1. Overview of the initiative

Name of initiative:
Finnish Open Science and Research Initiative (ATT)

Objective:
The aim of the project was to make scholarship, science and research more reliable, support the endorsement of open research practices in the research community, and increase the social impact of research and scholarship. The ATT Initiative is a holistic program seeking a national transformation towards open science.

Type (strategy, policy, bill of law,...):
Strategy and policy program

Responsible policy making bodies:
- Leading Ministry / Agency: Ministry of Education and Culture
- Relevant Ministries/ Agencies: Main research funders: Academy of Finland and Tekes

Responsible implementing bodies:
CSC – IT Center for Science acted as a coordinator in the Initiative. Universities and research institutes, libraries, research archives, research support organizations.

International reference framework (if relevant):
The Initiative itself did not have direct involvement in international reference groups, but it helped to unify the Finnish position on different international policy groups. The Initiative also organized several international seminars on open science.

Target audience:
Targets audience is wide. It includes researchers, research administrators, policy makers, research funders etc.

Total duration of initiative (years):
The Initiative run from 2014 to 2017. The legacy of the ATT Initiative was then given to the Federation of Finnish Learned Societies, which was assigned the coordination responsibility of the national open science development.

Total budget of initiative (in national currency):
Total budget is difficult to estimate as the Initiative consists of different elements, coordinating activities and national services for open science that were built during the Initiative.

Type of data concerned (data from research, public sector information, private sector information):
Initiative mainly concerned research data

**Target audience (scientific community, business, civil society, general public):**

Scientific community

**Expected results:**

The ATT Initiative included three mutually supportive concepts:

1. Research publications
2. Research data
3. Research methods

The project clarifies the target state of the overall architecture of the research system and the related reference architectures, supports the clarification and construction of research system processes, takes into account copyright, data protection etc. issues as part of the operating model, and identifies and develops knowledge related to open science. In addition, a user perspective on research data is organized and innovation is promoted by creating environments and promoting the integration of open science and culture as part of traditional science and research.

**2. Rationale, motives and key drivers**

In 2009, a national and cross-sectoral study project was created to map and coordinate more efficient usage of publicly funded research outputs. The ensuing final report in 2011, *Putting data into use. A roadmap for the utilization of electronic data in research*, outlined the way forward. The following vision was adopted:

> Finland has a clear data policy supported by common e-services. Data resources generated with the aid of public funding are easily available for research and in principle without any charge, guided by legislation and uniform terms of use and taking the data confidentiality issues into consideration. A sustainable development and funding system of the information infrastructure guarantees that both existing and new data are sufficiently described and made available by using easy to use network services. A supportive and fair merit system supported by the funding bodies ensures that new, high quality data is added to the information infrastructure.

The underlying motivation was the notable collection of unique public sector information including digital cultural heritage, as well as high-quality knowledge and skills in research fields that produce vast amounts of electronic data. At that time, and even today, some publicly funded data was difficult to find, access or utilize. There also were, and still are, problems with issues such as scattered storage and management of data, complex legislation, terms of use, payments, and services that support the use of data. The competitiveness of Finnish research requires a strong commitment to the building of an information infrastructure and to the strengthening of the related knowledge and skills. These also form the basis for international research cooperation, innovativeness and the enhancement of equal opportunities for data usage among researchers. All these support the strengthening of national wellbeing and productivity.

Following this, in 2012 the Ministry of Education and Culture set up the Finnish Research Data Initiative to advance open access to research publications, open access to research data and
openness of research methods. The importance of these focus areas was confirmed in the opinions gathered from major stakeholders.

Building upon these previous projects and initiatives, in 2014 the Ministry of Education and Culture started the latest and most holistic initiative, called the Open Science and Research Initiative (ATT). Its aim was to incorporate open science and research in the full research process in order to improve the visibility and impact of science and research in the innovation system and society at large. To guide the research system in Finland towards better competitiveness and higher quality, a transparent, collaborative and inspirational research process should be promoted. The measures should foster open publications, open research data, and open research methods and tools, increase skills, and improve knowledge and support services in the open science domain. Contributions from all research system actors are welcome to change the research culture towards openness. Finland will engage in international collaboration to promote open science and research.

