Open Science and Research in Finland

Evaluation of Openness in the Activities of Research Institutions and Research Funding Organisations in 2017

Summary

This evaluation of the openness of Finnish research institutions and research funding organisations was completed as part of the Open Science and Research Initiative (ATT) by the Ministry of Education and Culture. Our goal is for Finland to become one of the leading countries in open science and research by 2017.

The Open Science and Research Roadmap (OSR Roadmap) was published in 2014 to support us in making progress towards openness. In the OSR Roadmap, certain objectives and actions were defined, as well as the responsibilities of different stakeholders in policy implementation. The openness of activities was first evaluated in 2015 when universities, universities of applied sciences and research institutes were assessed with respect to their policies on and implementation of open science practices. In 2016, this evaluation was repeated and extended to cover university hospitals and research funding organisations. The evaluation of research funding organisations included a comparison with selected European research funding organisations. All the previous evaluations are available at http://avointiede.fi/toimintakulttuuri. This evaluation covers the activities of Finnish research institutions and research funding organisations in 2017.

The purpose of these evaluations is to highlight best practices and areas of development. The evaluation is by no means directed at the quality of work of the research institutions and research funding organisations. In addition, the ranking has no direct impact on the activities of organisations as such, but merely visualises their scores. As such, it should be interpreted carefully and by no means treated as a ranking table.

This evaluation examines the key indicators chosen to gauge performance on openness. Key indicators are used to provide some insights on the competences and capacity of the research system in supporting progress towards openness.

Contents

1. Introduction

The Ministry of Education and Culture's Open Science and Research Initiative (ATT), has set the goal of Finland becoming a leading country in open science and research by 2017. The Open Science and Research Roadmap 2014–2017[1] has defined a set of actions and measures to ensure the openness and reproducibility of research, and to enable the opportunities afforded by open science to be grasped on a broad basis within Finnish society. Dialogue on science and research will be promoted at many levels, both nationally and internationally. The target will be achieved through the roadmap's four sub-objectives: reinforcing the intrinsic nature of science and research, strengthening openness-related expertise, ensuring a stable foundation for the research process, and increasing the social impact of research. This can be done if those responsible for research systems are motivated and trained to put the related principles into practice. Based on the objectives in the OSR Roadmap, various stakeholders have responsibility for putting policies into practice. The development objectives are paired with certain measures which are defined as responsibilities on the OSR Roadmap. Success in meeting the targets will be evaluated by gauging the key factors of individual measures, in order to form a set of indicators.

A wise approach to openness promotes interoperability, enabling the collation and comparison of information from a variety of sources. Promoting a wise approach to interoperability brings many benefits: previously unconnected sources can be compared, making it easier for research organisations to manage their intellectual capital.

Open science and research requires a good, open method for managing research results. This can be achieved if those responsible for research systems are motivated and trained to put the related principles into practice. Various stakeholders have responsibility for implementing such principles, based on the objectives listed on the OSR Roadmap. Development objectives are paired with measures defined as responsibilities on the OSR Roadmap. Success in achieving the related targets will be evaluated by measuring the key factors underlying individual measures, in order to form a set of indicators.

Being responsible for the activities and culture of research environments, research organisations play a vital role in steering development towards the objectives in hand. The following responsibilities listed in the Roadmap can be considered key actions for promoting openness within the activities of research organisations:

- Including openness within the organisation's strategy
- Creating a collaborative culture
- Well-defined policies for publication, licensing, copyright and proprietary rights
- A clear description of researchers' rights and obligations with regard to openness
- Developing and maintaining competences
- Promoting the use of shared services
- Systematic use of quality systems
- Promotion of interoperability
- Exemplary management of research results and methods
- Promoting openness, availability, visibility and usability, and introducing support services for the measurement of such factors

Many prominent funding agencies have already adopted policies that embrace single elements of Open Science. Among others, the National Institutes of Health (NIH), the Wellcome Trust, the European Research Council, and the European Commission Framework Programme Horizon 2020 require funded projects to make project-related research data and publications freely available. On 27 May 2016, the Council of the EU met to discuss the transition of Member States towards an Open Science System, in cooperation with the European Commission. Following a debate on open science, the Council adopted certain conclusions on the transition towards an open science system.

An organisation's operational culture should be apparent in its strategies, values and quality systems. It is therefore important for organisations to provide clear guidelines for researchers, or to openly communicate their research results online. Openness also requires organisations

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[1] The Open Science and Research Roadmap 2014–2017, http://openscience.fi/open-science-and-research-roadmap-2014-2017

to adhere to and support extensive shared and general guidelines, policies and principles. Consideration of the broader context should be embraced, including issues such as end-user and re-use requirements.

1.1 Framework for Evaluation

The OECD Science, Technology and Industry Outlook document says the following: *"As Open Science progresses, new policy approaches will be needed to determine how public research is funded, research is undertaken, research outputs are exploited, research results are accessed and protected, and to shape how science and society interact."*

In order to develop policies that support open science and research in the appropriate manner, we need a better understanding of several critical aspects of the openness of research activities, such as the policies and guidelines that apply to research funding. For this purpose, we need to provide indicators for benchmarking national performance in open science. We believe that the selected indicators reflect openness-related activities. The purpose of this evaluation is to highlight best practices and areas of development at national level and to initiate discussions on open science and research at international level. This evaluation is by no means directed at the quality of work of the research funding organisations and has no direct impact on the activities of research funding organisations as such. It merely visualises research scores and should be interpreted with caution: it should by no means be treated as a ranking table.

This evaluation examines the key indicators selected to gauge performance in terms of openness. Such indicators are used to provide insights on the competences and capacity of the research system to progress towards openness. However, since Open Science and openness are interpreted differently depending on the country or target of the funding instrument, the overall comparison has limitations. This report is being published at a time when many similar studies are being conducted on the open science movement, a fact which highlights the importance of debates on the topic. For example, an earlier survey on Open Access Publishing Policies from Science Europe also examined research funding organisations, but based on a different approach.[2]

1.2 Purpose of Evaluation

The evaluation of research institutions covers 12 Finnish research institutions.

The target of evaluating institutions that perform research is:

- To establish a clear picture of the current level of openness in research institutions
- To evaluate progress since 2016
- To identify strengths and weaknesses in promoting openness
- To identify areas in which support and cooperation are needed

The evaluation of research funding organisations includes three major Finnish research funding organisations.

