Open Science and Research in Finland

Evaluation of Openness in the Activities of Research

Organisations and Research Funding Organisations in 2016

Summary

This evaluation of the openness of Finnish research organisations 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 includes a comparison with selected European research funding organisations.

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

The 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. However, as Open Science and openness are interpreted differently depending on the country or target of the funding instrument, the overall comparison has limitations.

This year, we were to some extent able to use the previous results to evaluate development: the indicators used in the evaluation show consistent and comprehensive progress towards openness. Two organisations managed to improve their openness with an overall score of 30. One organisation has reached the highest maturity level according to this evaluation and 12 are on the second highest level. Last year, only two organisations reached the second highest maturity level and none were at the highest level.

However, we are shooting at a moving target, as the open science landscape is constantly changing. There will be no similar evaluation in 2017.

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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, the recent 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

This evaluation of research organisations covers all major Finnish research-performing organisations, a total of 14 universities, 24 universities of applied sciences, 5 university hospitals and 12 research institutions.

The target of evaluating organisations that perform research is:

- To establish a clear picture of the current level of openness in research organisations
- To evaluate progress since 2015
- 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 selected national research funding organisations are compared with a sample of eight selected and similar-sized European research funding organisations and Horizon 2020.

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 compare the results of the national research funding organisations with selected European research funding organisations
- 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

The sample of research funding organisations comprises Nordic neighbours, similar-sized countries in the EU and the European Commission:

- Danish National Research Foundation
- FWF (Austrian Science Fund)
- Horizon 2020
- Interreg Baltic Sea Region
- NordForsk
- The Research Council of Norway
- The Swedish Research Council
- Vinnova

The evaluation includes the following steps:

1) **Preliminary Data Collection**: The data used in the preliminary analysis consists of each organisation's external website.
2) **Preliminary Analysis**: On the basis of this information, the preliminary level of openness within the organisations has been scored with reference to a number of areas.
3) **Preliminary Report**: Preliminary evaluation based on the preliminary analysis.
4) **Complementary Data Collection:** Data collected via a request for information sent to the selected organisations by the Ministry of Education and Culture.
5) **Final Analysis**: Based on preliminary and complementary data collection.
6) **Final Report**: This report, a final analysis based on the combined data.

2. The Approach

The target of this evaluation is to assess the openness of operational cultures in research organisations 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.
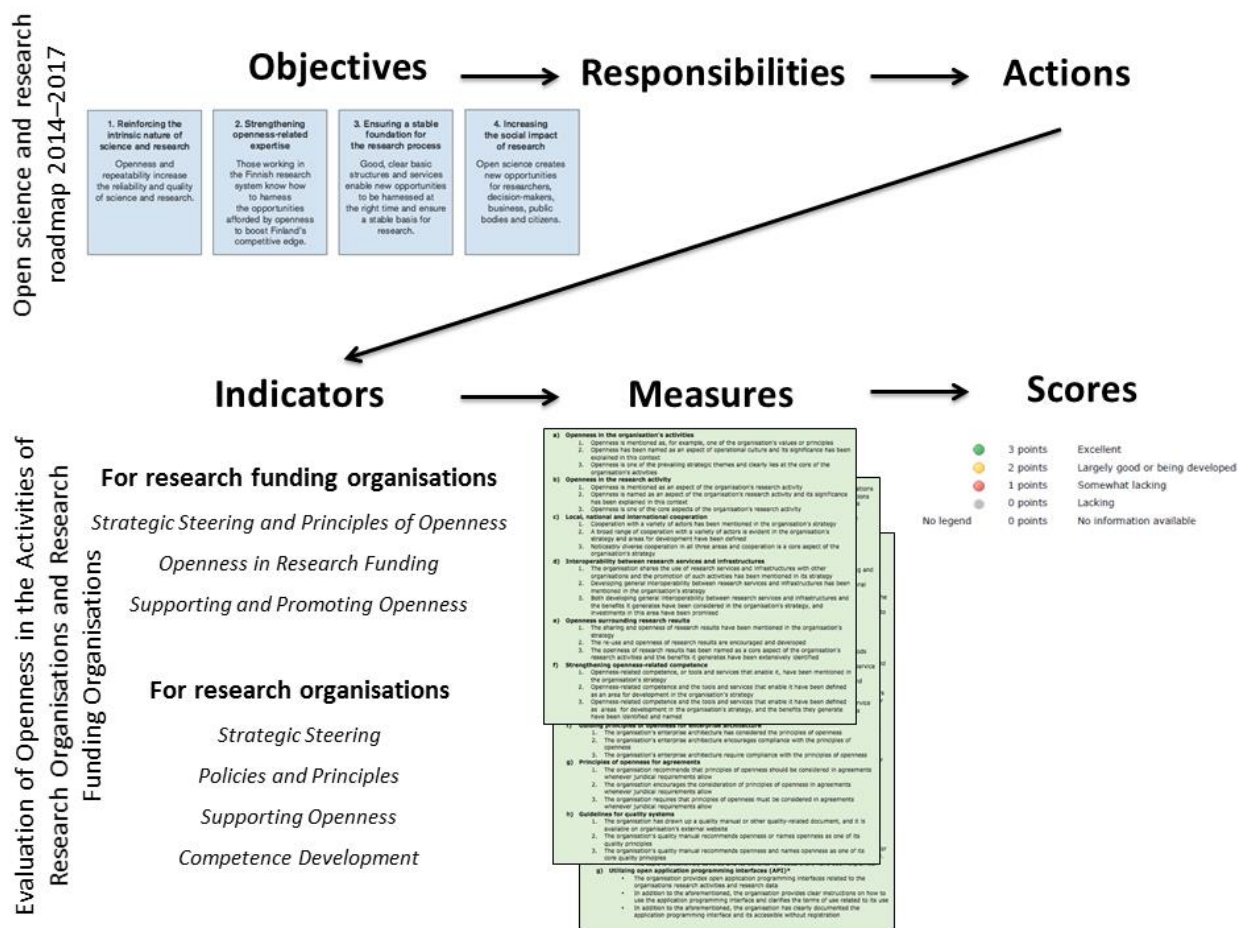
Figure 1: Relation of this evaluation and its indicators and measures to the Open Science and Research Roadmap 2014–2017