The role of higher education institutions and public research organisations as generators of new knowledge is central. The ATT Initiative creates conditions in which the knowledge generated in the higher education institutions and public research institutions can be exploited for the benefit of the whole society, both the public and private sector. In target-setting, international developments were closely followed.

The ATT Initiative’s roadmap consists of a wide range of responsibilities given to research organisations. The topics cover strategic and policy development, services for researchers, competence development, promotion of interoperability, encouragement of the use of common service infrastructures, improvement of the replicability of research, and overall promotion of openness.

Data governance to create trust was one of the central issues in the Initiative. Disseminating knowledge on the issues of privacy, quality and ethics through seminars, working groups etc. was an important element of the Initiative. A wiki-based manual for open access was created during the Initiative.

Discoverability/findability, machine readability and data standards were important factors in the creation of open science services during the Initiative.

A recognition and reward system for data authors was highlighted as an important aspect during the Initiative. However, a coherent reward system has not yet been created.

Business models for open data provision were seen as an important area and a case for future development. In the impact report interviews, stakeholders noted that more should be learned about the business models and the role of business sectors utilising open science.

Competence building was also one of the central issues in the Initiative. Human capital and the institutional capabilities of public agencies to manage, create, curate and reuse data are central to the Initiative. These competences were built in the working groups at the same time with the services, and during seminars and other dissemination events. Without the ATT Initiative, it would
have been much harder and more expensive to create the tools and services and develop the competence of staff members.

In 2018, after the ATT Initiative had finished, the coordination and steering mandate for the national open science development was given to the Federation of Finnish Learned Societies (TSV). They are seen as a central and neutral organisation to host this type of activity. In addition, TSV has close ties to the Finnish National Board on Research Integrity (TENK) and the Committee for Public Information (TJNK), which are integral agents of open science.

3. Governance

In order to organize the implementation of the ATT Initiative, the Ministry of Education and Culture set up a strategy group, chaired by the director in charge of science policy and with high-level representatives from, among others, universities, universities of applied sciences, research institutes, other ministries and funding bodies. Under this group worked an expert group chaired by the Secretary General of the Initiative. A forum open for all interested parties convened annually to discuss and comment current topics. In addition, more focused thematic round table discussions were held for more targeted groups. All stakeholders were involved during the process, including major scientific publishers.

The strategy group’s tasks were:
- Defining the target state for open science and research for 2017 in three mutually supportive frameworks: research publications, research data and research methods
- National coordination of development efforts between the actors in the three sub-assemblies
- Identifying legislative and administrative development needs and finding solutions
- Making use of the research institute reform from an open science perspective
- Promoting cooperation between science and research at the international level and developing expertise
- Promoting the principles and policies of open science

The expert group’s tasks were:
- Promoting the dialogue between the producers and users of open science and research services
- Guiding the work of the necessary working groups
- Controlling the overall architectural work
- Arranging the necessary workshops and accurate reports

The members of the strategy group and expert group came from all the major stakeholders in the higher education and research sector. The Initiative also set up numerous working groups focusing on different areas.

The central point in the governance structure involved ensuring, on one hand, representativeness of stakeholders and, on the other, flexibility because of the changing nature of the open access phenomenon. As a major funder, the Ministry of Education and Culture had the final say in the decision making.
4. Process

The Initiative process was set up in a typically Finnish way. Before the Initiative, a working group on openness of research data had been appointed. This group carried out the preparatory work and raised major issues that should be focused on. The open data theme had already been highlighted in an earlier government strategy document. Meanwhile, the open science movement was gaining ground internationally and open science was a focus area in many groups set up by organisations such as the European Commission and OECD. The themes for the Open Science Initiative were worked out against this background.

