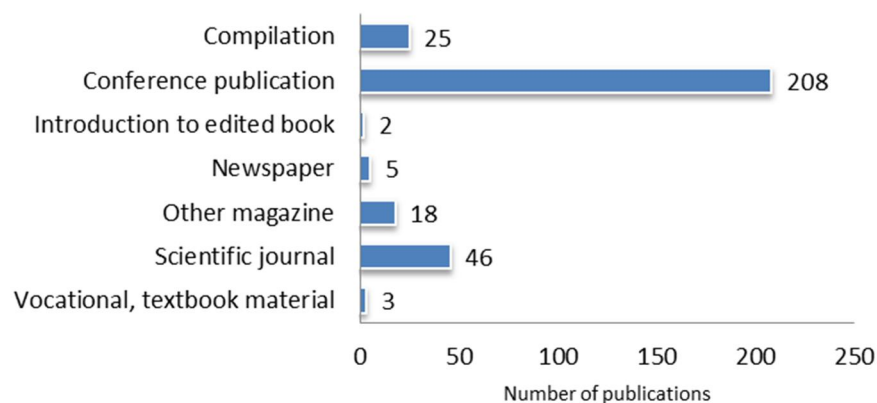


Figure 1. Number of all publications by type for years 2007–2011 (n=307).

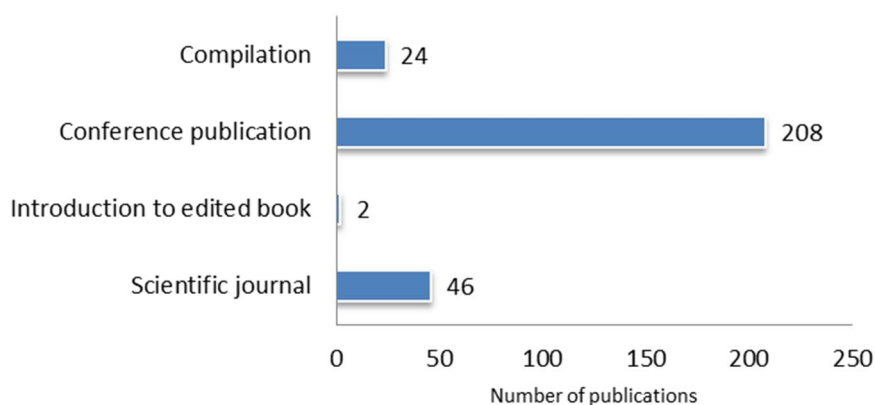


Figure 2. Number of scientific publications by type for years 2007–2011 (n=280).

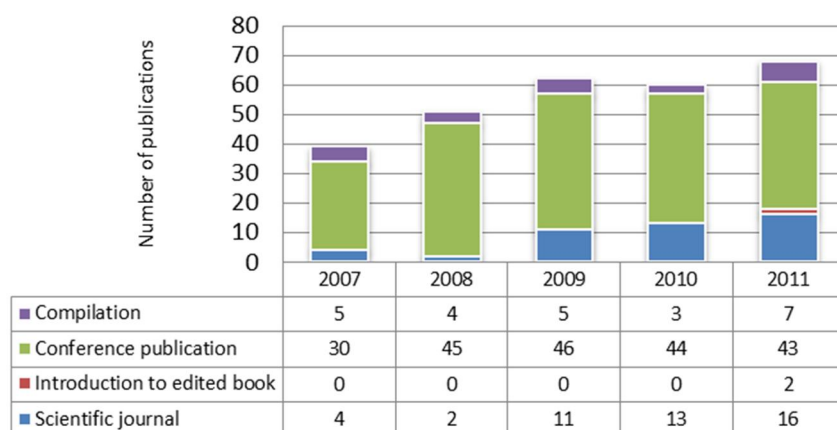


Figure 3. Number of scientific publications by type and year for years 2007–2011 (n=280).

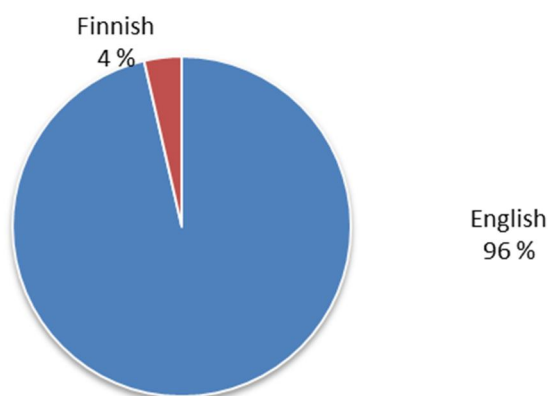


Figure 4. Percentage of different languages in scientific publications for years 2007–2011 (n=280).

### Quality of publications

The Publication Forum rating of a scientific publication is determined primarily by the level of the publication series in the journal and publication series list. If the publication series is not mentioned, the level of monographs, compilations and conference publications is determined by the level mentioned in the book publisher list.

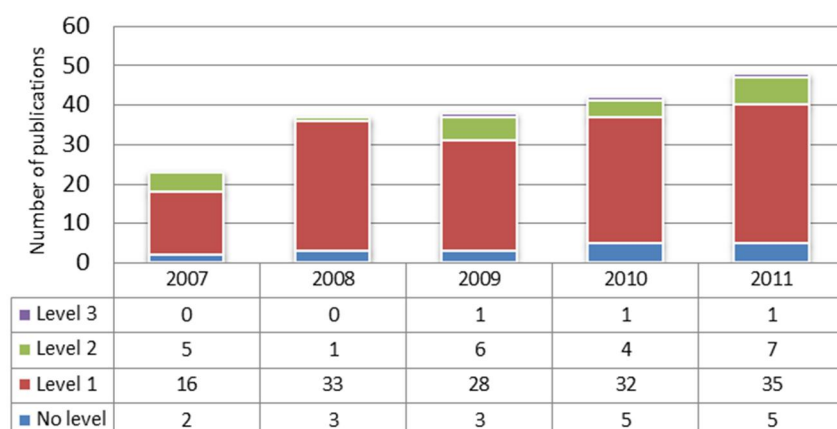


Figure 5. Number of scientific publications and the Publication Forum rating of journal and publication series for years 2007–2011 (n=188). The levels are 1 = basic, 2 = leading and 3 = top.

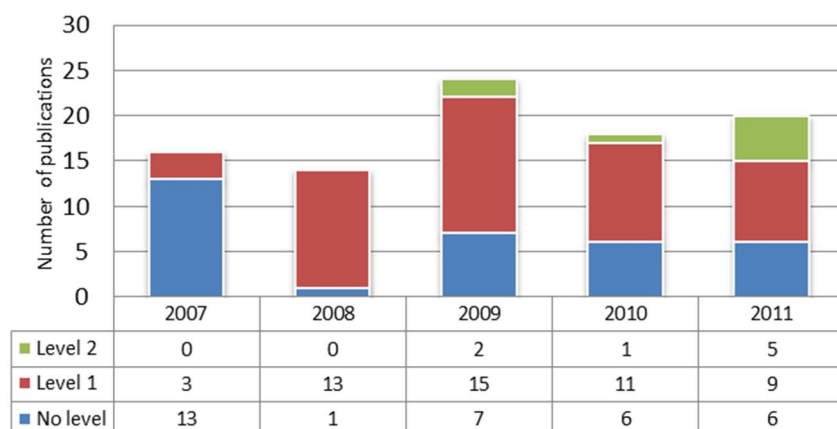


Figure 6. Number of scientific publications and the Publication Forum rating of book publishers for years 2007–2011 (n=92). The levels are 1 = basic and 2 = leading.

Table 3. Publication Forum rating of journal and publication series vs. language for years 2007–2011 (n=188). The levels are 1 = basic, 2 = leading and 3 = top.

Language	Publication Forum journal and series rating				Total
	No level	Level 1	Level 2	Level 3	
English	15	143	22	3	183
Finnish	3	1	1	0	5
Total	18	144	23	3	188

Table 4. Publication Forum rating of book publishers vs. language for years 2007–2011 (n=92). The levels are 1 = basic and 2 = leading.

Language	Publication Forum book publisher rating			Total
	No level	Level 1	Level 2	
English	29	51	7	87
Finnish	4	0	1	5
Total	33	51	8	92

### Impact of publications

The number of citations was counted up to and including the year 2012, which favours older publications. Self-citations of all authors are excluded. In the Scopus database this means that citing and cited documents do not have any common authors.

Table 5. Citation indicators of scientific publications in the Scopus database.

Document type	P <sub>Sci</sub>	P <sub>Sco</sub>	TCS	MCS	% uncited
Compilation	24	2	2	1,0	50,0
Conference publication	208	146	103	0,7	70,5
Introduction to edited book	2	1	0	0,0	100,0
Scientific journal	46	30	144	4,8	23,3
All scientific publications	280	179	249	1,4	62,6

P<sub>sci</sub> = Number of scientific publications, P<sub>sc</sub> = Number of publications in Scopus database, TCS = Number of citations, MCS = Number of citations per publication, % uncited = Percentage of uncited publications

## Oulu University Library bibliometric report of LET - Learning and Educational Technology Research Unit

### Publishing activity

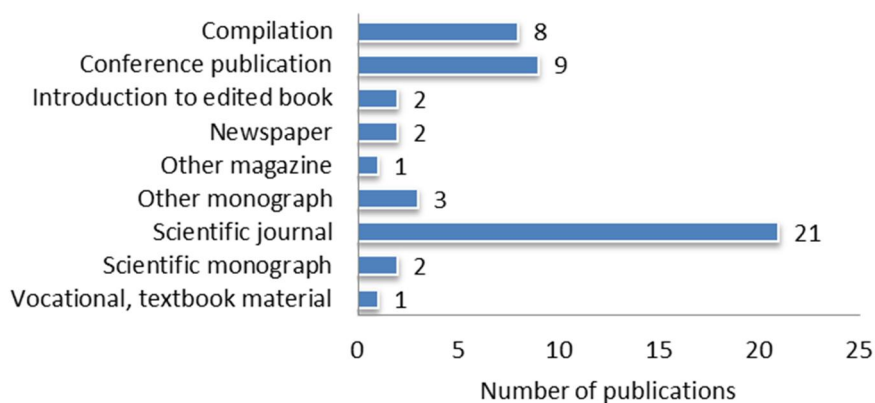


Figure 1. Number of all publications by type for years 2007–2011 (n=49).