The target of evaluating research funding organisations is:

- To establish a clear picture of the current level of openness in national research funding organisations
- To evaluate progress since 2016
- To identify national strengths and weaknesses in promoting openness
- To identify areas where support and cooperation are required

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[2] http://scieur.org/oa-survey

2. The Approach

The target of this evaluation is to assess the openness of operational cultures in Finnish research institutions and research funding organisations. The key objectives, against which the assessments will be made, are defined in the Open Science and Research Roadmap. Using the objectives listed in this roadmap, various stakeholders have responsibility for putting openness policies into practice. The development objectives are implemented through actions, which are defined as responsibilities in the OSR Roadmap. Key indicators reflect the objectives to be targeted. Success in achieving the targets is evaluated by scoring against the key measures that form the indicators. Figure 1 shows the relation of the OSR Roadmap to the indicators, measures and scores of this analysis.
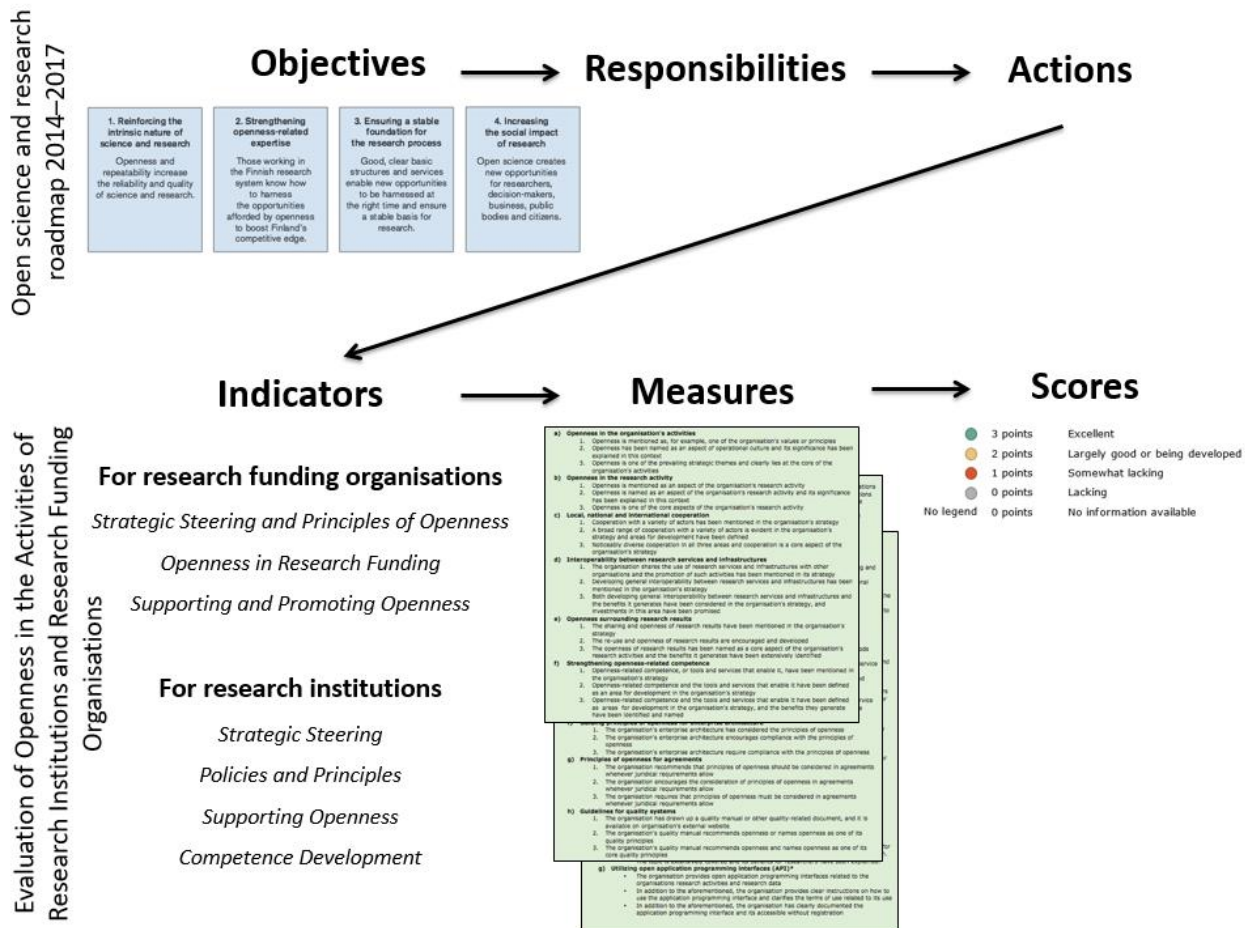

Figure 1: Relation of this evaluation and its indicators and measures to the Open Science and Research Roadmap 2014–2017

The key indicators were used to define the maturity of openness activities. Such maturity is described in terms of levels, the so-called maturity hierarchy. Each organisation is ranked within this maturity hierarchy, on the basis of the scores given for each measure.

The evaluation consisted of the following steps:

1) **Preliminary data collection**: Data used in preliminary analysis consists of each organisation's external website, its publicly accessible strategies, policies and principles, and its guidelines for supporting openness.
2) **Preliminary analysis**: On the basis of this information, the preliminary level of openness within the organisations was scored with reference to a number of areas. Scoring was based on indicators derived from the responsibilities for promoting openness assigned to each research organisation within the Open Science and Research Roadmap.
3) **Preliminary report**: Preliminary evaluation based on preliminary analysis.
4) **Complementary Data Collection:** Data collected via a request for information sent to organisations of interest by the Ministry of Education and Culture, together with the

preliminary analysis. In the request for information, the organisations can make additions and correct mistakes or misinformation in the preliminary data and analysis, and provide further insights on the activities undertaken within the organisation.

5) **Final Analysis**: Based on preliminary and complementary data collection.
6) **Final Report**: This report. The final evaluation based on the combined data.

2.1 Preliminary Data Collection

As the preliminary data, information was collected from the organisations' external websites. A local copy of the web page or document was made for archival purposes. During data collection, a specific set of data was used in the analysis performed for each key indicator. For all indicators, data was limited to each organisation's external (public) website. No information available on internal (e.g. intranet) pages was included. If the organisation's website linked to external guidelines, the website had to mention that the organisation either adhered to those guidelines or recommended their use. A simple link to external guidelines did not suffice.

All of the organisations' strategies were collected from public websites for analysis. If no bespoke strategy document was available for downloading, strategy-related web pages, or comparable documents (such as values and visions), were used instead.