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 this 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 has been 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 research 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 analysis 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.

For national research funding organisations, the preliminary data was collected in April 2016. For European research funding organisations and national research organisations, it was collected in August–September 2016.

2.2 Complementary Data Collection

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

For national research funding organisations, the complementary data was collected in June–August 2016 and for European research funding organisations and national research organisations it was collected in September–October 2016.

The request for information was sent to 11 research funding organisations and 55 research-performing organisations. Responses were received from 11 research funding organisations (a response rate of 100 per cent) and 48 research organisations (a response rate of 87 per cent).

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

The final 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 organisations and research funding organisations.

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 performing organisations were:
1) Strategic Steering

2) Policies and Principles
3) Indicators and Scoring Principles
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 organisations 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 compared with selected European research funding organisations. The sample supports the identification of best practices and areas of development among Nordic neighbours, similar sized countries in the EU and the European Commission. For the sake of clarity, a specific selection is made based on this rationale. The sample consists of a wide spectrum of programmes and organisational types from several countries and the European Commission, with distinct scopes of funding. Nevertheless, the common ground for most of these organisations is funding mainly targeted at basic research. Furthermore, Sweden's Innovation Agency, Vinnova, and a Programme that funds transnational cooperation on regional development, Interreg Baltic Sea Region, are included in the sample. It should be noted that the latter two have different scopes of funding, although these two organisations also fund higher education projects. Against this background, the comparison of organisations with different funding scopes must be carefully interpreted and a similar level of openness should not be required. Since Open Science and openness are defined differently, depending on the country or target of the funding instrument, the overall comparison has limitations.

Data was collected based on a request for information sent to the selected European research funding organisations by the Ministry of Education and Culture. In the request for information, the research funding organisations were able to add information to and correct mistakes or misinformation in the preliminary data and analysis. To ensure an equal comparison between the organisations, documents in languages other than English were not considered. In addition, sources from websites other than those of research funding organisations were disregarded, since only the research funding organisations themselves and their communications on open science were analysed.

A request for information was sent to 11 research funding organisations and responses were received from 11 such organisations (a response rate of 100 per cent).

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 individual measures used to score organisations based on this indicator. Table 3 shows the scoring for each organisation in accordance with 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

Six of the funders have included openness as an organisational value or principle in their strategies. One funder mentions openness as a prevailing strategic theme. Nine organisations promote openness and the re-use of research outputs in the research they fund and two name this as one of the core aspects of their research funding.

All but one of the research funders included in this analysis engage in well-established national and international cooperation, which is a core part of the strategic steering of eight of them.

Organisation	Strategic Steering a	b	c	d	e	Total Points
Academy of Finland	red	yellow	green	grey	red	7
Danish National Research Foundation	yellow	yellow	green	grey	grey	5
FWF (Austrian Science Fund)	red	green	green	yellow	red	8
Horizon 2020	green	green	green	yellow	yellow	13
Interreg Baltic Sea Region	grey	yellow	green	yellow	grey	6
Kone Foundation	grey	grey	grey	grey	grey	0
NordForsk	red	yellow	green	green	grey	9
TEKES	grey	yellow	green	grey	red	5
The Research Council of Norway	yellow	yellow	yellow	yellow	grey	7
The Swedish Research Council	grey	red	yellow	yellow	grey	5
Vinnova	grey	grey	green	yellow	grey	5

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

The interoperability of funded research infrastructures is being actively developed within six funders included in this analysis. One funder is developing these even further, having acknowledged the benefits. It should also be noted that some of the funders do not fund research infrastructures at all. Four funders mentioned the strengthening of openness-related competencies 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 individual measures used to score organisations according to this indicator. Table 5 shows the scoring, based on this indicator, for each organisation.

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 but one of the funders included in this analysis apply principles related to open access publishing: one of the funders encourage and seven of the funders require that research publications be published via open access channels.

Eight funders have policies on research data in place. Three of these recommend the open publication of research data, two encourage this and three require that research data be openly published.