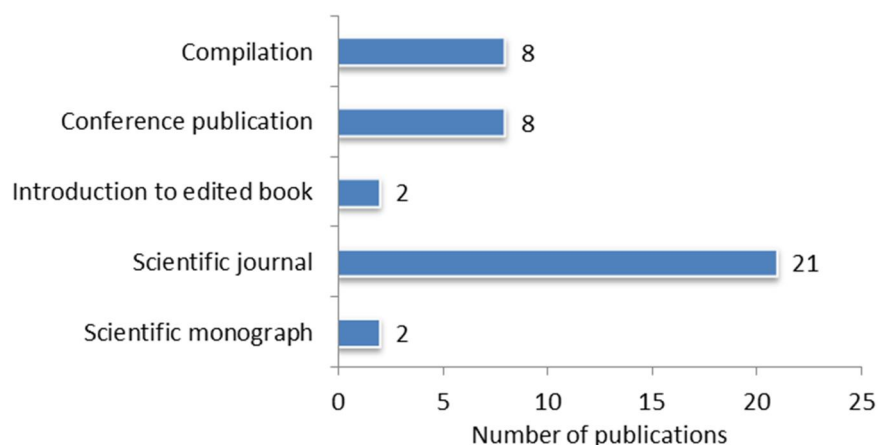


Figure 2. Number of scientific publications by type for years 2007–2011 (n=41).

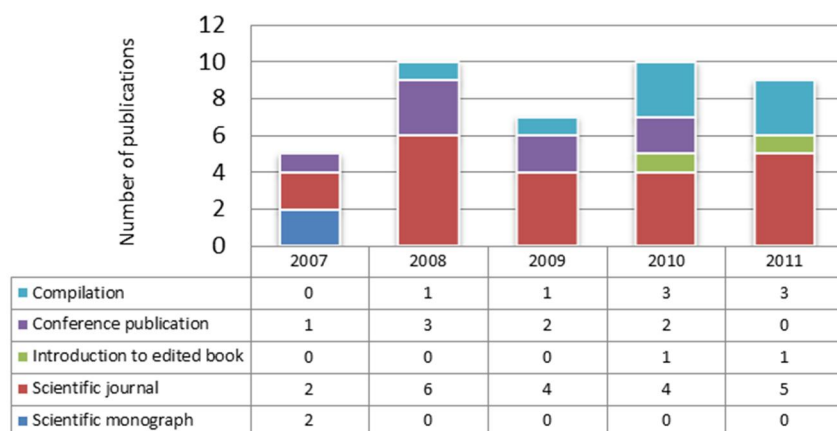


Figure 3. Number of scientific publications by type and year for years 2007–2011 (n=41).

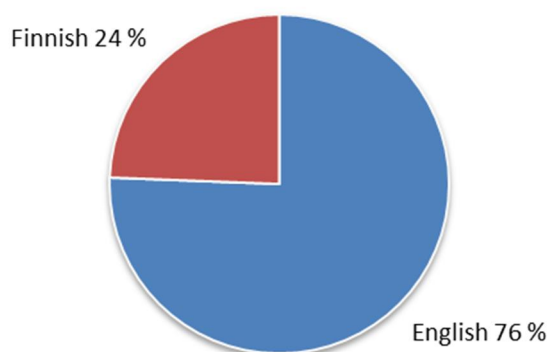


Figure 4. Percentage of different languages in scientific publications for years 2007–2011 (n=41).

### Quality of publications

The Publication Forum rating of a scientific publication is determined primarily by the level of the publication series in the journal and publication series list. If the publication series is not mentioned, the level of monographs, compilations and conference publications is determined by the level mentioned in the book publisher list.

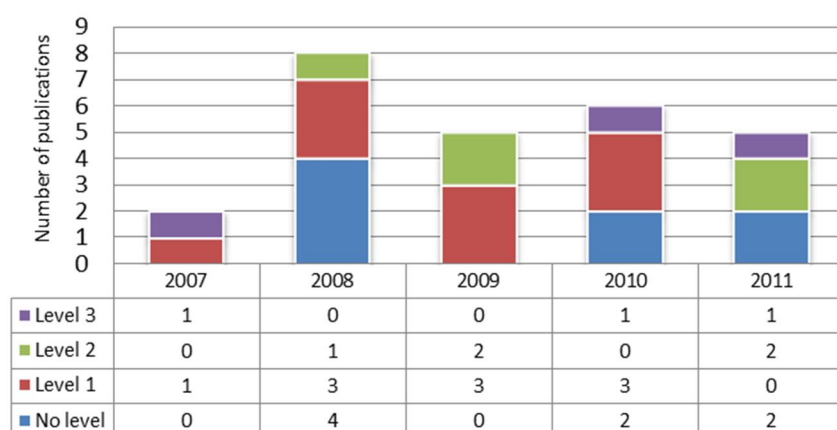


Figure 5. Number of scientific publications and the Publication Forum rating of journal and publication series for years 2007–2011 (n=26). The levels are 1 = basic, 2 = leading and 3 = top.

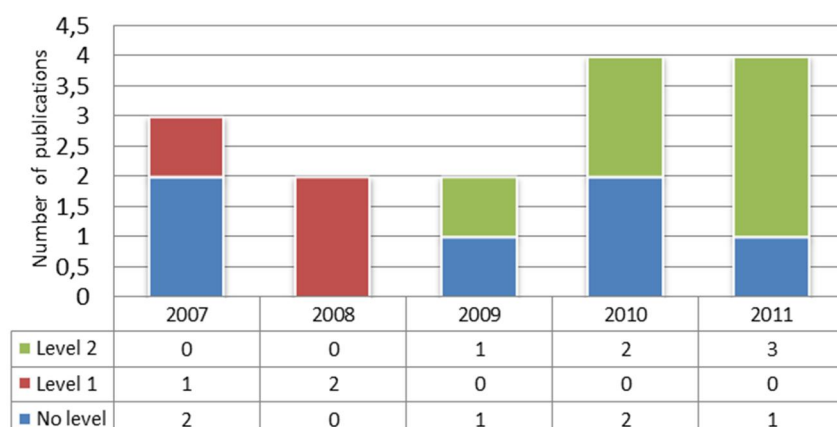


Figure 6. Number of scientific publications and the Publication Forum rating of book publishers for years 2007–2011 (n=15). The levels are 1 = basic and 2 = leading.

Table 3. Publication Forum rating of journal and publication series vs. language for years 2007–2011 (n=26). The levels are 1 = basic, 2 = leading and 3 = top.

Language	Publication Forum journal and series rating				Total
	No level	Level 1	Level 2	Level 3	
English	6	7	4	3	20
Finnish	2	3	1	0	6
Total	8	10	5	3	26

Table 4. Publication Forum rating of book publishers vs. language for years 2007–2011 (n=15). The levels are 1 = basic and 2 = leading.

Language	Publication Forum book publisher rating			Total
	No level	Level 1	Level 2	
English	2	3	6	11
Finnish	4	0	0	4
Total	6	3	6	15

### Impact of publications

The number of citations was counted up to and including the year 2012, which favours older publications. Self-citations of all authors are excluded. In the Scopus database this means that citing and cited documents do not have any common authors.

Table 5. Citation indicators of scientific publications in the Scopus database.

Document type	P <sub>Sci</sub>	P <sub>Sco</sub>	TCS	MCS	% uncited
Compilation	8	0	-	-	-
Conference publication	8	3	2	1	66,7
Introduction to edited book	2	0	-	-	-
Scientific journal	21	14	127	9	28,6
Scientific monograph	2	0	-	-	-
All scientific publications	41	17	129	8	35,3

P<sub>Sci</sub> = Number of scientific publications, P<sub>Sco</sub> = Number of publications in Scopus database, TCS = Number of citations, MCS = Number of citations per publication, % uncited = Percentage of uncited publications

## Oulu University Library bibliometric report of

### Living Stories - Narratives in Education – Living stories in theory and practice

#### Publishing activity

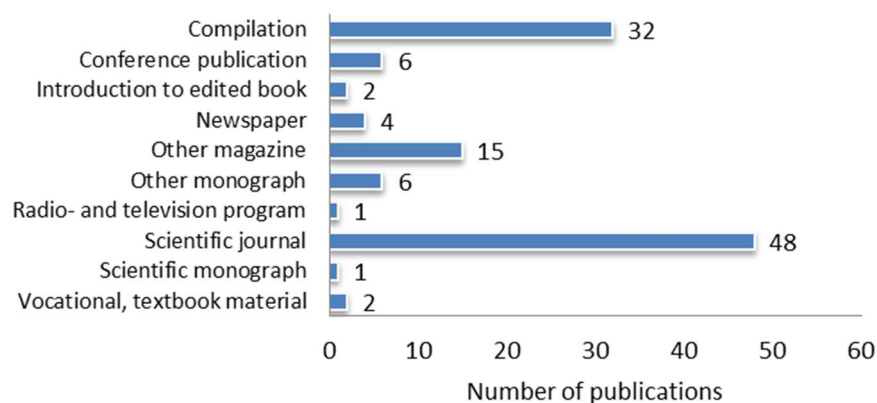


Figure 1. Number of all publications by type for years 2007–2011 (n=117).

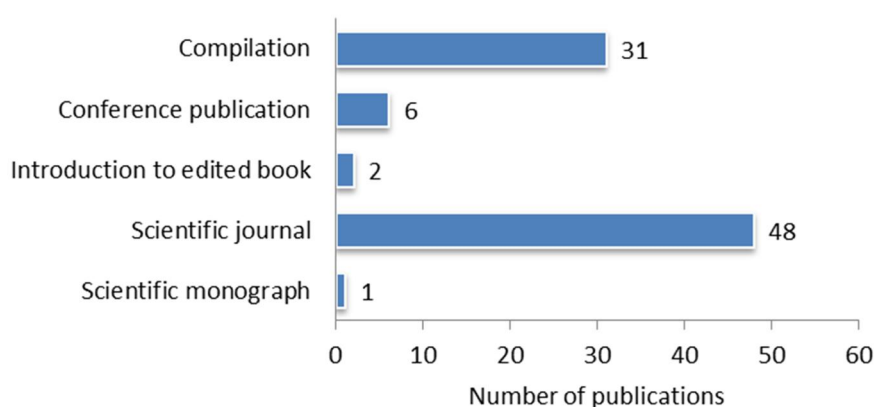


Figure 2. Number of scientific publications by type for years 2007–2011 (n=88).