During the Initiative, a large group of experts was harnessed in eleven expert groups. In addition, a funding call for over a million euros was carried out during the Initiative for projects that in some way advanced openness. Workshops and special reports were used to gather information and help in the steering of the Initiative. A key document was the Framework for Open Science and Research, drawn up using enterprise architecture methodology (http://urn.fi/URN:NBN:fi-fe2016122731718).

According to the midterm assessment, the most relevant disagreements were related to the notion that quality increases together with openness, the relevance of openness in making unanticipated discoveries, and cost-effectiveness of the work advancing openness. The importance of open access publications, sharing and re-use of data, and the ethics and verification of results were found highly relevant with low disagreement.

One could say that all the relevant authorities in Finland were someway involved in the Initiative. Because of this, the knowledge base for the Initiative was also quite large.

Throughout the Initiative, the strategy and expert groups arranged wide consultations of the stakeholders. Large steering groups facilitated the communication in the Initiative.

5. Adoption and implementation of the initiative

The Initiative’s roadmap had four sub-objectives:

1. Reinforcing the intrinsic nature of science and research, so that openness and repeatability increase the reliability and quality of science and research.
2. Strengthening openness-related expertise, so that those working in the Finnish research system know how to harness the opportunities afforded by openness to boost Finland’s competitive edge.
3. Ensuring a stable foundation for the research process, so that good, clear basic structures and services enable new opportunities to be harnessed at the right time and ensure a stable basis for research.
4. Increasing the societal impact of research, so that open science creates new opportunities for researchers, decision-makers, business, public bodies and citizens.
These sub-objectives were divided into more specified objectives. For example, sub-objective 2 had seven specified targets:

- Researchers will have access to user-friendly tools and services for successfully documenting and linking data.
- The lifecycle management of research data will be improved, and the importance of openness and availability will be internalised in the Finnish research system.
- Those who produce research data will know how to plan the lifecycle management of their results. Information will be available and can be reused.
- Research groups and researchers are able to choose the suitable level of openness, depending on data sensitivity, research ethics, legal constraints, age and other factors.
- Open science and research will not simply be a collection of methods and recommendations, it will be an approach that networked parties in the research system will be motivated by and trained to realise.
- Research organisations will develop competence and related services for stakeholders such as researchers and research groups, but will also provide expertise that serves society in a broader sense.
- Target groups will be informed about research data in an interesting manner, and taking their needs into account.

Targets were mainly concerned with policy. Expected results were linked to targets, meaning competence building, changes in attitudes, practical tools researchers, and putting open science more firmly in the agenda of the strategies of different organisations.

The Initiative was mostly targeted at higher education institutions and public research institutions. Larger society was taken into account mostly in the case of target 4, (Increasing the societal impact of research).

The ATT roadmap identified the relevant stakeholders groups, which were the science policy makers, research funders, research organisations and research groups, researchers, and trade and commerce. Using the measures in the roadmap, various parties took responsibility for putting policies into practice. By monitoring the progress and impact of individual measures, the Initiative’s steering group gauged how successfully the targets were reached. Monitoring was strengthened by increasing visibility, analysing shared sets of basic information, using impact assessments, and making use of any required support functions and analyses.

One successful way of monitoring progress was the evaluation of openness in the activities of organisations, i.e. organisations that performed or funded research. The results of these evaluations have been used as background material in the bilateral negotiations between the Ministry of Education and Culture and the higher education institutions.

6. International aspects
The international aspect of the Initiative was already clearly recognised in the roadmap documents: “Many international organisations are campaigning for open science. OECD reports and reviews focus on harnessing open science in industry and innovation. UNESCO’s focal point is, in addition to the civil rights of open science, its use in education. In the EU, open science has also been recognised as a key for change. In addition to the EU’s four freedoms – free movement of people, goods, services and capital – a fifth has arisen: free movement of information.” So one can say with confidence that international dimensions strongly influenced the design of the Initiative.