Organisation	Funding Openn. a b c d	Total Points
Academy of Finland	green green yellow yellow	10
Danish National Research Foundation	green grey grey grey	3
FWF (Austrian Science Fund)	green green grey grey	6
Horizon 2020	green yellow red yellow	8
Interreg Baltic Sea Region	green green grey red	7
Kone Foundation	red red grey grey	2
NordForsk	yellow red grey yellow	5
TEKES	red grey red grey	2
The Research Council of Norway	green red grey green	7
The Swedish Research Council	green yellow grey yellow	7
Vinnova	grey grey grey red	1

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

Three funders have guidelines on the openness of research methods in relation to the research they fund and one of them encourages openness in research methods.

Seven funders have principles on openness with respect to the research infrastructures they fund, with two of them recommending, four encouraging, and one requiring the shared and open use of these infrastructures. 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 scoring for each organisation based on using this indicator. Table 7 shows the individual measures used to evaluate organisations using 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

More than half of the funders included in this analysis have made instructions available for funding applicants and have comprehensive instructions on open research practices and how their research funding takes these into account.

Most research funders present the possibility of making research outputs open to funding applicants.

Organisation	Supporting Openness a	b	c	d	e	Total Points
Academy of Finland	red	yellow	green	green	yellow	7
Danish National Research Foundation	red	green	green	grey	red	3
FWF (Austrian Science Fund)	green	green	green	green	yellow	12
Horizon 2020	green	green	green	green	green	13
Interreg Baltic Sea Region	grey	grey	green	grey	red	2
Kone Foundation	grey	yellow	green	green	yellow	5
NordForsk	grey	green	green	red	green	7
TEKES	red	red	green	red	green	6
The Research Council of Norway	yellow	yellow	green	grey	yellow	7
The Swedish Research Council	green	green	yellow	green	red	12
Vinnova	grey	grey	red	grey	grey	1

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

All of the research funders broadly explain the process of their funding calls and the criteria used. One research funder has openness and re-use of research as an evaluation criteria, while another also explains the indicators used to measure this.
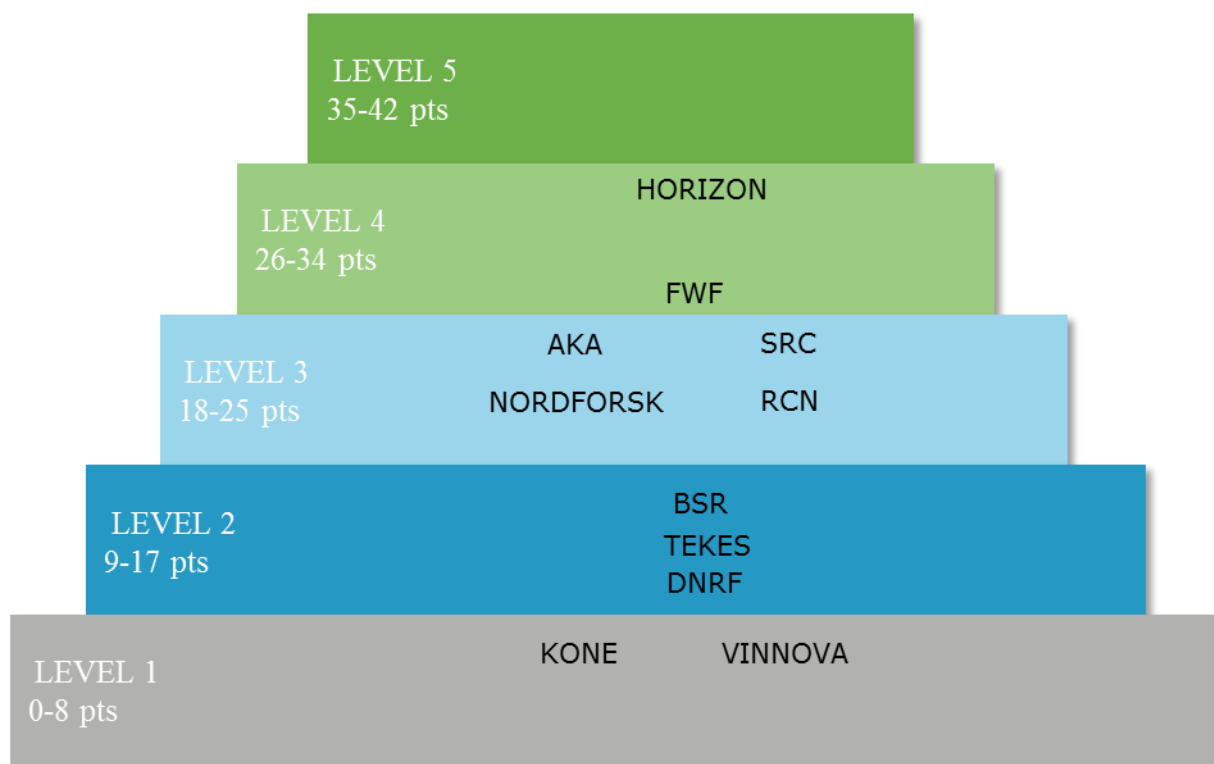
Six of the research funders monitor openness to some extent, whereas three have monitoring of openness as a permanent part of joint reporting performed by the funded researchers.

All but one of the research funders share information about funding decisions on their website. Most of them make the decisions available in machine-readable format and one provides them through an open API.