Other information was acquired from external websites, both by browsing and via searches using terms derived from the indicator's measures. Any and all of the available relevant information was included in the analysis.

The preliminary data was collected in April-May 2017.

2.2 Complementary Data Collection

During complementary data collection, the preliminary data, preliminary report and a request for information was sent to research funding organisations and research institutions for a review and additions. The organisations were able to provide further insights into the activities conducted within each organisation.

The request for information was sent to 3 research funding organisations and 12 research institutions. Responses were received from 3 research funding organisations (a response rate of 100 per cent) and 9 research institutions (a response rate of 75 per cent).

Complementary data was collected in June-September 2017.

The reviewed data and the responses to the requests for information were combined to form the final data used for the final evaluation.

The data gathered for this analysis is available in Appendix 4.

2.3 Indicators and Scoring Principles

In the analysis, selected indicators were used to evaluate the openness of research funding organisations and research institutions.

The indicators for research funding organisations were:
1) Strategic Steering and Principles of Openness
2) Openness in Research Funding
3) Supporting and Promoting Openness

The indicators for research institutions were:
1) Strategic Steering
2) Policies and Principles
3) Supporting Openness
4) Competence Development

Each indicator had a number of individual measures that were scored using the data, based on the score category (see below). All indicators and measures are found in Appendices 1 and 2.

Openness was evaluated separately for each measure, using a four-tiered scoring system:

For each measure, each organisation was given a score between zero and three on the basis of the available information. Valuation of the scores for each measure was performed by at least two individuals. If no information was available or information was lacking, zero points were awarded. The scores for each measure used in an indicator were presented as follows:

●	3 points	Excellent
●	2 points	Largely good or being developed
●	1 points	Somewhat lacking
●	0 points	Lacking
No legend	0 points	No information available

To achieve the overall score for openness, a sum score was calculated covering all measures and across all indicators for each organisation. This was calculated as the sum of points received for all measures across all indicators.

2.4 Maturity Levels

Based on the analysis scores, both the research institutions and research funding organisations were placed within a hierarchy of maturity levels. A five-level maturity model was employed. A figure depicting the overall maturity level is shown below. The scores required for each maturity level are given alongside the maturity levels in question.

Table 1 provides an interpretation of these maturity levels from the perspective of open science and research.

Level 5 Strategic
An open operational culture is publicly encouraged throughout the organisational level and openness has been defined as a core value in the organisation's strategy and policies. Activities are open and developed in accordance with the principles of openness and in cooperation with other actors. Openness has also been linked to the long-term planning and management of activities. The organisation is always able to ensure that it is moving towards its goals, and is learning and adapting. Key benchmarks are in comprehensive use and are continually reviewed. Personnel are aware of their targets and the organisation's progress towards openness.
Level 4 Managed
The organisation is actively working towards an open operational culture, and principles of openness have been publicly set as one of its objectives. Activities are largely open and adhere to the principles of openness. Openness is managed and regularly measured. Measurements are analysed and corrective measures are proactively taken. The organisation is mature in terms of its utilisation of open information, which is also taking on increased significance.
Level 3 Defined
At this level, decisions are increasingly made with the aid of data based on openness measurements. Management supports the planning and implementation of an already more effective openness strategy. The organisation has done a great deal of work towards breaking down information silos, in order to establish an extensive organisation-wide technology management and architecture. Although progress has been made towards an open operational culture, this has yet to be completely achieved due to deficiencies in policies and principles. Openness is not to be found as a core steering value in the organisation's strategy. Activities are in many respects open and based on documented descriptions.
Level 2 Partly managed
The organisational culture will begin to change at the next level. Understanding the benefits of openness and its impact on activities is key. However, support for openness is limited and the organisation still has unlinked data warehouses. The first steps have been taken towards an open operational culture, but this is not publicly encouraged. Openness does not appear as a core value in the organisation's strategy. Activities are open to some extent. The organisation has begun efforts to develop competencies and create a systematic approach to openness. Performance measurement is largely the measurement of financial performance.
Level 1 Unmanaged
No steps have yet been publicly taken towards an open operational culture and the organisation lacks guiding principles and policies. Processes have not been clearly defined. Openness is not included in the organisation's strategy. Openness-related activities are not encouraged at organisational level. Indicates a situation in which openness is not consciously managed. At worst, the organisation may be an information silo. The term 'information silo' denotes informal point solutions. Although systems are in use, data for reports and benchmarks is often manually collated from a variety of information systems and other sources.

Table 1: Hierarchy of maturity levels for openness in the operational culture, with definitions

3. Promoting Openness in Research Funding Organisations

The selected Finnish research funding organisations are evaluated in the aforementioned maturity hierarchy levels. The sample supports the identification of best practices and areas of development.

In 2017, data was collected from information openly available in organizations' web pages. The correction round was based on requests for information, sent by the Ministry of Education and Culture. In the requests for information, the research funding organisations were able to add information to and correct mistakes or misinformation in the preliminary data and analysis.

3.1 Strategic Steering and Principles for Openness

An organisation's strategy reveals both its long-term and short-term visions, as well as its strategic choices. An organisation uses its strategy to communicate its objectives not only to its own personnel, but also to others. Openness within the organisation's operating culture should therefore be evident in its strategy. Transparency is at least as important as concrete actions. Table 2 shows the measures considered for the evaluation of activities in this indicator. Table 3 shows the scoring of each organisation for each measure in this indicator.

Strategic Steering and Principles for Openness

   a) **Strategic steering of openness**
   b) **Promoting the openness and re-use of research outputs**
   c) **National and international cooperation**
   d) **Interoperability of research infrastructures**
   e) **Strengthening openness-related competence**

See Appendix 1 for more details about scoring in these measures.

Table 2: Measures for Strategic Steering and Principles for Openness indicator

Data shows that two funders have mentioned openness as value or principle in their strategies and all three funders have promoted openness and re-use of the research they fund as a principle.

Organisation	Strategic Steering a b c d e	Total Points
Academy of Finland	● ● ● ● ●	8
Kone Foundation	● ● ● ● ●	2
TEKES	● ● ● ● ●	5

Table 3: Scoring for research funding organisations in Strategic Steering and Principles for Openness indicator

National and international cooperation is well established in two of the research funders and it can be seen as core part of their strategic steering.

Based on the data all research funders are missing policies or principles on developing interoperability in the research infrastructures they fund. It should be noted though that not all of the research funders in this analysis fund research infrastructures. Two funders have mentioned the strengthening of openness-related competencies or services in their strategies.