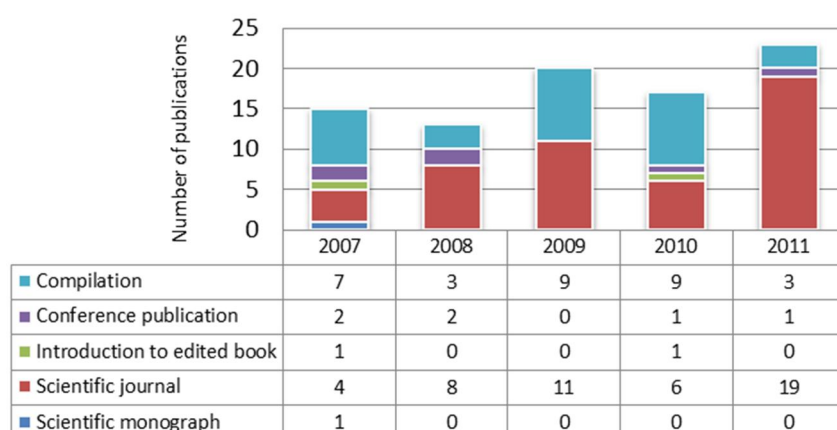


Figure 3. Number of scientific publications by type and year for years 2007–2011 (n=88).



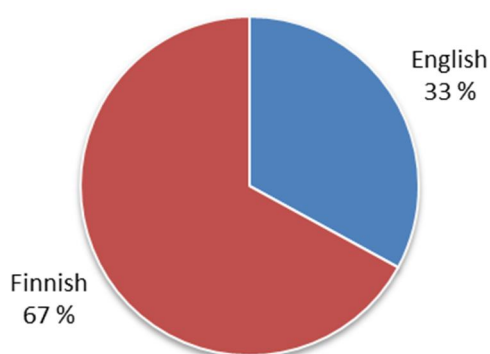


Figure 4. Percentage of different languages in scientific publications for years 2007–2011 (n=88).

### Quality of publications

The Publication Forum rating of a scientific publication is determined primarily by the level of the publication series in the journal and publication series list. If the publication series is not mentioned, the level of monographs, compilations and conference publications is determined by the level mentioned in the book publisher list.

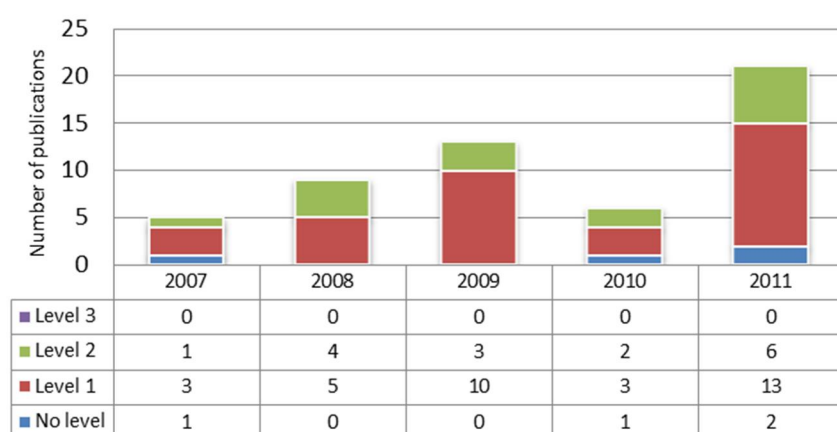


Figure 5. Number of scientific publications and the Publication Forum rating of journal and publication series for years 2007–2011 (n=54). The levels are 1 = basic, 2 = leading and 3 = top.

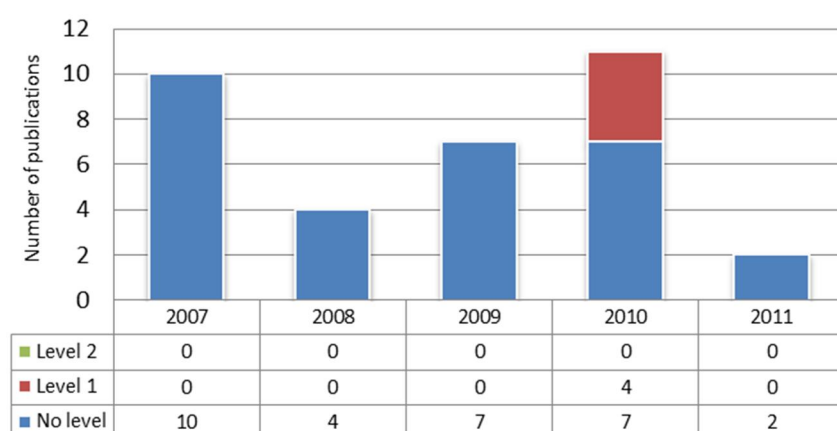


Figure 6. Number of scientific publications and the Publication Forum rating of book publishers for years 2007–2011 (n=34). The levels are 1 = basic and 2 = leading.

Table 3. Publication Forum rating of journal and publication series vs. language for years 2007–2011 (n=54). The levels are 1 = basic, 2 = leading and 3 = top.

Language	Publication Forum journal and series rating				Total
	No level	Level 1	Level 2	Level 3	
English	1	15	7	0	23
Finnish	3	19	9	0	31
Total	4	34	16	0	54

Table 4. Publication Forum rating of book publishers vs. language for years 2007–2011 (n=34). The levels are 1 = basic and 2 = leading.

Language	Publication Forum book publisher rating			Total
	No level	Level 1	Level 2	
English	6	0	0	6
Finnish	24	4	0	28
Total	30	4	0	34

### Impact of publications

The number of citations was counted up to and including the year 2012, which favours older publications. Self-citations of all authors are excluded. In the Scopus database this means that citing and cited documents do not have any common authors.

Table 5. Citation indicators of scientific publications in the Scopus database.

Document type	P <sub>Sci</sub>	P <sub>Sco</sub>	TCS	MCS	% uncited
Compilation	31	0	-	-	-
Conference publication	6	0	-	-	-
Introduction to edited book	2	0	-	-	-
Scientific journal	48	18	52	2,9	61,1
Scientific monograph	1	0	-	-	-
All scientific publications	88	18	52	2,9	61,1

P<sub>sci</sub> = Number of scientific publications, P<sub>sc</sub> = Number of publications in Scopus database, TCS = Number of citations, MCS = Number of citations per publication, % uncited = Percentage of uncited publications

## Oulu University Library bibliometric report of

## Multi-Scale Test - Multi-Scale Testing and Trans-scale Modeling of High-Performance Materials

## Publishing activity

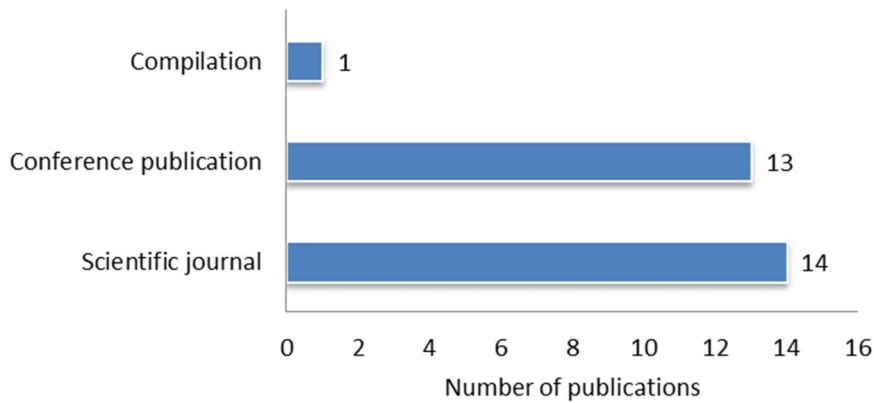


Figure 1. Number of all publications by type for years 2007–2011 (n=28).

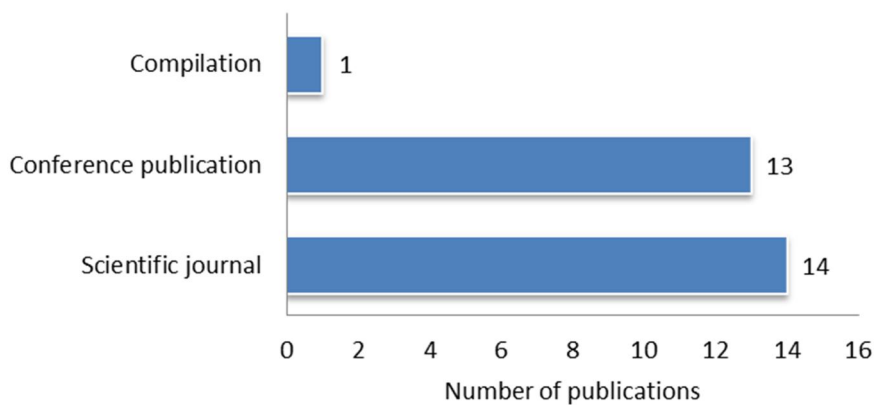


Figure 2. Number of scientific publications by type for years 2007–2011 (n=28).

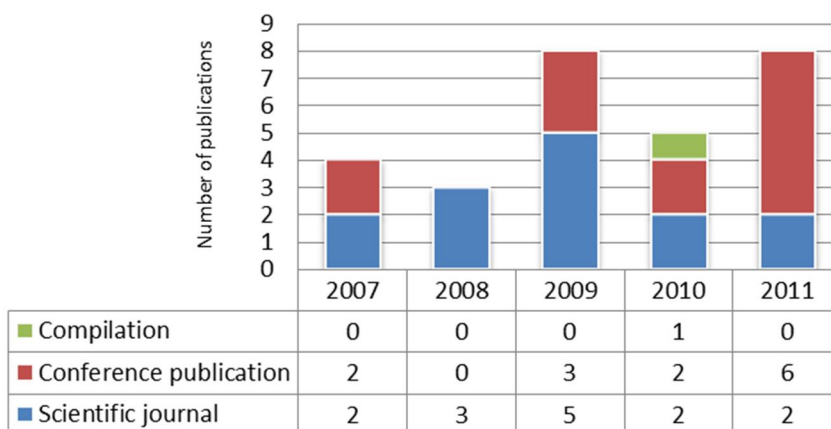


Figure 3. Number of scientific publications by type and year for years 2007–2011 (n=28).



Figure 4. Percentage of different languages in scientific publications for years 2007–2011 (n=28).