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

Evaluation of Operational Culture Maturity Rankings of Research Funding Organisations

LEVEL 5
35-42 pts

LEVEL 4
26-34 pts
HORIZON
FWF

LEVEL 3
18-25 pts
AKA   SRC
NORDFORSK   RCN

LEVEL 2
9-17 pts
BSR
TEKES
DNRF

LEVEL 1
0-8 pts
KONE   VINNOVA

organisation included in this analysis.
Figure 2: Overview of operational culture maturity rankings of research funding organisations

Horizon 2020	34
FWF (Austrian Science Fund)	26
Academy of Finland	24
The Swedish Research Council	24
NordForsk	21
The Research Council of Norway	21
Interreg Baltic Sea Region	15
TEKES	13
Danish National Research Foundation	11
Kone Foundation	7
Vinnova	7

Table 8: Total sum scores across all indicators for each research funding organisation.

4. Promoting Openness in Research Organisations

Finnish research-performing organisations are compared with the results of the evaluation performed in 2015. Data and a request for information were sent to the organisations by the Ministry of Education and Culture. In the request for information, the research organisations were able to add information to and correct mistakes or misinformation in the preliminary data and analysis. The request for information was sent to 55 research organisations and responses were received by 48 research organisations (a response rate of 87 per cent).

This year, we were able to use the previous results to evaluate development to some extent – the indicators used in the evaluation show consistent and comprehensive progress towards openness. Two organisations managed to improve their openness with a total score of 30. One organisation had reached the highest maturity level in this evaluation, while a total of 11 organisations were on the second highest level. Last year, only two organisations reached the second highest maturity level and none were at the highest level.

Research institutes show more modest development. University hospitals are not yet aboard the current transition towards a more effective and open science and research culture.

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

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.

> **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

Universities

Most universities scored well in terms of cooperation with other organisations, both nationally and internationally as well as locally. More than half of the universities valued openness in their activities, or in their values. The strengthening of openness-related competences at strategic level was mentioned by exactly half of the universities.

Within their strategies, more than half of the universities have adopted notions of openness with respect to research results and interoperability between research services and infrastructures.

Scoring for universities based on this indicator is shown in Table 10.

Universities of applied sciences

Almost all of the universities of applied sciences mention cooperation in their strategy documents, at local, national and international level. Four organisations define such cooperation as a core element of their strategy.

Universities of applied sciences prioritise openness of research activities in just three cases, but openness within the organisation's activities as a general value is mentioned in approximately half of such organisations.

The scoring for universities of applied sciences based on this indicator is shown in Table 10.

Organisation	Strategic Steering a b c d e f g	Total points
AALTO		6
HANKEN		5
HY		14
ISY		6
JY		13
LTY		12
LY		3
OY		10
TAIDE		3
TAY		7
TTY		9
TY		12
VY		3
ÅA		14
ARCADA		6
CENTRIA		4
DIAK		3
HAAGA-HELIA		2
HAMK		3
HUMAK		3
JAMK		2
KAMK		4
KARELIA		2
KYAMK		4
LAMK		4
LAPIN AMK		5
LAUREA		7
MAMK		3
METROPOLIA		4
NOVIA		2
OAMK		3
SAIMAA		6
SAMK		2
SAVONIA		4
SEAMK		6
TAMK		3
TURUN AMK		3
VAMK		1

Table 10: Scoring for universities and universities of applied sciences based on the Strategic Steering indicator

Research institutions

Openness as an organisational value or guiding principle was mentioned in more than half of cases, while others barely referred to it in their broader description of their working culture. Two organisations noted that openness was a feature of their research activities.

Local, national and international collaboration is strongly noted in the research institutions' strategic definition of policy. Collaboration is established at all levels, leading to high scores with respect to this measure.

Only three of the research institutions raised interoperability between research services and infrastructures within their strategy documents. Six institutions mention openness of research results in their strategic work. The strengthening of openness-related competences is not defined or mentioned in the strategies of research institutions.

Organisation	Strategic Steering a b c d e f g	Total points
EVIRA		3
GTK		6
IL		3
KOTUS		4
LUKE		9
MML		7
STUK		3
SYKE		7
THL		6
TTL		4
VATT		2
VTT		4

Table 11: Scoring for research institutions for Strategic Steering - indicator

With respect to this indicator, the scoring of research institutions is shown in Table 11.

University hospitals

University hospitals engage in broad collaboration at local, national and international level. Cooperation with local universities and research institutions is mentioned in all of the strategies and such collaboration is regarded as being of major value in some. Two university hospitals mention interoperability and shared use of research infrastructures and services as part of their strategies.

Openness as a general commitment, or as a specific one with regard to open science and its practices, was not found within the strategies of university hospitals. Two organisations mentioned openness as a value within the organisation's activities in general.

Organisation	Strategic Steering a b c d e f g	Total points
HYKS		6
KYS		4
OYS		4
TAYS		2
TYKS		5

Table 12: Scoring for university hospitals for Strategic Steering - indicator

The scoring for university hospitals based on this indicator is shown in Table 12.

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 13 shows the measures considered under Policies and Principles.

> **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 13: Measures for Policies and Principles indicator

Universities

Most universities had policies concerning the self-archiving of scientific publications, which may be recommended, encouraged, or required. Of the two open-access methods, self-archiving was more popular within the publication principles of the universities.

