8.14 FAIR DATA MATURITY MODEL (2018.06)

8.14.1 IDENTIFICATION OF THE ACTION

Service in charge	RTD.A6
Associated Services	CONNECT, OP

8.14.2 EXECUTIVE SUMMARY

Technological advancements have made all the sectors of the EU economy more data intensive and interconnected, with public administrations, research organisations and businesses producing and sharing increasing volumes of data. In their effort to produce high quality data, data professionals have to follow good data management and data stewardship practises. Beyond proper collection, annotation and archival, good data management and stewardship include the notion of long-term care of valuable digital assets, either alone or in combination with newly generated data. Good data management and stewardship is not a goal in itself but rather is a key conduit leading to easier and simpler data and knowledge discovery and evaluation, and to subsequent data and knowledge sharing, integration and reuse.
To maximise the value of data, data (sets) should have four foundational characteristics; they should be:

- 'Findable', i.e. discoverable with machine readable metadata, identifiable and locatable by means of a standard identification mechanism;
- 'Accessible', i.e. available and obtainable;
- 'Interoperable', i.e. both syntactically parseable and semantically understandable, allowing data exchange and reuse among scientific disciplines, researchers, institutions, organisations and countries; and
- 'Reusable', i.e. sufficiently described and shared with the least restrictive licences, allowing the widest reuse possible across scientific disciplines and borders, and the least cumbersome integration with other data sources.

Findability, Accessibility, Interoperability and Reusability – the FAIR principles [1] – were first introduced in 2014 and intend to define a minimal set of community-agreed guiding principles and practices that enable both machines and humans to Find (F), Access (A), Interoperate (I) and Re-use (R) data and metadata. The FAIR principles were initially focused on research data but their coverage has been extended to data produced or managed by the public sector as well. The FAIR principles apply to data in the conventional sense as well as to data-related algorithms, tools, workflows, protocols and other data-related services.
The FAIR Data Maturity Model will help public sector and research organisations to assess their maturity level in the implementation of the FAIR data principles. The FAIR Data Maturity Model will have three purposes:

a. Descriptive, i.e. to describe the as-is FAIR-related maturity level of an organisation;
b. Prescriptive, i.e. to provide guidance to improve the implementation of the FAIR principles (aka 'FAIRness') through recommendations; and

c. Comparative, i.e. to allow a benchmark based comparison amongst peers.

The Action on FAIR Data Maturity Model will deliver a self-assessment toolset that will enable organisations to evaluate the readiness and implementation level of their datasets, projects and data infrastructures vis-à-vis the FAIR data principles, along with the guidelines necessary to climb up the ladder of FAIR. At a later stage, the Model will provide estimations about the costs and benefits for organisations, both in economic and non-economic terms, for moving to a higher maturity level. That will allow the FAIR Data Maturity Model to become an instrument for providing evidence to decision makers on setting up short and long-term actions pertinent to the practical implementation of FAIR principles.
The Action will systematically coordinate all existing efforts at national and/or sectorial level to develop evaluation criteria for the FAIR Data principles, aiming to create a solution for broader adoption that will combine the most salient of their characteristics. In addition, it will align with community-driven initiatives at international, European and Member States level (e.g. GO-FAIR, Research Data Alliance, CODATA etc.) and complement other endeavours (e.g. funded by the H2020 work Programme 2018-2020) that support the FAIR Data uptake and compliance across borders and across sectors/disciplines.
The Digital Single Market Strategy [2] and the European Cloud Initiative [3] have recognised the importance of a FAIR-enabled data ecosystem by putting forward an FAIR Data Action Plan (published end 2017). The FAIR Data Maturity Model will facilitate and promote a cross-border and cross-sector data sharing and reuse and will contribute to growth and accelerate innovation in a global digital economy.

8.14.3 OBJECTIVES

The main objective of this action is to develop a self-assessment methodology that any public sector or research organisation can use in order to measure its maturity level from the following perspectives:

a. Data findability, i.e. how well an organisation describes the data it produces or manages with rich metadata, assigns to data/metadata a globally unique persistent identifier and registers or indexes them in a searchable resource;
b. Data accessibility, i.e. how well an organisation allows the retrieval of its data/metadata by their identifier using a standardized communications protocol that is open, free and universally implementable;
c. Data interoperability, i.e. how well an organisation ensures that the precise format and meaning of exchanged and shared data/metadata is preserved and understood;
d. Data reusability, i.e. how well an organisation releases data/metadata with a clear and accessible data usage license, associated with detailed provenance and follows practices that promote the reuse and share of data, unless certain privacy or confidentiality restrictions apply.