3.2 Openness in Research Funding

The research funding organisation implements strategy in practice by defining and executing policies and principles that encourage openness. These include defining policies on the openness of data, methods, research infrastructures and publications. The principles describe openness as part of the research funding organisations' activities and help actors to embrace it. Table 4 shows the measures considered for the evaluation of activities in this indicator. Table 5 shows the scoring of each organisation for each measure in this indicator.

Openness in Research Funding

    a) **Principles of open-access publishing**
    b) **Principles of research data openness**
    c) **Principles of research method openness**
    d) **Principles of openness for research infrastructures**

See Appendix 1 for more details on scoring according to these measures.

Table 4: Measures for Openness in Research Funding -indicator

All research funders have established openness to some extent in their research funding. Two funders require open-access publishing and one recommends it. For research data, one funder requires, one encourages and one recommends openness.

Organisation	Funding Openn. a b c d	Total Points
Academy of Finland	🔵🔵🟡🔵	11
Kone Foundation	🔴🔴⚪⚪	2
TEKES	🔵🟡🔴⚪	6

Table 5: Scoring for research funding organisations in Openness in Research Funding -indicator

Based on the findings, two research funders recommend openness for research methods and one of them urges it. Only one funder has principles of openness for the research infrastructures it funds. As noted in section 3.1., some of them do not fund research infrastructures at all.

3.3 Supporting and Promoting Openness

The measures included in this indicator are concrete actions taken within the research funding organisation, using which openness can be promoted and encouraged. Using well-defined guidelines for the research community, it is possible for the entire organisation to harness the benefits of openness. Guidelines play a key role in providing information and motivation, and thereby the more extensive promotion of openness. Table 6 shows the measures considered for the evaluation of activities in this indicator. Table 7 shows the scoring of each organisation for each measure in this indicator.

Supporting and Promoting Openness

    a) **Instructions for open science and research**
    b) **Recommendations of openness for research outputs**
    c) **Developing openness in research funding evaluation**
    d) **Monitoring openness**
    e) **Openness of funding decisions**

See Appendix 1 for more details on scoring according to these measures.

Table 6: Measures for Supporting and Promoting Openness indicator

Two research funders have instructions for open science and research practices for funding applicants in some form. All research funders have information available on the possibilities of research outputs openness.

Organisation	Supporting Openness a b c d e	Total Points
Academy of Finland	🟢🟢🔴🟢🟠	12
Kone Foundation	⚪🔴🔴⚪🟠	4
TEKES	🟠🔴🔴🔴🟠	7

Table 7: Scoring for research funders in Supporting and Promoting Openness -indicator

Based on the data all research funders explain broadly the process of their funding calls and the review criteria used, but none of them have openness or re-use of research as a review criterion in their funding calls.

Two research funders monitor the openness of the research they fund as a permanent part of their common reporting required from the funded research and one of the funders promote re-use of research during the research they have funded. All research funders publish their funding decisions on their website in a machine-readable format.

3.4 Maturity Rankings of Research Funding Organisations

Research funding organisations included in the evaluation were ranked according to a five-level maturity model. Each research funding organisations' ranking is based on the total sum of scores derived from each of the measures used for each of the indicators. Figure 2 presents the maturity results of research funding organisations, based on the findings of the evaluation. Table 8 presents the total sum of scores across all indicators for each research funding organisation included in this analysis.

Evaluation of Operational Culture Maturity Rankings of Research Funding Organisations

LEVEL 5
35-42 pts

LEVEL 4   AKA
26-34 pts

LEVEL 3
18-25 pts

TEKES

LEVEL 2
9-17 pts

KONE

LEVEL 1
0-8 pts
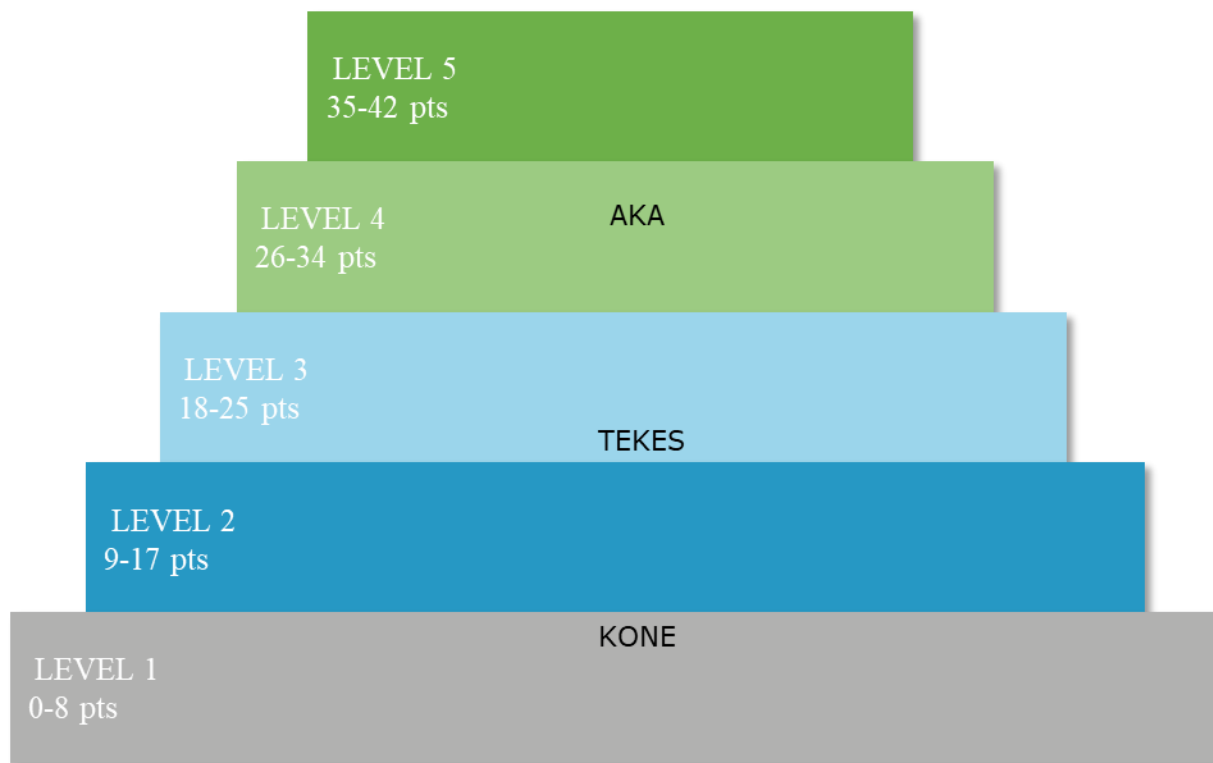
Figure 2: Overview of operational culture maturity rankings of research funding organisations

Organisation	Total sum score in 2017	Difference to 2016
Academy of Finland	31	7
TEKES	18	5
Kone Foundation	8	1

Table 8: Total sum scores across all indicators for each research funding organisation and the difference in total sum score compared to the total score in 2016.