### Quality of publications

The Publication Forum rating of a scientific publication is determined primarily by the level of the publication series in the journal and publication series list. If the publication series is not mentioned, the level of monographs, compilations and conference publications is determined by the level mentioned in the book publisher list.

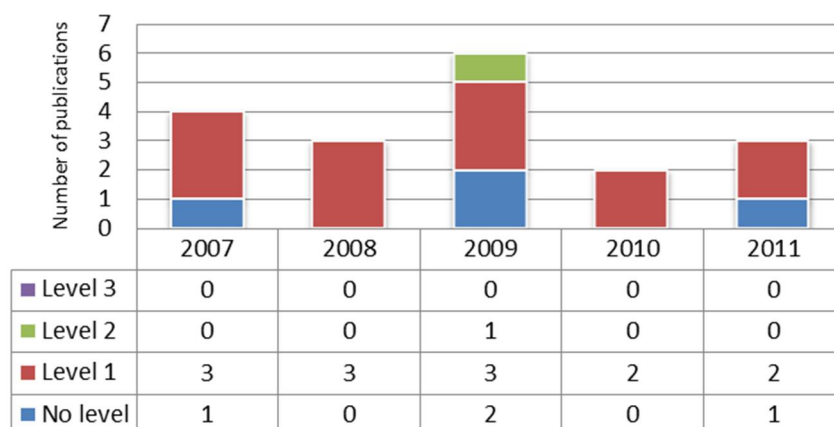


Figure 5. Number of scientific publications and the Publication Forum rating of journal and publication series for years 2007–2011 (n=18). The levels are 1 = basic, 2 = leading and 3 = top.

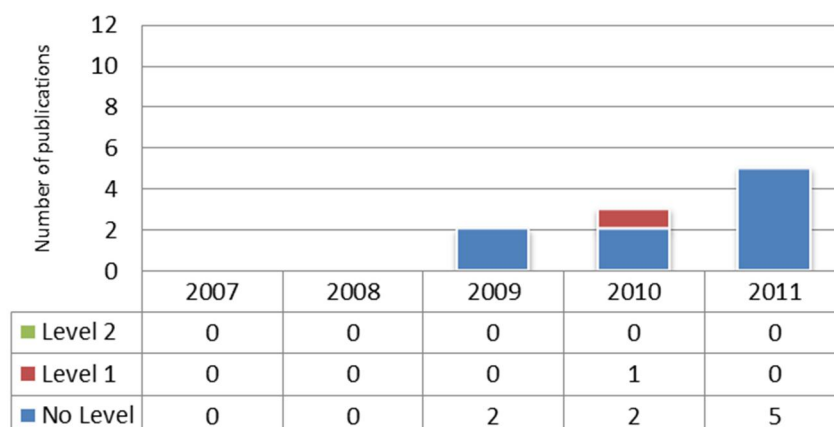


Figure 6. Number of scientific publications and the Publication Forum rating of book publishers for years 2007–2011 (n=10). The levels are 1 = basic and 2 = leading.

Table 3. Publication Forum rating of journal and publication series vs. language for years 2007–2011 (n=18). The levels are 1 = basic, 2 = leading and 3 = top.

Language	Publication Forum journal and series rating				Total
	No level	Level 1	Level 2	Level 3	
English	4	13	1	0	18
Total	4	13	1	0	18

Table 4. Publication Forum rating of book publishers vs. language for years 2007–2011 (n=10). The levels are 1 = basic and 2 = leading.

Language	Publication Forum book publisher rating			Total
	No level	Level 1	Level 2	
English	7	0	0	7
Finnish	2	1	0	3
Total	9	1	0	10

### Impact of publications

The number of citations was counted up to and including the year 2012, which favours older publications. Self-citations of all authors are excluded. In the Scopus database this means that citing and cited documents do not have any common authors.

Table 5. Citation indicators of scientific publications in the Scopus database.

Document type	P <sub>Sci</sub>	P <sub>Sco</sub>	TCS	MCS	% uncited
Compilation	1	0	-	-	-
Conference publication	13	3	1	0,3	66,7
Scientific journal	14	12	39	3,3	41,7
All scientific publications	28	15	40	2,7	46,7

P<sub>Sci</sub> = Number of scientific publications, P<sub>Sco</sub> = Number of publications in Scopus database, TCS = Number of citations, MCS = Number of citations per publication, % uncited = Percentage of uncited

# Oulu University Library bibliometric report of OSSSI - Oulu Software and Systems Initiative

## Publishing activity

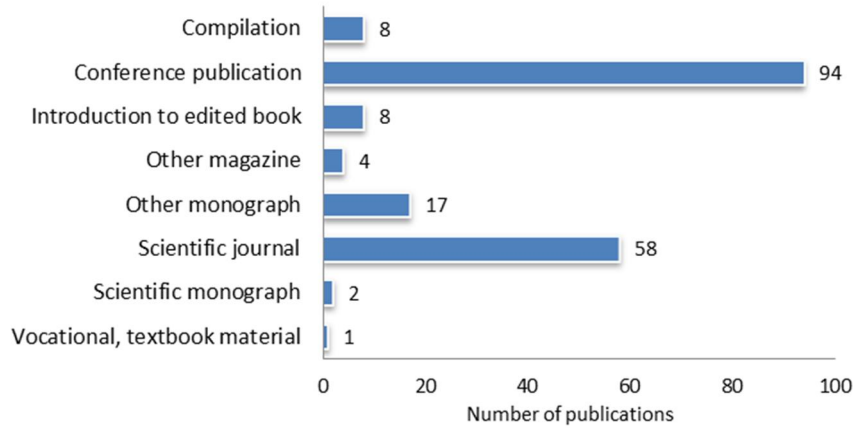


Figure 1. Number of all publications by type for years 2007–2011 (n=192).

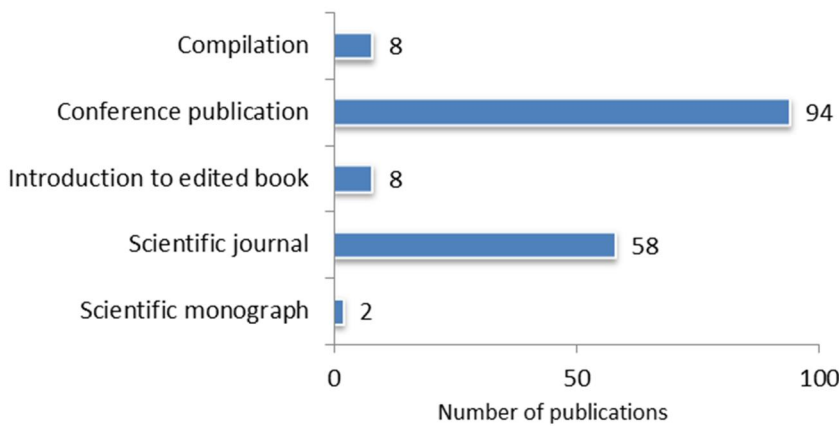


Figure 2. Number of scientific publications by type for years 2007–2011 (n=170).

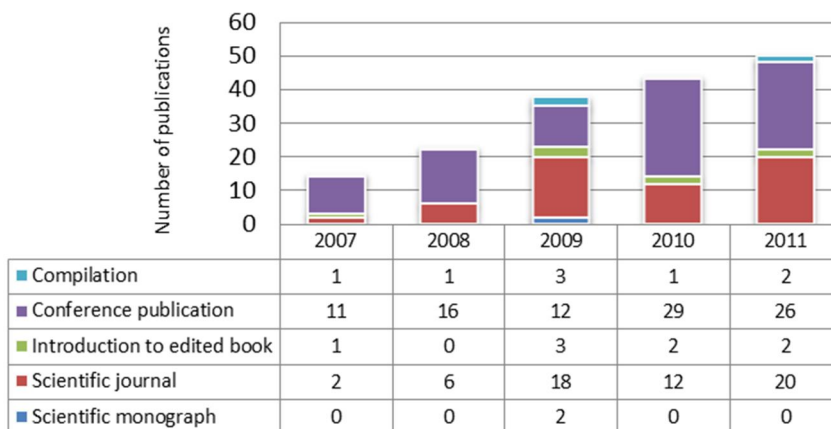


Figure 3. Number of scientific publications by type and year for years 2007–2011 (n=170).

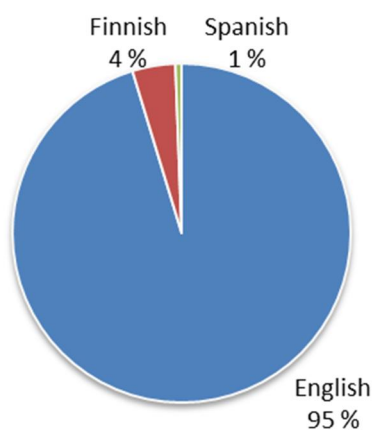


Figure 4. Percentage of different languages in scientific publications for years 2007–2011 (n=170).

### Quality of publications

The Publication Forum rating of a scientific publication is determined primarily by the level of the publication series in the journal and publication series list. If the publication series is not mentioned, the level of monographs, compilations and conference publications is determined by the level mentioned in the book publisher list.

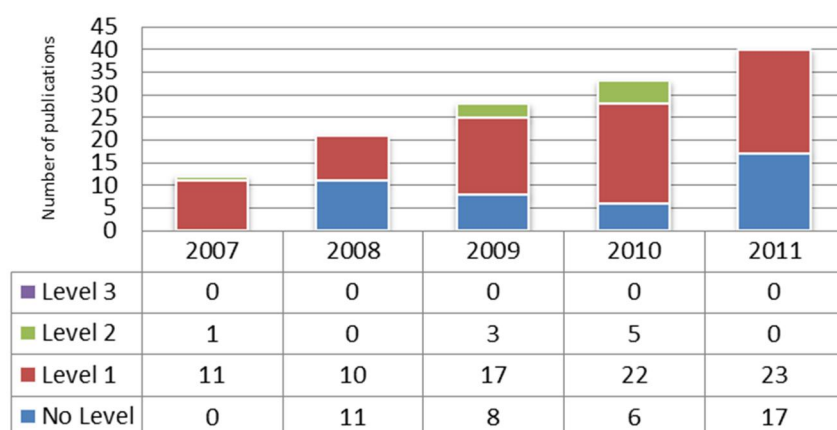


Figure 5. Number of scientific publications and the Publication Forum rating of journal and publication series for years 2007–2011 (n=134). The levels are 1 = basic, 2 = leading and 3 = top.