International aspects were recognised in several dimensions of the Initiative’s design. One of the key points was interoperability of research services and infrastructures for open access. Here internationally interoperable metadata was seen as an important factor, not only for the functioning of the services, but also for Finnish research for the purpose of obtaining international visibility and achieving a global impact. Internationalisation was also mentioned as an important factor in science policy collaboration.

7. Monitoring and evaluation

The Open Science Initiative was a holistic program seeking a national transformation towards open science. The ATT Initiative’s roadmap, published in 2014, mentioned several measures or steps to be taken. The success of these measures has not yet been comprehensively evaluated.

The strategy group outlined a set of key indicators for monitoring the progress of the Initiative. These were: doctoral programs with open science training, open access to publications (in the EU assessment) and open access to new datasets. The problem with these indicators was that their definitions changed over time and overlapping targets were introduced from other policy processes.

The Initiative published an independent review in 2016. The evaluation was carried out before the end of the initiative as it sought to offer recommendations for the last operational year of the ATT Initiative, and for the years ahead.

The review “analyses success in achieving targets, and the progress and impact of individual measures. The analysis tackles different levels, from the level of international policies to the ‘grassroots’ level. Has the initiative managed to change the culture towards openness, and what actions should we take to gain benefits from this and to ease the transition towards openness? The report tackles several key questions related to open science and research. How are researchers harnessing the benefits of open science and research? What are the societal benefits? What are the challenges? How should we support the way forward? Can we learn something from this approach to managing system-level changes?”

In the evaluation, the chosen methods were individual and group interviews (thematic), questionnaires, and web brainstorming (a web survey of 365 respondents).

Impact evaluation was chosen due to the dynamic and multilevel nature of the ATT Initiative. The impact was evaluated on three levels: interest, policy and operations. As a whole, the Initiative has had a strong impact on the ‘interest’ level. The ATT Initiative has been able to raise interest in
open science among its target groups. However, some variation was found at this level; for instance, thus far the Initiative’s impact on the innovation ecosystem has been weak.

At the policy level, the impact has been medium strong. The ATT Initiative has influenced the strategies or policies of the target group, but there has been great variation among the target groups. For example, in research organisations the impact strength varied depending on how mature the organisation’s approach was to open science. At the operational level, the impact has been weak. However, there are many activities that focus on the operational level of the target groups (i.e. services for researchers). Thus, the impact was expected to increase during the final period of the ATT Initiative.

As the impact assessment was carried out one year prior to the end of the ATT Initiative, its findings were taken into consideration in the final year of the Initiative. The ideas covered the following themes:
First, active participation in international forums and the possible conceptualisation of the ATT Initiative would support the transformation of other countries towards open science. Second, the best practices and cases from different disciplines are needed to convince the sceptics, help the organisations in their processes, and inspire new actors. Third, the development process tools should be tested, finalised and implemented. Fourth, special attention must be paid to open innovation and the innovation ecosystem, including SMEs. Fifth, specific actions are needed in order to activate researchers and staff members.

The services built during the ATT Initiative are still running, and a new open science coordination group coordinates their development. As the new services have been running for a couple of years, now would be a good time to reassess their impact on the end users.

The impact assessment can be found at [http://www.doria.fi/handle/10024/127285](http://www.doria.fi/handle/10024/127285).

The ATT Initiative also organised an evaluation of openness in the activities of research institutions and research funding organisations. The purpose of these evaluations is to highlight best practices and areas of development while initiating discussions on open science and research at the international level. 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. The evaluation was repeated third time in 2017 and it has been used as a background material in the agreement negotiations between higher education institutions and the Ministry of Education and Culture.

The evaluation examines the key indicators chosen to gauge performance with regard to openness. Key indicators are used to provide insights into the competences and capacity of the research system in supporting progress towards openness.