Academy of Finland has reached level 4 with definite actions and improvements especially in communicating the recommendations, policies and instructions to applicants.

4. Promoting Openness in Research Institutions

Finnish research institutions were compared with the results of the evaluation performed in 2016. Data from the web pages form the preliminary evaluation results. The Ministry of Education and Culture sent a request for information, in which the research organisations were able to add information to and correct mistakes or misinformation in the preliminary data and analysis.

The collected data supports the identification of best practices and areas of development. Against this background, the comparison shows that organisations with resolute strategic steering and clear policies and principles are able to manage change towards openness.

4.1 Strategic Steering

An organisation's strategy reveals both its long-term and short-term visions, and the organisation's strategic choices. An organisation uses its strategy to communicate its objectives not only to its own personnel but also to others. The openness of an organisation's operating culture should therefore be evident in its strategy. Transparency is at least as important as concrete actions. Table 9 shows the measures considered for the evaluation of activities in this indicator. Table 10 shows the scoring of each organisation for each measure in this indicator.

Strategic Steering

  a) **Openness in the organisation's activities**
  b) **Openness in the research activity**
  c) **Commitment to implementing measures to promote open science and research**
  d) **Local, national and international cooperation**
  e) **Managing interoperability**
  f) **Openness of research results**
  g) **Strengthening of openness-related competencies**

See Appendix 2 for more details on scoring in relation to these measures.

Table 9: Measures for Strategic Steering indicator

Based on the data of this evaluation, a bit more than half of the research institutions have included openness in their strategies. At the same time only three research institutions have mentioned openness being a part of their research activity based on their strategic document.

Local, national and international cooperation is strongly noted in the research institutions' strategies, as all research institutions in this evaluation have cooperation with variety of actors. Four of them has the cooperation named as the core aspect of their strategies.

Half of the research institutions have mentioned the promotion of interoperability in their strategic steering. Also half of the institutions mention openness related to the research results of the said institution.

Organisation	a	b	c	d	e	f	g	Total points
EVIRA								4
GTK								4
IL								7
KOTUS								2
LUKE								7
MML								10
STUK								4
SYKE								5
THL								9
TTL								5
VATT								2
VTT								4

Table 10: Scoring for research institutions for Strategic Steering - indicator

Data shows that there is no mention of strengthening openness-related competencies in the strategic documents of research institutions.

4.2 Policies and Principles

The organisations implement their strategies in practice by defining and executing policies and principles that encourage openness. These include defining policies on the openness of data and publications, writing clear instructions for supporting services, and including openness within an organisation's quality systems. Their various policies and principles describe openness as part of the organisation's activities and help actors to embrace openness. Table 11 shows the measures considered for the evaluation of activities in this indicator. Table 12 shows the scoring of each organisation for each measure in this indicator.

Policies and Principles

  a) **Principles of openness for scientific publications**
  b) **Principles of self-archiving of scientific publications**
  c) **Principles of openness relating to research methods**
  d) **Principles of openness relating to the availability, use and licensing of research data**
  e) **User rights and principles of openness for services and resources**
  f) **Guiding principles from Open Science framework**
  g) **Principles of openness for cooperation**
  h) **Principles of openness in agreements**
  i) **Guidelines for quality systems**

See Appendix 2 for more details on scoring in relation to these measures.

Table 11: Measures for Policies and Principles indicator

Based on the data more than half of the research institutions have principles which recommend or encourage the use of open-access channels for publishing. Six of the research institutions have recommendations on self-archiving the publications in institutional or other repositories with one of them encouraging this activity. Three research institutions recommend and one encourages openness of research methods.

All but two of the institutions have principles of openness relating to the availability, use and licensing of research data. Seven research institutions also state the user rights and principles of openness for the services and resources it administers.

Data used shows that there are five institutions that have considered the principles from Open Science framework publicly.

Organisation	Policies and Principles a b c d e f g h i	Total Points
EVIRA		3
GTK		6
IL		8
KOTUS		10
LUKE		11
MML		8
STUK		7
SYKE		10
THL		10
TTL		16
VATT		3
VTT		6

Table 12: Scoring for research institutions in accordance with the Policies and Principles indicator

Most of the research institutions have principles of openness for cooperation, which is evident by sharing open data and openly describing their activities. Seven research institutions recommend principles of openness to be considered in the juridical requirements of agreements. Five research institutions have publicly available quality-related documentation.

4.3 Supporting Openness

The measures are concrete actions in organisations with which openness can be promoted and encouraged. By well-defined guidelines for the research community, it is possible for the entire organisation to harness the benefits of openness. A common understanding of the benefits of openness coupled with competences facilitates cooperation and researcher exchange. Guidelines play a key role in providing information and motivation, and thereby the more extensive promotion of openness. Table 13 shows the measures considered for the evaluation of activities in this indicator. Table 14 shows the scoring of each organisation for each measure in this indicator.

Supporting Openness

   a) **Monitoring the openness of publishing (Open Access, self-archiving)**
   b) **Monitoring the openness of research data (making data available, utilisation)**
   c) **Monitoring the visibility of research (impact; scientific and social media)**
   d) **Services for cataloguing and creating metadata for research materials**
   e) **Services for documenting research publications and materials**

See Appendix 2 for more details about scoring in these measures.

Table 13: Measures for Supporting Openness indicator

Based on the data over half of the research institutions provide support in the use of services for documenting research results e.g. self-archiving research publications. More than half of the research institutions monitor the openness of both publications and research data or have plans to do so. Of these two, the monitoring of publications is more usual and active.

Many of the research organisations also monitor the visibility of their research in both scientific and social media and the data on those is actively collected to support openness.

Seven research institutions provide some sort service to provide metadata for research materials. Guidelines for storing research publications in institutional or other repositories is provided in seven research institutions.