More than half of the universities have established openness principles in relation to their research methods. Five of the universities have principles of openness with respect to agreements, but just over half have such principles relating to the availability, use and licensing of research data and material; user rights and principles of openness for services and resources; and guiding principles for system architecture.

Nine of the universities have at least considered an Open Science framework and five have guiding principles of openness with respect to cooperation.

All but two of the universities provide information on their quality control system.

The scoring for universities based on this indicator is shown in Table 14.

Universities of applied sciences

With respect to the principles governing the self-archiving of scientific publications, the universities of applied sciences rely on a joint open access statement issued by their rectors in 2009. However, nine of the organisations recommend open-access publications in general for their scientific publications. Two organisations recommend openness relating to research methods and only one organisation has a policy on the openness of research data.

Only one organisation provides guidelines on user rights and the principles of openness with respect to its services and resources. Six organisations have at least considered an Open Science framework.

Seven universities of applied sciences have principles of openness for cooperation and seven have some policies in place concerning principles of openness in agreements.

Almost all of the organisations have thoroughly described their quality systems, but openness is recognised as an important instrument in such work by only four universities of applied sciences.

The scoring for universities of applied sciences based on this indicator is shown in Table 14.

Research institutions

Most research institutes at least recommend open scientific publication and self-archiving. With respect to the principles of open research data availability, reuse and licensing, many institutions recommend the use of open licensing.

Around a quarter of institutions have published their quality systems or guidelines, but none of these mentioned openness as a guiding principle of quality work. More than half of the research organisations have principles of openness in relation to cooperation and agreements.

The scoring for research institutions, based on this indicator, is shown in Table 15.

University hospitals

None of the university hospitals have policies or principles of any kind on open-access publishing. One of the organisations provides principles relating to research methods, but none have principles of openness relating to research data.

Two organisations have principles of cooperation and one university hospital has openness principles in place with respect to agreements.

The scoring for university hospitals based on this indicator is shown in Table 16.

Organisation	Policies and Principles a b c d e f g h i	Total Points
AALTO		13
HANKEN		15
HY		16
ISY		11
JY		12
LTY		11
LY		8
OY		13
TAIDE		0
TAY		8
TTY		10
TY		7
VY		3
ÅA		4
ARCADA		4
CENTRIA		3
DIAK		12
HAAGA-HELIA		5
HAMK		2
HUMAK		2
JAMK		3
KAMK		4
KARELIA		2
KYAMK		3
LAMK		7
LAPIN AMK		2
LAUREA		8
MAMK		3
METROPOLIA		8
NOVIA		3
OAMK		4
SAIMAA		4
SAMK		2
SAVONIA		3
SEAMK		7
TAMK		3
TURUN AMK		3
VAMK		2

Table 14: Scoring for universities and universities of applied sciences for Policies and Principles -indicator

Organisation	Policies and Principles a b c d e f g h i	Total Points
EVIRA		4
GTK		5
IL		3
KOTUS		9
LUKE		7
MML		4
STUK		1
SYKE		7
THL		3
TTL		9
VATT		2
VTT		5

Table 15: Scoring for research institutions in accordance with the Policies and Principles indicator

20

Organisation	Policies and Principles a b c d e f g h i	Total Points
HYKS	⚫⚫⚫⚫⚫⚫⚫⚫⚫	0
KYS	⚫⚫🔴⚫⚫⚫🔴🔴⚫	3
OYS	⚫⚫⚫⚫⚫⚫⚫⚫⚫	0
TAYS	⚫⚫⚫⚫⚫⚫⚫⚫⚫	0
TYKS	⚫⚫⚫⚫⚫⚫🔴⚫⚫	1

Table 16: Scoring for university hospitals for Policies and Principles -indicator

4.3 Supporting Openness

The measures considered under this indicator comprise the concrete actions taken in support of openness. These measures include monitoring the openness of an organisation's research activities and making use of such information. Measures related to services that support and encourage the use of metadata for research materials and when documenting research publications are also included. Table 17 shows the measures considered in terms of Supporting Openness.

> **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 on scoring based on these measures.**

Table 17: Measures for Supporting Openness indicator

Universities

Almost all universities are monitoring the openness of their research activities, most notably the visibility of research in the scientific and social media. Such monitoring is active and being developed in almost all of the organisations.

The use of services for cataloguing and creating metadata is active in all except two of the institutions.

All of the universities provide some guidelines and support on services for documenting research publications and materials.

The scores for universities based on this indicator is shown in Table 18.

Universities of applied sciences

Universities of applied sciences most often monitor the visibility of their research, as almost all of them make use of such information. Around half of these organisations monitor the openness of publishing and research data to some extent.

Eight organisations make use of services related to metadata on research materials. A few organisations provide support in relation to services for documenting research publications and materials, and the re-use and findability of research results.

The scores for universities of applied sciences based on this indicator are shown in Table 18.

Research institutions

Research institutions widely monitor the openness and visibility of their research activities; such monitoring is being further developed in most of the organisations. The most monitored quantity is the visibility of research in terms of its impact in both the scientific and social media.