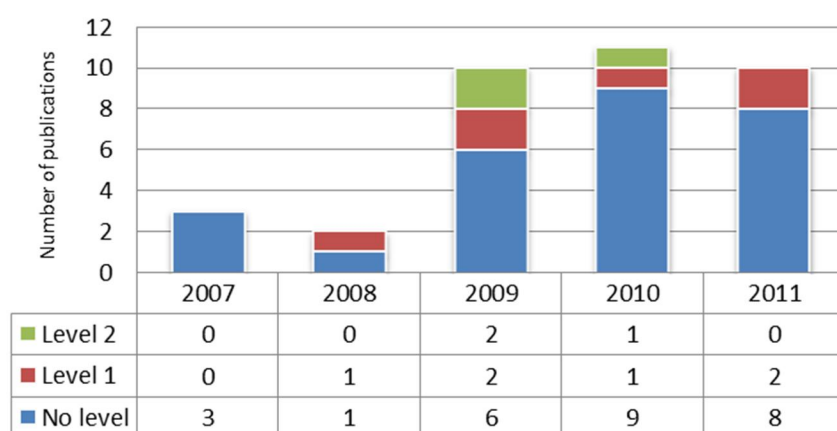


Figure 6. Number of scientific publications and the Publication Forum rating of book publishers for years 2007–2011 (n=36). The levels are 1 = basic and 2 = leading.

Table 3. Publication Forum rating of journal and publication series vs. language for years 2007–2011 (n=134). The levels are 1 = basic, 2 = leading and 3 = top.

Language	Publication Forum journal and series rating				Total
	No level	Level 1	Level 2	Level 3	
English	41	83	9	0	133
Finnish	1	0	0	0	1
Total	42	83	9	0	134

Table 4. Publication Forum rating of book publishers vs. language for years 2007–2011 (n=36). The levels are 1 = basic and 2 = leading.

Language	Publication Forum book publisher rating			Total
	No level	Level 1	Level 2	
English	20	6	3	29
Finnish	7	0	0	7
Total	27	6	3	36

### Impact of publications

The number of citations was counted up to and including the year 2012, which favours older publications. Self-citations of all authors are excluded. In the Scopus database this means that citing and cited documents do not have any common authors.

Table 5. Citation indicators of scientific publications in the Scopus database.

Document type	P <sub>Sci</sub>	P <sub>Sco</sub>	TCS	MCS	% uncited
Compilation	8	2	3	1,5	50,0
Conference publication	94	39	21	0,5	76,9
Introduction to edited book	8	3	0	0,0	100,0
Scientific journal	58	37	95	2,6	35,1
Scientific monograph	2	0	-	-	-
All scientific publications	170	81	119	1,5	58,0

P<sub>Sci</sub> = Number of scientific publications, P<sub>Sco</sub> = Number of publications in Scopus database, TCS = Number of citations, MCS = Number of citations per publication, % uncited = Percentage of uncited publications



## Oulu University Library bibliometric report of

### RELATE-OULU - Crossing borders: The relational and territorial politics of bordering, identities and transnationalization

#### Publishing activity

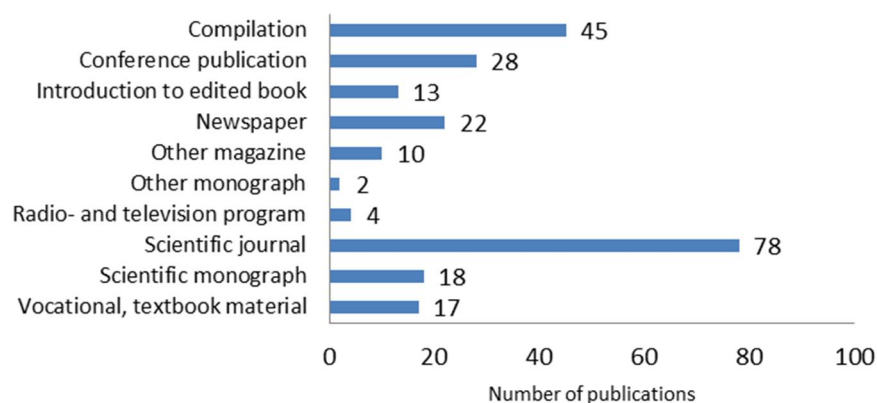


Figure 1. The number of all publications by type for years 2007–2011 (n=237).

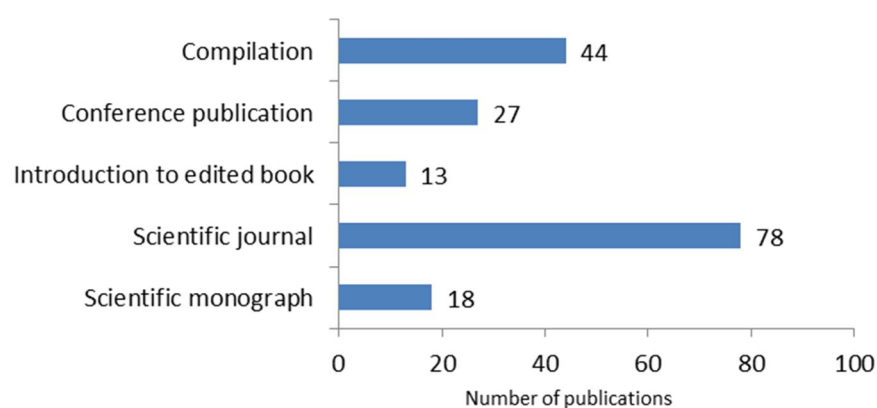


Figure 2. The number of scientific publications by type for years 2007–2011 (n=180).

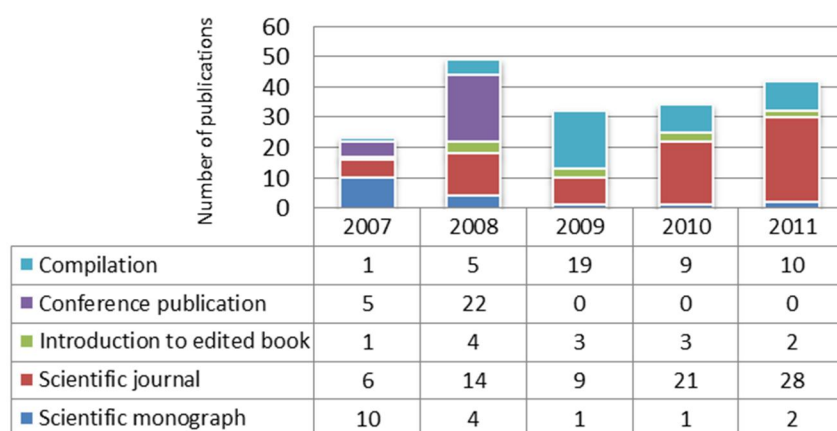


Figure 3. The number of scientific publications by type and year for years 2007–2011 (n=180).

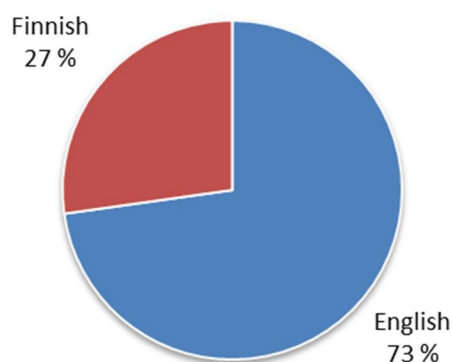


Figure 4. Percentage of different languages in scientific publications for years 2007–2011 (n=180).

### Quality of publications

The Publication Forum rating of a scientific publication is determined primarily by the level of the publication series in the journal and publication series list. If the publication series is not mentioned, the level of monographs, compilations and conference publications is determined by the level mentioned in the book publisher list.

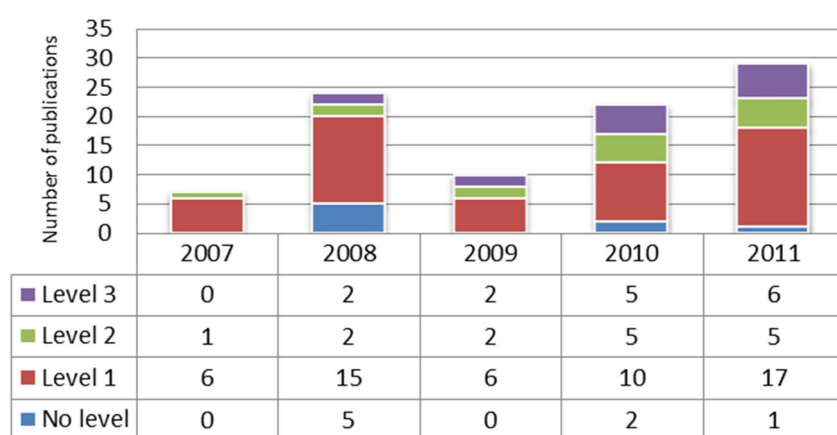


Figure 5. Number of scientific publications and the Publication Forum rating of journal and publication series for years 2007–2011 (n=92). The levels are 1 = basic, 2 = leading and 3 = top.

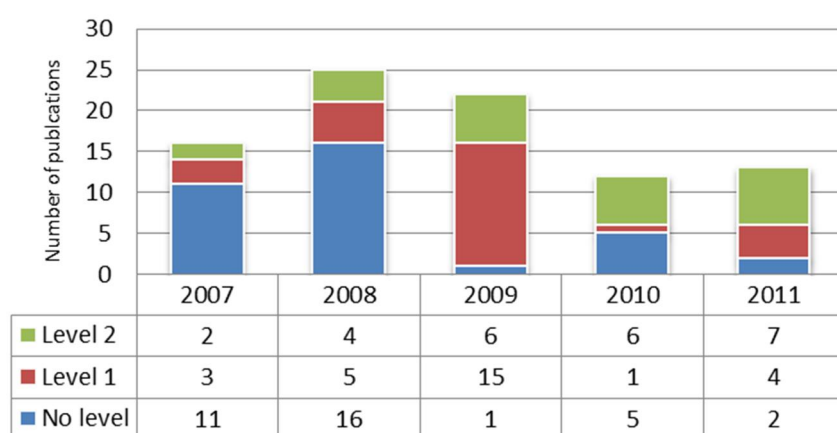


Figure 6. Number of scientific publications and the Publication Forum rating of book publishers for years 2007–2011 (n=88). The levels are 1 = basic and 2 = leading.