Organisation	Supporting Openness a b c d e	Total Points
EVIRA		0
GTK		0
IL		9
KOTUS		0
LUKE		9
MML		8
STUK		0
SYKE		12
THL		10
TTL		9
VATT		6
VTT		8

Table 14: Scoring for research institutions for Supporting Openness -indicator

18

4.4 Competence Development

By steering the research community, it is possible for an entire organisation to harness the benefits generated by openness. Well-defined guidelines for the research community can enable an entire organisation to harness the benefits of openness. Coupled with competencies, a common understanding of such benefits facilitates cooperation and researcher exchange. Guidelines play a key role in providing information and motivation, and thereby the more extensive promotion of openness. Table 15 shows the measures considered for the evaluation of activities in this indicator. Table 16 shows the scoring of each organisation for each measure in this indicator.

Competence development.
a) **Lifecycle management of research data**   b) **The re-use and findability of research results**   c) **Use of shared services**   d) **Competence development in open science and research**   See Appendix 2 for more details on scoring in these areas.

Table 15: Measures for Competence Development indicator

A total of seven research institutions provide guidance for their researchers on lifecycle management of research data i.e. for creating data management plans. Eight institutions provide guidelines and support on the re-use and findability of research results for their researchers.

Four research institutions recommend the use of common open science services. Almost half of the institutions provide some sort of open science and research training for their staff and researchers with two institutions being highly active in developing these activities.

Organisation	Comp. Devel. a b c d	Total Points
EVIRA	○ ○ ○	0
GTK	○ ○ ○	0
IL	● ○ ○ ○	3
KOTUS	○ ● ●	2
LUKE	● ● ● ○	5
MML	● ● ○ ●	5
STUK	○ ● ○ ○	1
SYKE	● ● ○ ●	5
THL	● ● ● ●	6
TTL	● ● ○ ○	5
VATT	○ ○ ○ ○	0
VTT	● ○ ○ ○	1

Table 16: Scoring for research institutions for Competence Development -indicator

4.5 Maturity Rankings of Research Institutions

The organisations included in the evaluation were ranked based on a five-level maturity model. Each organisation's ranking is based on the total sum of scores for each of the measures, for all indicators. Figure 3 presents the maturity results for research organisations, based on the findings of the evaluation. Table 16 presents the total sum of scores, across all indicators, for each research organisation included in this analysis.
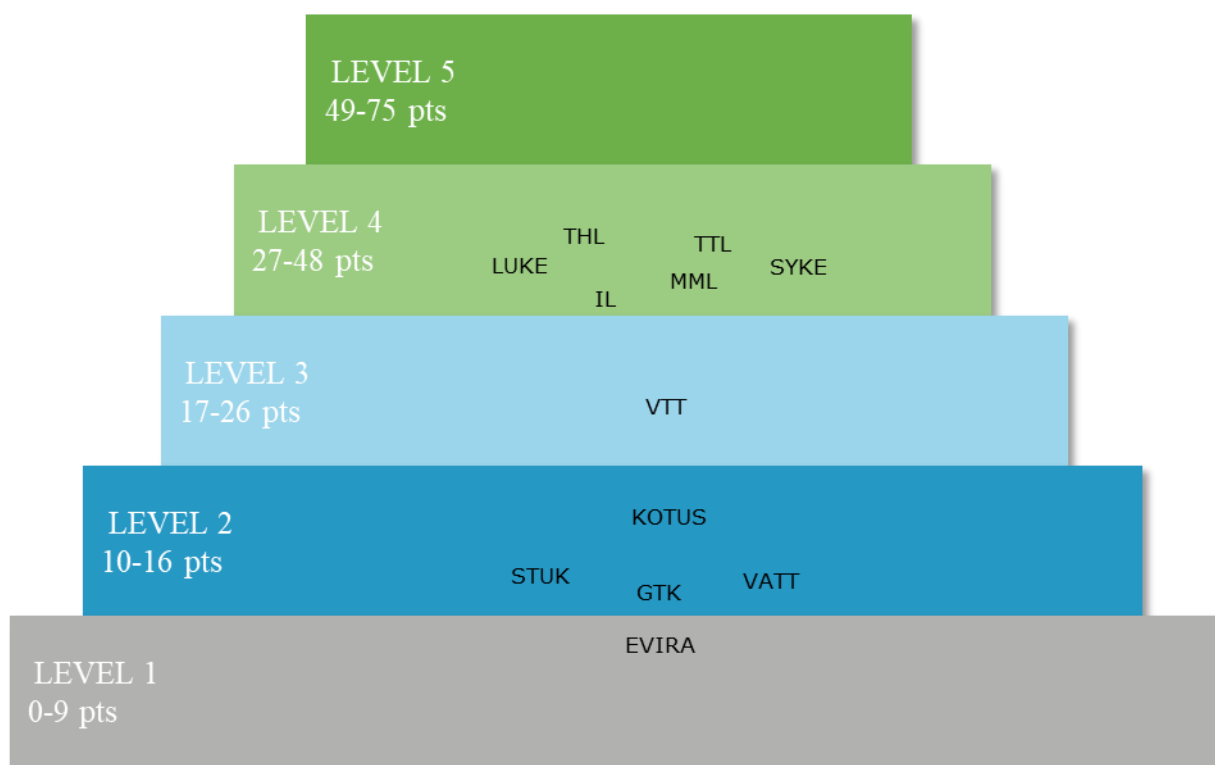

Figure 3: Overview of operational culture maturity rankings of research institutions.

Organisation	Total sum score in 2017	Difference to 2016
THL	35	24
TTL	34	13
LUKE	32	9
SYKE	32	2
MML	31	11
IL	27	10
VTT	19	-1
KOTUS	14	-7
STUK	12	7
VATT	11	0
GTK	10	-13
EVIRA	7	-6

Table 16: Total sum scores in 2017 across all indicators for each research institution and the difference in total sum score compared to the total score in 2016.

The results show that some organizations have been able to make relevant improvements in the openness of the operating culture. Unfortunately, some organizations did not answer to the request of information and thus possibly lost some scores (KOTUS, GTK, EVIRA).