Organisation	Openness a b c d e	Points
AALTO		10
HANKEN		9
HY		12
ISY		10
JY		12
LTY		12
LY		12
OY		10
TAIDE		1
TAY		13
TTY		10
TY		9
VY		6
ÅA		6
ARCADA		4
CENTRIA		4
DIAK		5
HAAGA-HELIA		5
HAMK		5
HUMAK		0
JAMK		2
KAMK		4
KARELIA		6
KYAMK		5
LAMK		9
LAPIN AMK		0
LAUREA		5
MAMK		6
METROPOLIA		3
NOVIA		3
OAMK		1
SAIMAA		5
SAMK		4
SAVONIA		5
SEAMK		9
TAMK		3
TURUN AMK		5
VAMK		1

Table 18: Scoring for universities and universities of applied sciences for Supporting Openness -indicator

22

Almost all of the research institutions make use of services for cataloguing and creating metadata for research materials. Only three provide guidelines or support with respect to services for documenting research publication.

The scoring for research institutions according to this indicator is shown in Table 19.

University hospitals

Two of the university hospitals monitor the openness of their publishing and one extends such monitoring to research data. Two of the organisations monitor the visibility of their research activity.

One university hospital uses services for cataloguing and creating metadata for research materials, but none of the organisations make use of services for documenting research publications and materials

The scoring for university hospitals according to this indicator is shown in Table 20.

Organisation	Supporting Openness a b c d e	Total Points
EVIRA		4
GTK		10
IL		7
KOTUS		7
LUKE		6
MML		7
STUK		0
SYKE		11
THL		0
TTL		7
VATT		7
VTT		9

Table 19: Scoring for research institutions for Supporting Openness -indicator

Organisation	Supporting Openness a b c d e	Total Points
HYKS		0
KYS		6
OYS		2
TAYS		0
TYKS		4

Table 20: Scoring for university hospitals for Supporting Openness -indicator

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 21 shows measures considered with respect to Competence Development.

> **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 21: Measures for Competence Development indicator

Universities

Openness is supported, at least to some extent, in every university. Organisations support openness well in terms of the lifecycle management of research data and the re-use and findability of research results. Recommendations on the use of shared services are made by almost every university except one.

All universities except one have ongoing or are developing training in open science and research.

The scores for universities in accordance with this indicator is shown in Table 22.

Universities of applied sciences

Many universities of applied sciences have insufficient guidelines on the lifecycle management of research data, the re-use and findability of research results, and the use of shared services.

In most such organisations, training on open science and research is ongoing or being developed.

The scoring for universities of applied sciences according to this indicator is shown in Table 22.

Organisation	Comp. Devel. a	b	c	d	Total Points
AALTO					10
HANKEN					8
HY					12
ISY					8
JY					11
LTY					9
LY					8
OY					11
TAIDE					5
TAY					11
TTY					12
TY					11
VY					3
ÅA					1
ARCADA					2
CENTRIA					1
DIAK					3
HAAGA-HELIA					3
HAMK					3
HUMAK					0
JAMK					2
KAMK					1
KARELIA					4
KYAMK					1
LAMK					6
LAPIN AMK					2
LAUREA					5
MAMK					1
METROPOLIA					2
NOVIA					3
OAMK					0
SAIMAA					0
SAMK					0
SAVONIA					1
SEAMK					8
TAMK					1
TURUN AMK					1
VAMK					1

Table 22: Scoring for universities and universities of applied sciences for Competence Development -indicator

Research institutions

Around half of the research institutions provide support on the re-use and findability of research results and the lifecycle management of research data. None of the organisations provide guidelines on using shared services.

In exactly half of the organisations, training in open science is either developed or actively ongoing.

The scoring for research institutions, based on this indicator, is shown in Table 23.

University hospitals

None of the university hospitals have guidelines or support available for the lifecycle management of research data or the use of shared services. Three organisations provide guidelines on the re-use and findability of research results.

One university hospital has plans for training in open science and research.

The scoring for university hospitals, based on this indicator, is shown in Table 24.

Organisation	Comp. Devel. a b c d	Total Points
EVIRA	⚪ ⚪ ⚪ 🟡	2
GTK	🔴 ⚪ ⚪ 🔴	2
IL	🔴 🟡 ⚪ 🔴	4
KOTUS	⚪ 🔴 ⚪ ⚪	1
LUKE	⚪ ⚪ ⚪ 🔴	1
MML	⚪ 🔴 ⚪ 🔴	2
STUK	⚪ 🔴 ⚪	1
SYKE	🔴 🔴 ⚪ 🟢	5
THL	🔴 🔴 ⚪	2
TTL	🔴 ⚪ ⚪ ⚪	1
VATT	⚪ ⚪ ⚪ ⚪	0
VTT	🟡 ⚪ ⚪ ⚪	2

Table 23: Scoring for research institutions for Competence Development -indicator

Organisation	Comp. Devel. a b c d	Total Points
HYKS	⚪ 🔴 ⚪	1
KYS	⚪ ⚪ ⚪ 🔴	1
OYS	⚪ ⚪ ⚪ ⚪	0
TAYS	⚪ 🟡 ⚪	2
TYKS	⚪ 🔴 ⚪ ⚪	1