Table 3. Publication Forum rating of journal and publication series vs. language for years 2007–2011 (n=92). The levels are 1 = basic, 2 = leading and 3 = top.

Language	Publication Forum journal and series rating				
	No level	Level 1	Level 2	Level 3	Total
English	4	37	12	15	68
Finnish	4	17	3	0	24
Total	8	54	15	15	92

Table 4. Publication Forum rating of book publishers vs. language for years 2007–2011 (n=88). The levels are 1 = basic and 2 = leading.

Language	Publication Forum book publisher rating			
	No level	Level 1	Level 2	Total
English	11	27	25	63
Finnish	24	1	0	25
Total	35	28	25	88

### Impact of publications

The number of citations was counted up to and including the year 2012, which favours older publications. Self-citations of all authors are excluded. In the Scopus database this means that citing and cited documents do not have any common authors.

Table 5. Citation indicators of scientific publications in the Scopus database.

Document type	P <sub>Sci</sub>	P <sub>Sco</sub>	TCS	MCS	% uncited
Compilation	44	1	0	0,0	100,0
Conference publication	27	2	0	0,0	100,0
Introduction to edited book	13	0	-	-	-
Scientific journal	78	42	105	2,5	33,3
Scientific monograph	18	0	-	-	-
All scientific publications	180	45	105	2,3	37,8

P<sub>Sci</sub>= Number of scientific publications, P<sub>Sco</sub> = Number of publications in Scopus database, TCS = Number of citations, MCS= Number of citations per publication, % uncited = Percentage of uncited publications

## Oulu University Library bibliometric report of SusBen - Sustainable Benefication

### Publishing activity

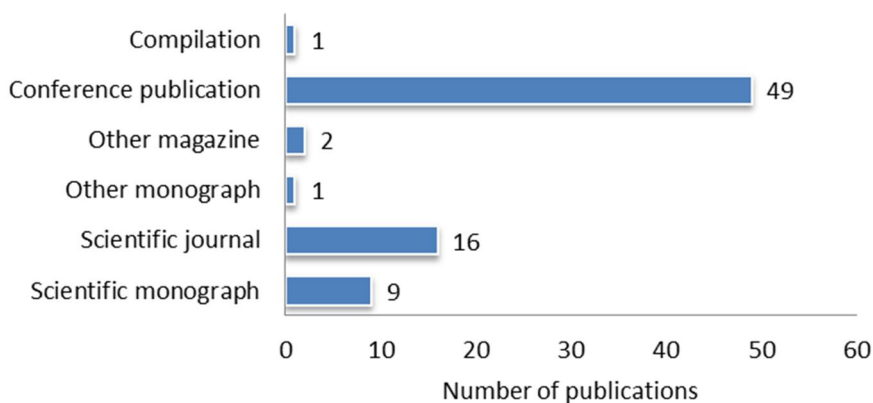


Figure 1. The number of all publications by type for years 2007–2011 (n=78).

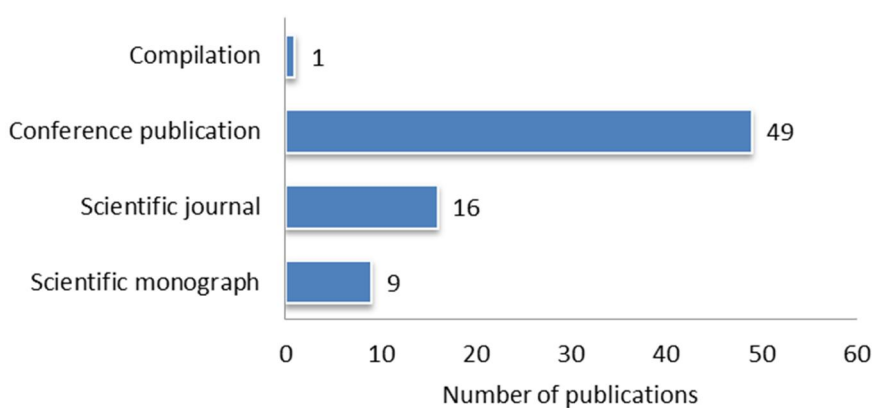


Figure 2. The number of scientific publications by type for years 2007–2011 (n=75).

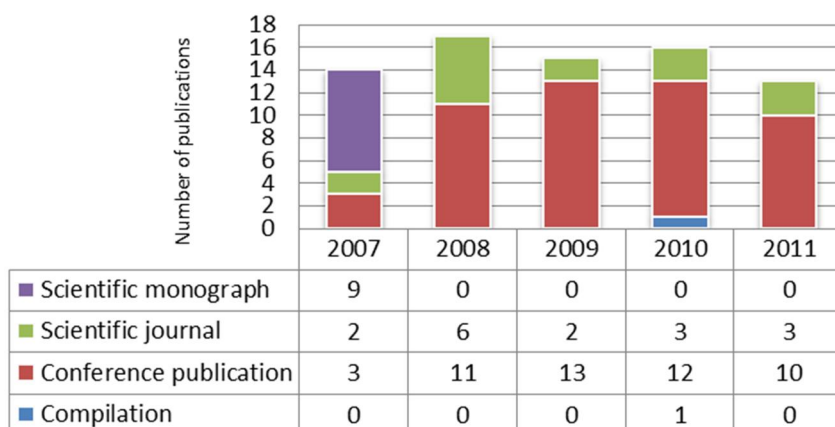


Figure 3. The number of scientific publications by type and year for years 2007–2011 (n=75).

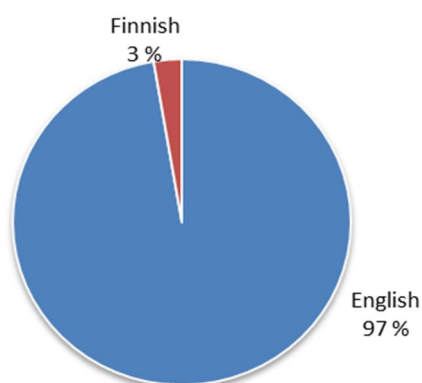


Figure 4. Percentage of different languages in scientific publications for years 2007–2011 (n=75).

### Quality of publications

The Publication Forum rating of a scientific publication is determined primarily by the level of the publication series in the journal and publication series list. If the publication series is not mentioned, the level of monographs, compilations and conference publications is determined by the level mentioned in the book publisher list.

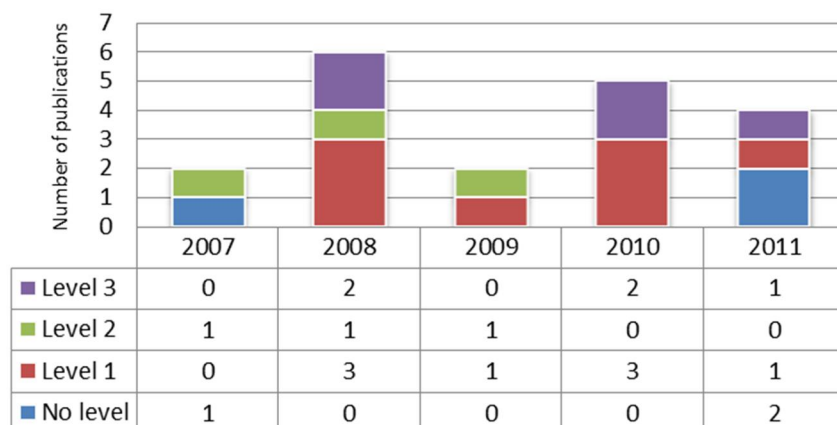


Figure 5. Number of scientific publications and the Publication Forum rating of journal and publication series for years 2007–2011 (n=19). The levels are 1 = basic, 2 = leading and 3 = top.

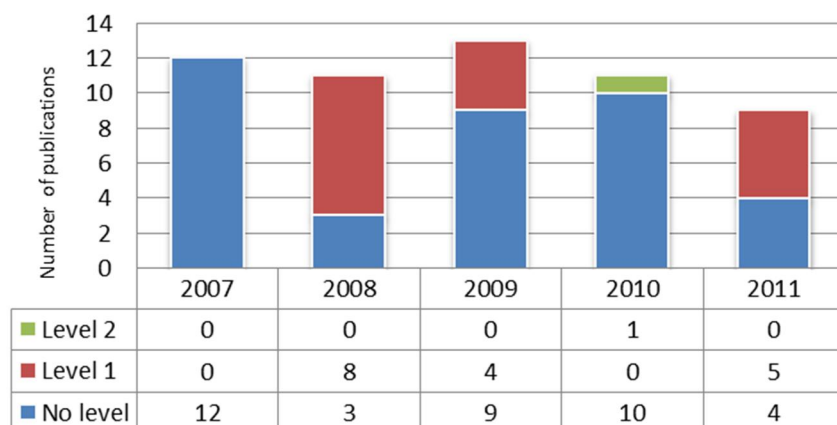


Figure 6. Number of scientific publications and the Publication Forum rating of book publishers for years 2007–2011 (n=56). The levels are 1 = basic and 2 = leading.

Table 3. Publication Forum rating of journal and publication series vs. language for years 2007–2011 (n=19). The levels are 1 = basic, 2 = leading and 3 = top.

Language	Publication Forum journal and series rating				Total
	No level	Level 1	Level 2	Level 3	
English	2	8	3	5	18
Finnish	1	0	0	0	1
Total	3	8	3	5	19

Table 4. Publication Forum rating of book publishers vs. language for years 2007–2011 (n=56). The levels are 1 = basic and 2 = leading.

Language	Publication Forum book publisher rating			Total
	No level	Level 1	Level 2	
English	37	17	1	55
Finnish	1	0	0	1
Total	38	17	1	56

### Impact of publications

The number of citations was counted up to and including the year 2012, which favours older publications. Self-citations of all authors are excluded. In the Scopus database this means that citing and cited documents do not have any common authors.

Table 5. Citation indicators of scientific publications in the Scopus database.