5. Appendices

Appendix 1 – **Indicators and Measures for Research Funding Organisations**

Appendix 2 – **Indicators and Measures for Research Institutions**

Appendix 3 – **Abbreviations Used in the Analysis**

Appendix 4 – **Data Collected for the Analysis**

Appendix 1 – Indicators and Measures for Research Funding Organisations

1) Strategic Steering and Principles for Openness

a) **Strategic steering of openness**
1. Openness is mentioned as one of the organisation's values or principles
2. Openness has been named as an aspect of operational culture and its significance has been explained in this context
3. Openness is one of the prevailing strategic themes and clearly lies at the core of the organisation's activities

b) **Promoting the openness and re-use of research outputs**
1. Openness of funded research's research outputs is mentioned in the organisation's strategy
2. Openness of funded research's research outputs is encouraged and research funding is developed this in mind
3. Openness and re-use of funded research's research outputs is named as one of the core aspects of the organisation's research funding

c) **National and international cooperation**
1. Cooperation in research funding on national and international level is mentioned in the organisation's strategy
2. Cooperation in research funding on national and international level is mentioned in the organisation's strategy and there are funding calls and instruments in use based on this cooperation
3. Cooperation in research funding on national and international level is names as one of the core aspects of research funding organisation's activities and there are funding calls and instruments in use based on this cooperation

d) **Interoperability of research infrastructures**
1. Interoperability and shared use of funded research services and infrastructures is mentioned in the organisation's strategy
2. Interoperability and shared use of funded research services and infrastructures is mentioned in the organisation's strategy and those are being developed
3. Interoperability and shared use of funded research services and infrastructures is mentioned in the organisation's strategy and those are developed even further acknowledging the benefits

e) **Strengthening openness-related competence**
1. Openness-related competence, or services that enable it, are mentioned in the organisation's strategy
2. Openness-related competence, or services that enable it, are defined as an area for development in the organisation's strategy
3. Openness-related competence, or services that enable it, are defined as an area for development in the organisation's strategy, and the opportunities created by these are identified extensively

2) Openness in Research Funding

a) Principles of open access publishing
1. Funded research's research publications are recommended to be published in open access publishing channels
2. Funded research's research publications are urged to be published in open access publishing channels
3. Funded research's research publications are required to be published in open access publishing channels

b) Principles of research data openness
1. Funded research's research data is recommended to be published open
2. Funded research's research data is urged to be published open in accordance with national recommendations on open data publishing services and open licensing
3. Funded research's research data is required to be published open in accordance with national recommendations on open data publishing services and open licensing

c) Principles of research methods openness
1. Openness of funded research's research methods is recommended and developed further
2. Openness of funded research's research methods is urged and developed further
3. Openness of funded research's research methods is required and developed further

d) Principles of openness for research infrastructures
1. Funded research infrastructures are recommended to enable shared use in their policies and terms of use
2. Funded research infrastructures are urged to enable shared and open use in their policies and terms of use
3. Funded research infrastructures are required to clearly enable shared and open use in their policies and terms of use in accordance with national recommendations

3) Supporting and Promoting Openness

a) **Instructions for open science and research**
1. Instructions on open research practices are available and benefits of open science are presented to research funding applicants
2. Comprehensive instructions on open research practices are available and benefits of open science are presented to research funding applicants
3. Comprehensive instructions on open research practices are available, benefits of open science and how these are taken into account by research funder, for example in funding instruments, are presented to research funding applicants

b) **Recommendations of openness for research outputs**
1. The possibilities of research outputs openness are presented to research funding applicants
2. The possibilities of research outputs openness are presented and openness is recommended to research funding applicants
3. The possibilities and benefits of research outputs openness are broadly presented and openness is recommended to research funding applicants

c) **Developing openness in research funding evaluation**
1. The research funder explains broadly the process of funding calls and the evaluation criteria used
2. The research funder explains broadly the process of funding calls and the evaluation criteria used. One evaluation criterion in funding calls is openness and re-use of research
3. The research funder explains broadly the process of funding calls and the evaluation criteria used. One evaluation criterion in funding calls is openness and re-use of research and the indicators to measure these are explained

d) **Monitoring openness**
1. The research funder monitors the openness of funded research alongside the common reporting required
2. The research funder monitors the openness of funded research alongside the common reporting required and the re-use of research is promoted during the research
3. Monitoring the openness of funded research is a permanent part of the common reporting required and the re-use of research is promoted during the research

e) **Openness of funding decisions**
1. The research funder opens its own information for example by publishing the funding decisions on its website
2. The research funder opens its own information for example by publishing the funding decisions on its website in a machine-readable format
3. The research funder opens its own information for example by publishing the funding decisions on its website in a machine-readable format and through an open API

Appendix 2 – Indicators and Measures for Research Institutions

1) Strategic Steering

a) **Openness in the organisation's activities**
   1. Openness is mentioned as, for example, one of the organisation's values or principles
   2. Openness has been named as an aspect of operational culture and its significance has been explained in this context
   3. Openness is one of the prevailing strategic themes and clearly lies at the core of the organisation's activities

b) **Openness in the research activity**
   1. Openness is mentioned as an aspect of the organisation's research activity
   2. Openness is named as an aspect of the organisation's research activity and its significance has been explained in this context
   3. Openness is one of the core aspects of the organisation's research activity

c) **Commitment to implementing measures to promote open science and research***
   1. The organisation provided an answer to the request for information in the Complementary Data collection

d) **Local, national and international cooperation**
   1. Cooperation with a variety of actors has been mentioned in the organisation's strategy
   2. A broad range of cooperation with a variety of actors is evident in the organisation's strategy and areas for development have been defined
   3. Noticeably diverse cooperation in all three areas and cooperation is a core aspect of the organisation's strategy

e) **Managing interoperability**
   1. The organisation shares the use of research services and infrastructures with other organisations and the promotion of such activities has been mentioned in its strategy
   2. Developing general interoperability of services, infrastructures and data has been mentioned in the organisation's strategy
   3. Both developing general interoperability of services, infrastructures and data and the benefits it generates have been considered in the organisation's strategy, and investments in this area are foreseen

f) **Openness of research results**
   1. The sharing and openness of research results have been mentioned in the organisation's strategy
   2. The re-use and openness of research results are encouraged and developed
   3. The openness of research results has been named as a core aspect of the organisation's research activities and the benefits it generates have been extensively identified

g) **Strengthening openness-related competence**
   1. Openness-related competence, or tools and services that enable it, have been mentioned in the organisation's strategy
   2. Openness-related competence and the tools and services that enable it have been defined as an area for development in the organisation's strategy
   3. Openness-related competence and the tools and services that enable it have been defined as areas for development in the organisation's strategy, and the benefits they generate have been identified and named