8. Lessons and challenges ahead
The objectives and goals of the Initiative are ambitious and multi-faceted. The ATT Initiative is a holistic program seeking a national transformation towards open science.

All in all, the ATT Initiative has definitely been an accelerator of open science in Finland and in the international context, too. The ATT Initiative has been a dynamic, multi-actor and multi-level facilitator of the transformation towards open science. It has been able to address a huge number of issues, such as digitalised services for the research field, creating reference architecture for open science, providing practical guidelines and support for researchers, and creating models and tools for open access, long-term preservation, metadata, etc. In addition, the ATT Initiative has provided comparative information for funding and research organisations on their position with respect to open science. These are just a few of the topics that one could mention. None of this would have been possible without a collaborative approach to operations.

In the impact assessment, all the participants highlighted the importance of continuing the transformation towards open science. During the interviews, the ‘future university’ was an overwhelmingly popular topic, including how open science changes the way research is conducted and how the whole sector needs to embrace openness. Also, a need to look at open science from the perspective of wider audiences was identified: for instance, how are students involved and what kinds of open science competences will they need in the future? Some respondents noted that open science should be taught at schools and kindergartens, not only in higher education. As so many major questions remain unanswered, there is a need to continue ATT in some form. In particular, the importance of the operator’s role was highlighted. The respondents thought that leaving the transformation to individual organisations would pose a risk of slowing down the pace of change.

Published in 2014, the ATT Initiative’s roadmap listed major threats and pitfalls that could obstruct the realisation of the vision of open science and research. It also outlined the possible impact of these threats, and suggested ways in which they might be prevented. One of the anticipated threats was that the opinions and needs of those using data would not be sufficiently considered. If this threat ever realised, openness would be considered a burden or a threat rather than an opportunity. This threat could largely be avoided by identifying the users’ special needs and involving the end users in the process.

Another anticipated threat involved insufficient or poorly organised resources for development and training, with no thought for the long-term future. This could lead to a situation where no one dares to invest in projects, and organisations’ operating models remain unchanged. This could be largely avoided by moving away from project-based funding to appropriate, permanent solutions. The Ministry of Education and Culture funds open science services separately, outside the Initiative’s coordination funding. In the ATT Initiative, there was a focus on training and systematic operations. At the same time, changes in working culture would yield more effective coordination and greater efficiency.

The third major threat was that openness would collapse when funding ceases in 2017; services would be forgotten and become obsolete. This was avoided by identifying the functions and services that require permanent funding. The working culture and methods of organisations and administrations should be shaped to support and prioritise openness and good data management in general. The efficient use of resources is boosted through cooperation and expertise, and
by establishing structures and working methods to support this.

One of the questions in the impact assessment was: ‘Are there any discrepancies in the procedures between different countries – Is there something in which Finland could take a role in strengthening the European/global-level policy, procedures or practices?’ During the discussions, it became evident that internationally there are strong expectations towards Finland. There are numerous topics on which it was said that Finland could take a leading role. First, an important question is how open science could be measured. In particular, the representative from UNESCO said that integrated measures could provide a new way to support policy making in their member states (e.g. the positive correlation between innovativeness and openness). Second, topics such as incentives, sustainability and skills were mentioned as being critical in implementing open science. In addition, there is a need to widen the knowledge on research infrastructures, especially in the business sector. Finally, it was hoped that a website would be launched to collect the best (and worst) practices on open science. As Finland has been the forerunner in developing the holistic approach, all the experiences would help other countries in their transformation.

All in all, according to international organisations, open science should be treated as a new ‘modus operandi’ or ‘paradigm’ for how to do research. Therefore, the Finnish way to aim at holistic transformations was praised. Thus, there is a strong wish that Finland would conceptualise the ATT Initiative and form a model that could be implemented elsewhere in the world. Finally, continuous communication with the organisations, the encouragement to make ‘noise’ on the experiences and achievements, and active involvement in different forums are needed in order to maintain the forerunner status.