Document type	P <sub>Sci</sub>	P <sub>Sco</sub>	TCS	MCS	% uncited
Compilation	1	0	-	-	-
Conference publication	49	32	4	0,1	87,5
Scientific journal	16	15	62	4,1	26,7
Scientific monograph	9	0	-	-	-
All scientific publications	75	47	66	1,4	68,1

P<sub>Sci</sub>= Number of scientific publications, P<sub>Sco</sub> = Number of publications in Scopus database, TCS = Number of citations, MCS= Number of citations per publication, % uncited = Percentage of uncited publications

## Oulu University Library bibliometric report of

## TE - Transcultural Encounters

## Publishing activity

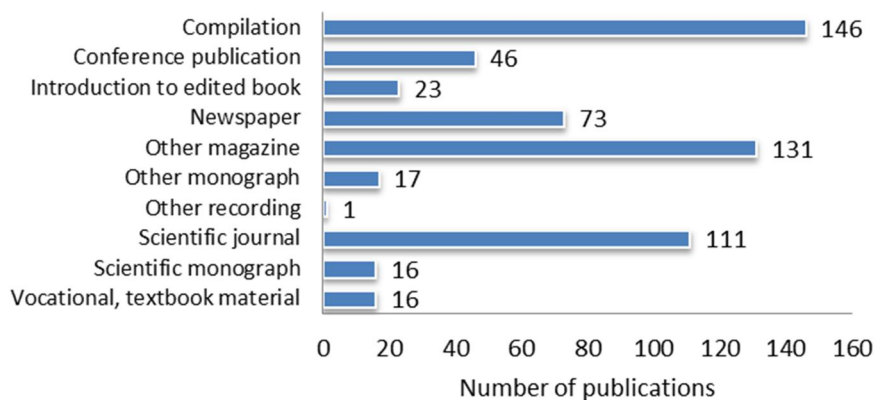


Figure 1. Number of all publications by type for years 2007–2011 (n=580).

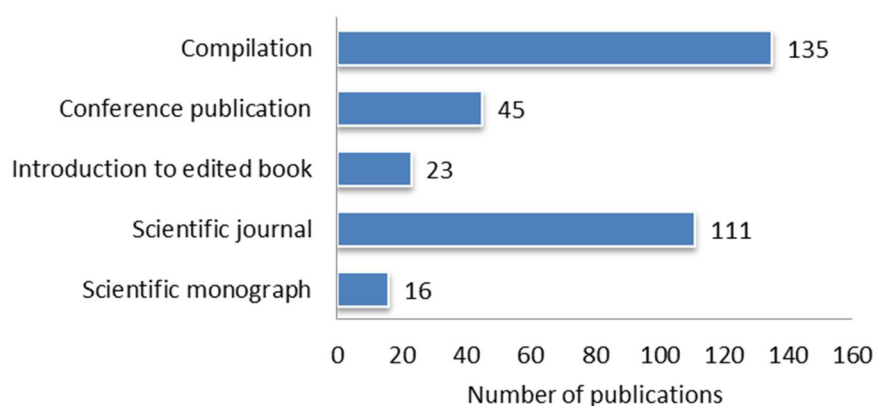


Figure 2. Number of scientific publications by type for years 2007–2011 (n=330).

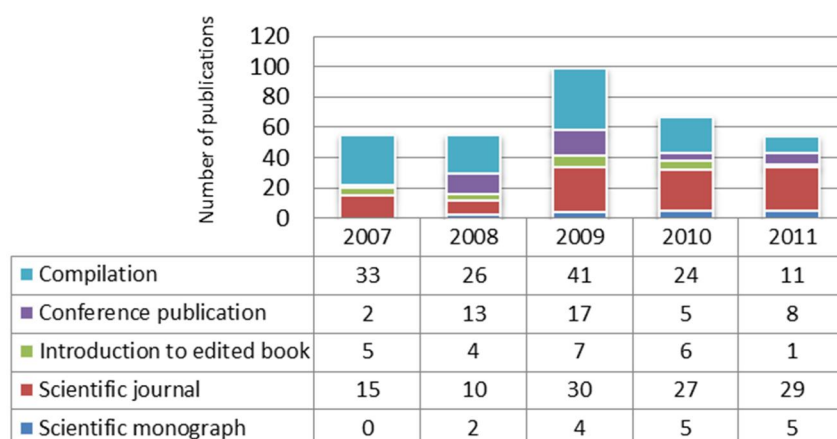


Figure 3. Number of scientific publications by type and year for years 2007–2011 (n=330).

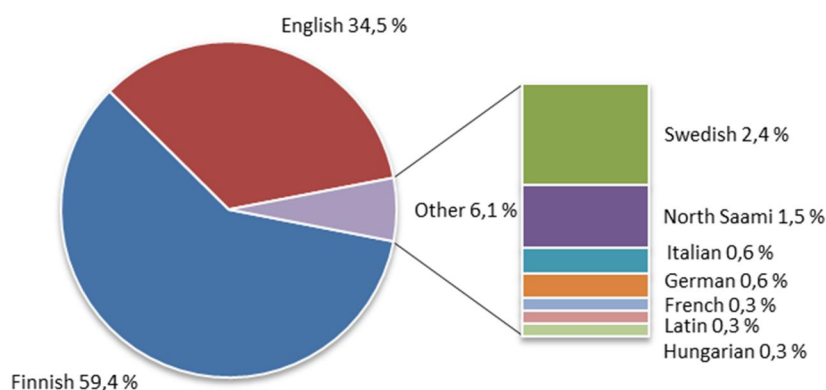


Figure 4. Percentage of different languages in scientific publications for years 2007–2011 (n=330).

### Quality of publications

The Publication Forum rating of a scientific publication is determined primarily by the level of the publication series in the journal and publication series list. If the publication series is not mentioned, the level of monographs, compilations and conference publications is determined by the level mentioned in the book publisher list.

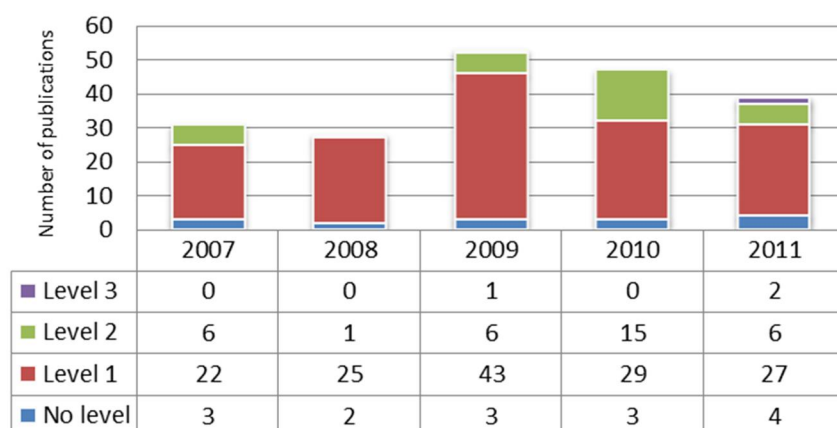


Figure 5. Number of scientific publications and the Publication Forum rating of journal and publication series for years 2007–2011 (n=198). The levels are 1 = basic, 2 = leading and 3 = top.

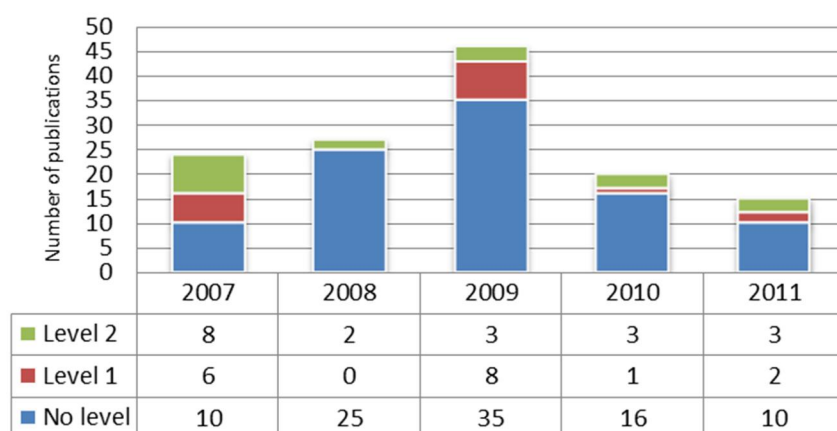


Figure 6. Number of scientific publications and the Publication Forum rating of book publishers for years 2007–2011 (n=132). The levels are 1 = basic and 2 = leading.



Table 3. Publication Forum rating of journal and publication series vs. language for years 2007–2011 (n=198). The levels are 1 = basic, 2 = leading and 3 = top.

Language	Publication Forum journal and series rating				Total
	No level	Level 1	Level 2	Level 3	
English	3	65	10	3	81
Finnish	10	70	24	0	104
Italian	1	1	0	0	2
North Saami	0	5	0	0	5
Swedish	1	5	0	0	6
Total	15	146	34	3	198

Table 4. Publication Forum rating of book publishers vs. language for years 2007–2011 (n=132). The levels are 1 = basic and 2 = leading.

Language	Publication Forum book publisher rating			Total
	No level	Level 1	Level 2	
English	19	8	6	33
Finnish	71	7	13	92
French	1	0	0	1
German	1	1	0	2
Hungarian	1	0	0	1
Latin	1	0	0	1
Swedish	1	1	0	2
Total	95	17	19	132

### Impact of publications

The number of citations was counted up to and including the year 2012, which favours older publications. Self-citations of all authors are excluded. In the Scopus database this means that citing and cited documents do not have any common authors.

Table 5. Citation indicators of scientific publications in the Scopus database.

Document type	P <sub>Sci</sub>	P <sub>Sco</sub>	TCS	MCS	% uncited
Compilation	135	0	-	-	-
Conference publication	45	1	0	0,0	100,0
Introduction to edited book	22	0	-	-	-
Scientific journal	111	7	5	0,7	57,1
Scientific monograph	16	0	-	-	-
All scientific publications	329	8	5	0,6	62,5

P<sub>Sci</sub>= Number of scientific publications, P<sub>Sco</sub> = Number of publications in Scopus database, TCS = Number of citations, MCS= Number of citations per publication, % uncited = Percentage of uncited publications

## RAE2013 1st step – Registration of the RCs

Fill in and submit this form as a pdf file (pdf/a, i.e. addition of new www links not allowed) and also the separate information of RC members\* as a xlsx file to [kirjaamo@oulu.fi](mailto:kirjaamo@oulu.fi) by 7 January, 2013 at 3pm local time.

- name this file with the name of RC Head: **Lastname\_firstname\_RCregistration.docx**
- convert it to pdf file
- check that *all the information added on the original form can be seen in the pdf file*
- send the files as e-mail attachments to [kirjaamo@oulu.fi](mailto:kirjaamo@oulu.fi) by the deadline (7 January, 2013 at 3pm local time).

\*see part 9. of this form.