2) Policies and Principles

a) **Principles of openness for scientific publications**
   1. The organisation recommends the use of open access channels for its research publications
   2. The organisation encourages the use of open access channels for its research publications
   3. The organisation requires the use of open access channels for its research publications

b) **Principles of self-archiving for scientific publications**
   1. The organisation recommends self-archiving (green open-access) research publications in institutional repository or other open archive
   2. The organisation encourages self-archiving (green open-access) research publications in institutional repository or other open archive
   3. The organisation requires self-archiving (green open-access) research publications in institutional repository or other open archive

c) **Principles of openness relating to research methods**
   1. The organisation recommends openness in the publication and development of research methods
   2. The organisation encourages openness in the publication and development of research methods
   3. The organisation requires openness in the publication and development of research methods

d) **Principles of openness relating to the availability, use and licensing of research data**
   1. The organisation recommends the open use of research data and the use of open licensing and open data repositories for research data
   2. The organisation encourages the open licensing of research data in accordance with national recommendations and the use of agreed open data repositories for research data
   3. The organisation requires the open licensing of research data in accordance with national recommendations and the use of agreed open data repositories for research data

e) **User rights and principles of openness for services and resources**
   1. The organisation recommends compliance with principles of openness in user rights and service principles for the resources it administers
   2. The organisation recommends compliance with principles of openness in its user rights and service principles for the resources it administers. Descriptions can be found on the organisation's website.
   3. The organisation requires compliance with principles of openness in its user rights and service principles for the resources it administers. Descriptions can be found on the organisation's website.

f) **Guiding principles from Open Science framework**
   1. The organisation has considered the principles of openness presented in Open Science Framework
   2. The organisation's enterprise architecture encourages compliance with the aforementioned principles of openness
   3. The organisation's enterprise architecture require compliance with the aforementioned principles of openness

g) **Principles of openness for cooperation**
   1. The organisation shares open data
   2. The organisation openly describes its activities
   3. The organisation invests in dialogue and using plain language
h) **Principles of openness in agreements**
   1. The organisation recommends that principles of openness should be considered in agreements whenever juridical requirements allow
   2. The organisation encourages the consideration of principles of openness in agreements whenever juridical requirements allow
   3. The organisation requires that principles of openness must be considered in agreements whenever juridical requirements allow
i) **Guidelines for quality systems**
   1. The organisation has drawn up a quality manual or other quality-related document, and it is available on organisation's external website
   2. The organisation's quality manual recommends openness or names openness as one of its quality principles
   3. The organisation's quality manual recommends openness and names openness as one of its core quality principles

3) Supporting Openness

a) **Monitoring the openness of publishing (open access, self-archiving)**
1. The organisation does not yet monitor the openness of its publishing activities, but has plans to do so
2. The organisation monitors the openness of its publishing activities to some extent and developments are ongoing
3. The organisation monitors the openness of its publishing activities and data is being actively collected

b) **Monitoring the openness of research data (making materials available, utilisation)**
1. The organisation does not yet monitor the openness of its research data, but has plans to do so
2. The organisation monitors the openness of its research data to some extent and developments are ongoing
3. The organisation monitors the openness of its research data and data is being actively collected

c) **Monitoring the visibility of research (impact; scientific and social media)**
1. The organisation does not yet monitor the visibility of its research activities, but has plans to do so
2. The organisation monitors the visibility of its research activities to some extent and developments are ongoing
3. The organisation monitors the visibility of its research activities and data is being actively collected

d) **Services for cataloguing and creating metadata for research materials**
1. The organisation does not yet use such services, but has plans to do so
2. The organisation uses such services to some extent and is developing their use
3. The organisation actively uses such services

e) **Services for documenting research publications and materials**
1. The organisation provides guidelines for storing research publications in its own archives and information about parallel publishing
2. In addition to the aforementioned, the organisation provides guidelines on storage and metadata for research materials, and information about open access publication
3. In addition to the aforementioned, the organisation recommends suitable storage sites for research materials and metadata, and explains what must be considered when storing them. The topic is extensively covered and its benefits for researchers have been explained.

4) Competence Development

a) **Lifecycle management of research data***
- The organisation provides guidelines for creating a data management plan and its significance and benefits for research are explained
- The organisation provides guidelines for the long-term preservation of research data and its significance and benefits for research are explained
- The organisation provides guidelines for describing and documenting research data

b) **The re-use and findability of research results***
- The organisation provides guidelines for creating external links and persistent identifiers for research and research materials (including DOI, URN, ORCID) and gives grounds for their use
- The organisation provides guidelines for licensing research publications and data (including CC, ODC) and gives grounds for their use
- The organisation explains what publication forums and citation databases are, and how bibliometrics and altmetrics are connected to scientific publication. These topics are extensively covered and their benefits for researchers have been explained.

c) **Use of common open science services***
- The organisation recommends compliance with the Academy of Finland's or other major scientific funders guidelines on availability and publishing of research
- The organisation recommends the use of the Open Science and Research Initiative's services (IDA, Etsin, AVAA) or other national services (such as AILA, FIN-CLARIN) for managing research data
- The organisation recommends the use of international or European services (such as PubMed Central, arXiv, OpenAIRE, Zenodo) for managing research data

d) **Competence development in open science and research**
1. The organisation does not yet provide training in open science and research, but has plans to do so
2. The organisation arranges and encourages participation in open science and research training
3. The organisation is actively developing the content of its open science and research training

* For the measures marked with bullet points the organisations were able to receive points for each criteria they fulfilled. For example the organisation could fulfil only the last criteria for it to receive one point for the measure.

Appendix 3 – Abbreviations Used in the Analysis

Organisation	Abbreviation
Academy of Finland	AKA
Finnish Environment Institute	SYKE
Finnish Food Safety Authority	EVIRA
Finnish Institute of Occupational Health	TTL
Finnish Meteorological Institute	IL
Geological Survey of Finland	GTK
Institute for the Languages of Finland	KOTUS
Kone Foundation	KONE
National Institute for Health and Welfare	THL
National Land Survey of Finland	MML
Natural Resources Institute Finland	LUKE
Radiation and Nuclear Safety Authority	STUK
Tekes	TEKES
VATT Institute for Economic Research	VATT
VTT Technical Research Centre of Finland	VTT

Appendix 4 – Data Collected for the Analysis

Data for research institutions is available for download at:
http://urn.fi/urn:nbn:fi:csc-kata20171113110158922883

Data for research funding organisations is available for download at:
http://urn.fi/urn:nbn:fi:csc-kata20171113110429829089