Table 24: Scoring for university hospitals for Competence Development -indicator

4.5 Maturity Rankings of Research Organisations

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 25 presents the total sum of scores, across all indicators, for each research organisation included in this analysis.
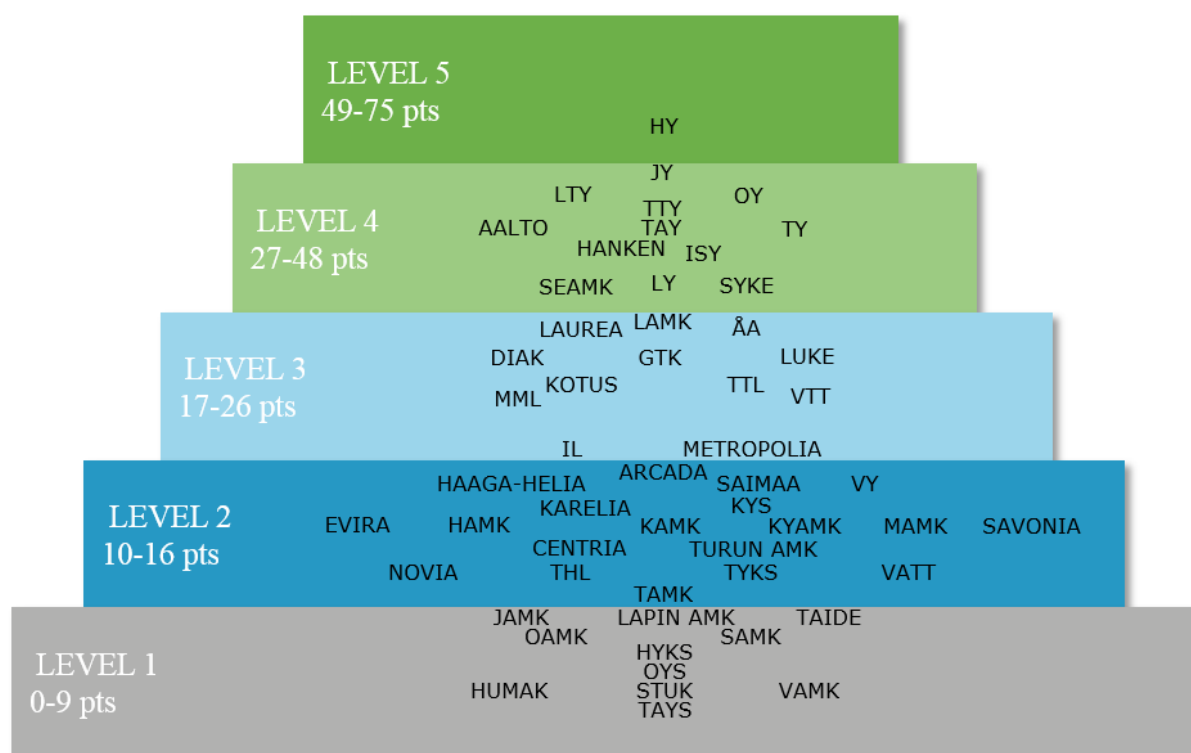
Figure 3: Overview of operational culture maturity rankings of research organisations.

HY	54	LAUREA	25	VY	15	VATT	11
JY	48	ÅA	25	KARELIA	14	TAMK	10
LTY	44	DIAK	23	KYS	14	JAMK	9
OY	44	GTK	23	EVIRA	13	LAPIN AMK	9
TTY	41	LUKE	23	HAMK	13	TAIDE	9
AALTO	39	KOTUS	21	KAMK	13	OAMK	8
TAY	39	TTL	21	KYAMK	13	SAMK	8
TY	39	MML	20	MAMK	13	HYKS	7
HANKEN	37	VTT	20	SAVONIA	13	OYS	6
ISY	35	IL	17	CENTRIA	12	HUMAK	5
LY	31	METROPOLIA	17	TURUN AMK	12	STUK	5
SEAMK	30	ARCADA	16	NOVIA	11	VAMK	5
SYKE	30	HAAGA-HELIA	15	THL	11	TAYS	4
LAMK	26	SAIMAA	15	TYKS	11		

Table 25: Total sum scores across all indicators for each research organisation.

4.6 Development in Openness in the Activities of Research Organisations

In the following tables, each research organisation is ranked by its total sum score of points based on this analysis, compared to the total sum score of points in the analysis from 2015. Table 26 presents the development of openness in the activities of each higher education institution, compared to the analysis performed in 2015. Please note that university hospitals are not included in this table, since they did not feature in the 2015 analysis.

Sum score change less than or 0 points		Sum score change 1-5 points		Sum score change 6-10 points		Sum score change 11-15 points		Sum score change more than 16 points	
TAIDE	0	HAMK	4	KYAMK	10	ISY	15	LTY	30
MAMK	-1	JAMK	4	METROPOLIA	9	ARCADA	14	OY	30
SAMK	-4	KAMK	4	NOVIA	7	LAUREA	14	HANKEN	23
HUMAK	-11	KARELIA	3	SAVONIA	7	ÅA	14	TY	21
		OAMK	3	TURUN AMK	6	AALTO	13	DIAK	20
		VAMK	3			SAIMAA	12	LAMK	19
		CENTRIA	2					LY	19
		LAPIN AMK	2					TAY	18
		TAMK	2					HY	17
		VY	2					JY	17
		HAAGA-HELIA	1					SEAMK	17
								TTY	17

Table 26: Development of openness in the actions of higher education institutions by sum score changes, compared to sum scores in analysis of higher education institutions in 2015.