1. Head of the Research Community (RC)					
Name:		Degree , and job title:		Department, Faculty / Institute:	
E-mail:		Address:			

2. Description of the participating RC	
Name of the RC:	Acronym of the RC:
Description of the practical motivation (operational basis) for forming the RC: e.g. research collaboration inside the RC and added value of the RC. Maximum 2200 characters with spaces:	

3. Scientific fields of the RC. <i>See Appendix 4 in Guidelines.</i> <i>List of main fields and subfields <a href="#">HERE</a></i>							
1 <sup>st</sup> main field:		Sub-fields (max. 2):		Additional main fields (optional):		Additional sub-fields (optional):	

4. RC's participation category (Veni – Vidi – Vici) and justification for the selected category. Maximum 2200 characters with spaces.

5. <i>Public</i> description of the RC's research. Maximum 2200 characters with spaces.

6. Description of the importance of the RC for the University of Oulu including international and national significance, collaboration and researcher training. Maximum 2200 characters with spaces.

7. RC's suggestions for eight (8) experts, at least four (4) of them working abroad, to be invited to the evaluation panels. Please avoid possible conflict of interest.

Name, e-mail, affiliation, main scientific field, maximum two (2) subfields. The scientific fields and subfields are listed [HERE](#) .

1	
2	
3	
4	
5	
6	
7	
8	

8. The RC's selection of the evaluation panel. Select one (1) with +

Health & Biosciences	
Human Sciences	
Technology & Natural Sciences	

*If it is impossible to select one panel, then give a second choice and justification below (max. 200 characters with spaces).*

--

9. Excel attachment to provide information on the RC: Research groups and group members

## RAE2013 1st step - Research Groups (RG) and Personnel of the Research Community (RC)

Name this file with the name of RC Head: **Lastname\_firstname\_RCpersons.xlsx**

Fill in and submit this form and the registration form to kirjaamo@oulu.fi by 7 January, 2013 at 3pm local time.

### 1. INFORMATION OF THE RC:

1.1. Name and acronym of the RC:						
1.2. Head of the RC:						
Lastname, firstname	Job title (1 December, 2012)	Degree	Faculty, Department / Insitute	E-mail	Phone	Address

1.3. Number of research groups in the RC:	
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## 2. INFORMATION OF THE RESEARCH GROUPS

COPY THIS PART FOR EVERY RESEARCH GROUP OF THE RC.

Acronym of the RC:					
2.1 Name of the research group:					
2.2. Principal investigator (PI; group leader):					
Degree and job title (1 December, 2012)		Job title no*	Academic degree, year, university	Faculty, Department/Institute	E-mail
Lastname, Firstname					

*\*Job title number according to the four-tiered research career system: (1) Distinguished Professor, Research Professor, Professor; (2) Senior Research Fellow, Associate Professor; (3) Postdoctoral Researcher, Assistant professor; (4) Doctoral student (UniOGS); (5) Other staff member (specify job title); (6) Other RC member (specify: grant recipients, Emeritus, Emerita etc.). The job title should be given according to the situation on 7 January, 2013 for (4) and on 1 December, 2012 for (1), (2), (3) and (5) \*\* RC Head, PI, Senior researcher, Postdoc, Doctoral student, other*

2.3. Personnel of the research group:					
Lastname, Firstname	Position in RC**	Job title no*	Academic degree, year, university	Faculty, Department/Institute	E-mail

COPY MORE ROWS HERE IF NEEDED

# RAE2013

## Instructions for the submission by February 28, 2013:

1. Principal Investigators' (PIs') CVs and list of selected publications
2. List of selected publications and most significant competitive external grants of the Research Communities (RCs)

There will be no specific forms for the material. All RAE2013 instructions can be found in [Guidelines for participating Research Communities](#).

### Submission of the material

The RC Heads send the material as *one -pdf file*, named as RCHead's "Lastname\_Firstname-addmat.pdf", to Registry Office of Univ Oulu (kirjaamo @ oulu.fi) after they have received the confirmed approval of their RC on week 7. Deadline for the submission is February 28, 2013 at 3 pm local time.

### Instructions how to organize the material

Material has to be sent as a single –pdf/a file (without links) as follows:

1. Name of the RC and the Head of the RC as in registration Step 1
2. RC Head's CV and list of selected 20 publications (timeframe and place of work not restricted)
3. Each PI's CV and list of selected 20 publications (timeframe and place of work not restricted)
4. List of selected 20 publications of the entire RC personnel (timeframe and place of work not restricted)
5. Five (5 / RC) most significant competitive external grants received by RC members in 2007-2012 (see the instructions at the end of this document)

### Instructions for Curriculum vitae (CV) (RC Head and each PI):

The CV shall be no more than four (4) pages. Use spacing 1, Times New Roman 12 pt or equivalent. The CV should be written in English and it is strongly recommended to follow this format (used by the Academy of Finland):

1. Name and year of birth
2. Degrees, dates and places, major subject, topic of doctoral dissertation
3. Adjunct professorships (i.e. docentships), universities, years of appointments
4. Present employment relationship (incl. start and end dates)
5. Most important previous employment relationships (incl. start and end dates)
6. Most important visits abroad
7. Most important scientific and academic administrative positions (incl. start and end dates)
8. Most important scientific acknowledgements and awards, memberships in science academies
9. Most important research funding

10. Research leaderships and supervised doctoral dissertations (as supervisor appointed by a university)
11. Other scientific expert positions and scientific achievements: memberships and positions of trust in scientific communities; memberships in editorial boards of scientific journals or positions as editor-in-chief or editor; referees of scientific journals; preliminary examiner or opponent of doctoral dissertations; assessment of scientific qualifications (e.g. adjunct professorships); faculty or board memberships; memberships in national or international experts, review or steering groups; international peer review of funding applications (e.g. ERC); important international invitation lectures; patents
12. Scientific and societal impact of the applicant's own research (if relevant): e.g. volume of publications (scientific and others); H index; most important and/or most cited articles/number of citations; merits in producing and publishing research and data materials

NOTE! The CV is a public document and shall not include any confidential information.

### Instructions for the list of selected 20 publications (RC Head, each PI and entire RC):

The classification below should be followed. The classification is based on the classification by the Ministry of Education, Science and Culture (2010). For more information, see the [Ministry's Publication Type Classification Manual](#). Use spacing 1, Times New Roman 12 pt or equivalent. The list of publications is written in English in the following order:

NOTE! Start the list with the name of the person in question with the present employment relationship and institute

#### Classification of publications:

- A. Peer-reviewed scientific articles  
Journal article (refereed), original research; review article, literature review, systematic review; book section, chapters in research books; conference proceedings NB. Doctoral dissertations (articles) also listed under item G.
- B. Non-reviewed scientific articles  
Non-refereed journal article; book section; non-refereed conference proceedings
- C. Scientific books (monographs)  
Book; edited book, conference proceedings or special issue of a journal. NB. Doctoral dissertations (monographs) also listed under item G.
- D. Publications intended for professional communities  
Article in a trade journal; article in a professional manual or guide or professional information system, textbook material; professional conference proceedings; published development or research report or study; textbook, professional manual or guide, dictionary
- E. Publications intended for the general public, linked to the applicant's research  
Popularised article, newspaper article; popularised monograph (No letters to the editor, short commentaries or self-published works)
- F. Public artistic and design activities  
Published independent work of art; public partial realisation of a work of art; public artistic performance or exhibition; model or design adopted for production/use
- G. Theses  
Polytechnic thesis, Bachelor's thesis, Master's thesis, polytechnic Master's thesis; Licentiate thesis; doctoral dissertation (monograph); doctoral dissertation (article)
- H. Patents and invention disclosures  
Granted patent, invention disclosure
- I. Audiovisual material, ICT software  
Audiovisual material; ICT software

### Instructions for the list of five most significant competitive external grants of the RC in 2007 – 2012 (Entire RC)

The funding period can start before 2007 and/or end after 2012.

NOTE! Start the list with the RC's name and acronym

1. Total sum of the RC's competitive external grants in 2007 – 2012 classified by the most significant funding agencies (e.g. Academy of Finland, Tekes, EC)
2. Specify for the five most significant competitive external grants received by RC members the following:
  - Name of the funded project / position:
  - Head applicant's name and institute, position in the RC:
  - Funding agency:
  - Total sum of the grant in question:
  - Funding period:
  - Benefit of the funding for the RC (shortly, max. 100 words)



## RC's research plan for 2014 - 2018

### COVER PAGE

Name of the RC:	
Acronym of the RC:	
Name of the RC Head:	
E-mail of the RC Head:	

Follow the detailed instructions on the next page and write the research plan.

Combine this cover page with the research plan and save it as a single file. Submit it as a **single –pdf/a file** (without links), named as **RCHead's "Lastname\_Firstname-resplan.pdf"**, to [kirjaamo@oulu.fi](mailto:kirjaamo@oulu.fi)

Deadline for the submission is March 31, 2013 at 3pm local time.

Write the Research Plan for 2014 – 2018 according to the detailed instructions below and starting from here. The research plan shall be no more than six (6) pages, (spacing 1, Times New Roman 12 pt or equivalent).

### **1. Scientific goals and innovativeness**

- Background to research, any previous research related to the topic, research objectives
- Expected results and scientific impact
- Scientific added value expected from the RC activity (justifications for why the implementation of the research plan requires an RC instead of normal research collaboration)
- Expected social impact
- Possible risks on implementation of the research

### **2. Scientific merits of researchers**

- Describe the merits and scientific expertise of the RC Head insofar as these benefit the RC leadership
- Describe the merits and scientific expertise and supplementary expertise the PIs add to the RC
- Describe the expertise of the research teams that they add to the RC

### **3. Research environment**

- Describe the infrastructure (including RCs) provided by the research environments
- Describe how the research project will promote creative research environments (e.g. strengthening framework conditions for multidisciplinary, interdisciplinary or transdisciplinary research, promoting national and/or international co-operation and researcher training, proposed structural changes, etc.)

### **4. Position of the RC with regard to the world leaders in the field**

- Pinpoint the position of the RC with regard to the world leaders in your field/s. If the RC has a special national character of research, then pinpoint international comparability of the RC. Name 2-3 research units or teams whose research program and research questions are close to your own and that you consider your major reference teams/scientific competitors. Justify your view.
- Name the most important international collaborators/networks of the RC and describe the nature of the cooperation (common funding, consortium/research team, infrastructure, research visits, doctoral education etc.)