Table 27 presents the development of openness in the activities of each research institution, compared to the analysis made in 2015. Note that the measures have changed between this analysis and the analysis in 2015 and this has an effect on the score changes.

Sum score change less than or 0 points		Sum score change 1-5 points		Sum score change 6-10 points		Sum score change 11-15 points		Sum score change more than 16 points	
TTL	-2	LUKE	5	VTT	7			KOTUS	18
VATT	-3	GTK	4					SYKE	18
MML	-4	EVIRA	2						
IL	-8								
STUK	-8								
THL	-12								

Table 27: Development of openness in the actions for research institutions, in terms of sum score changes compared to sum scores in the analysis of research institutions in 2015.

Effective progress has been made towards open operational culture in comparison to the 2015 report. The position of some research organisations in the maturity rankings has changed dramatically. Some organisations have managed a sum score change of 30 score points across all indicators, which is substantial. Even the 2015 top organisations have improved their performance, and one organisation has reached the highest maturity level.

A number of strategic decisions have been necessary in order to improve openness in research environments. A comparison of research funding organisations indicates that research organisations, researchers and funding agencies in Finland still need to systematically reinforce the openness dimension of Finnish science and research. However, the gap with the top performers is not wide.

This type of evaluation, with indicators for openness, seems to help organisations in targeting their actions, and could be applied to other system-level change initiatives.

5. Appendices

Appendix 1 – Indicators and Measures for Research Funding Organisations

Appendix 2 – Indicators and Measures for Research Organisations

Appendix 3 – Abbreviations Used in the Analysis

Appendix 4 – Data Collected for 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 Organisations

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

* The scoring in this measure differs from the rest as the measure indicates if the organisation in question provided an answer to the request for information sent by the Ministry of Education and Culture in the Complementary Data Collection. If an answer was provided, the organisation received one point, if no answer was provided, the organisation received zero points.

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

* In order for a university of applied science to achieve full points in measure b, it must have stated its compliance with the Rectors' Conference of Finnish University of Applied Sciences Open Access declaration on its external website. However, if the aforementioned declaration or other recommendation for self-archiving was absent, the organisation was still given one point.

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 an 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
Aalto University	AALTO
Åbo Akademi University	ÅA
Academy of Finland	AKA
Arcada University of Applied Sciences	ARCADA
Austrian Science Fund	FWF
Centria University of Applied Sciences	CENTRIA
Danish National Research Foundation	DNRF
Diaconia University of Applied Sciences	DIAK
Finnish Environment Institute	SYKE
Finnish Food Safety Authority	EVIRA
Finnish Institute of Occupational Health	TTL
Finnish Meteorological Institute	IL
Geological Survey of Finland	GTK
Haaga-Helia University of Applied Sciences	HAAGA-HELIA
Häme University of Applied Sciences	HAMK
Hanken School of Economics	HANKEN
Helsinki Metropolia University of Applied Sciences	METROPOLIA
Helsinki University Central Hospital	HYKS
Horizon 2020	HORIZON
Humak University of Applied Sciences	HUMAK
Institute for the Languages of Finland	KOTUS
Interreg Baltic Sea Region	BSR
JAMK University of Applied Sciences	JAMK
Kajaani University of Applied Sciences	KAMK
Karelia University of Applied Sciences	KARELIA
Kone Foundation	KONE
Kuopio University Hospital	KYS
Kymenlaakso University of Applied Sciences	KYAMK
Lahti University of Applied Sciences	LAMK
Lapland University of Applied Sciences	LAPIN AMK
Lappeenranta University of Technology	LTY
Laurea University of Applied Sciences	LAUREA
Mikkeli University of Applied Sciences	MAMK
National Institute for Health and Welfare	THL
National Land Survey of Finland	MML
Natural Resources Institute Finland	LUKE
NordForsk	NORDFORSK
Novia University of Applied Sciences	NOVIA
Oulu University Hospital	OYS
Oulu University of Applied Sciences	OAMK
Radiation and Nuclear Safety Authority	STUK
Saimaa University of Applied Sciences	SAIMAA
Satakunta University of Applied Sciences	SAMK
Savonia University of Applied Sciences	SAVONIA
Seinäjoki University of Applied Sciences	SEAMK
Tampere University Hospital	TAYS
Tampere University of Applied Sciences	TAMK
Tampere University of Technology	TTY
Tekes	TEKES
The Research Council of Norway	RCN
The Swedish Research Council	SRC

Turku University Hospital	TYKS
Turku University of Applied Sciences	TURUN AMK
University of Eastern Finland	ISY
University of Helsinki	HY
University of Jyväskylä	JY
University of Lapland	LY
University of Oulu	OY
University of Tampere	TAY
University of the Arts Helsinki	TAIDE
University of Turku	TY
University of Vaasa	VY
Vaasa University of Applied Sciences	VAMK
VATT Institute for Economic Research	VATT
Vinnova	VINNOVA
VTT Technical Research Centre of Finland	VTT

Appendix 4 – Data Collected for Analysis

Data for research funding organisations is available at:
http://urn.fi/urn:nbn:fi:csc-kata20161116100122819199

Data for research organisations is available at:
http://urn.fi/urn:nbn:fi:csc-kata20161116095550465398