8.14.4 SCOPE

The action will deliver a self-assessment methodology for measuring the readiness and implementation level of a dataset, project or data infrastructure of any public sector or research organisation vis-à-vis the FAIR principles (Findability, Accessibility, Interoperability and Reusability). The FAIR Data Maturity Model will have three purposes: a.) descriptive, i.e. to describe the as-is

FAIR-related maturity level of an organisation, b) prescriptive, i.e. to provide guidance to improve the implementation of the FAIR data principles (aka 'FAIRness') through recommendations, and c) comparative, i.e. to allow a benchmark based comparison amongst peers. The Model will apply to data in the conventional sense as well as to data-related algorithms, tools, workflows, protocols and other data-related services produced or managed by the assessed organisation.

8.14.5 ACTION PRIORITY

This section is used to assess the priority of the proposal to become a programme's action according to Art. 7 of the ISA^2 decision[56].

1.1.1.1 Contribution to the interoperability landscape

The contribution of the action to the interoperability landscape, measured by the importance and necessity of the action to complete the interoperability landscape across the Union

Question	Answer
How does the proposal contribute to improving interoperability among public administrations and with their citizens and businesses across borders or policy sectors in Europe? *In particular, how does it contribute to the implementation of:* • *the new European Interoperability Framework (EIF),* • *the Interoperability Action Plan and/or* • *the Connecting European Facility (CEF) Telecom guidelines* • *any other EU policy/initiative having interoperability requirements?*	The action contributes directly to the implementation of the European Interoperability Framework (EIF), the Digital Single Market Strategy and European Cloud initiative of the EU. Even though the FAIR principles were initially focused on research data, their coverage has been extended to data produced or managed by the public sector as well. The action that contributes to all interoperability principles set out in the EIF and notably to the principles of: • Openness: the FAIR Data Maturity Model will enable organisations to publish data and users to enjoy access to an open-by-default, efficient and cross-sector data environment supported by FAIR data principles. • Transparency: the FAIR Data Maturity Model will increase the internal visibility inside public sector or research organisations, allowing other actors to view the datasets, data infrastructures and projects they

[56] DECISION (EU) 2015/2240 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

	produce or manage. Especially for research organisations, it can have a positive impact for the scientific principle of credibility, replication and further research. • Reusability: one of the main focus areas of the FAIR Data Maturity Model is reusability. • Technological neutrality and data portability: the FAIR principles are neither standards nor practices; they are pragmatic and technology neutral. The FAIR Data Maturity Model will allow organisations to avoid lock-in, move and reuse data easily and support the free movement of data between countries and/ sectors. • Preservation of information: the FAIR principles are targeted to the long-term preservation of data produced or managed by public sector or research organisations. The FAIR Data Maturity Model allows organisations to build their pertinent capacity and develop the necessary policies and mechanisms to ensure long-term accessibility, including preservation of their data and metadata. • Assessment of effectiveness and efficiency: the FAIR Data Maturity Model is an instrument that can assess and improve the readiness, effectiveness and efficiency of public sector and research organisations in the implementation of the FAIR principles. In addition, the FAIR Data Maturity Model provides an assessment and improvement framework which covers multiple interoperability related aspects such as: data standards, persistent unique identifiers, legal clarity and harmonisation of the legal framework, catalogues of data, services and standards, capacity building, security and privacy etc.

Does the proposal fulfil an interoperability need for which no other alternative solution is available?	There is no published assessment methodology at European level for measuring the maturity of an organisation regarding its readiness and implementation level of the FAIR principles. The FAIR Data Maturity Model is the first instrument that assesses in a combined way the findability, accessibility, interoperability and reusability of data produced or managed by organisations.

1.1.1.2 Cross-sector

The scope of the action, measured by its horizontal impact, once completed, across the policy sectors concerned.

Question	Answer
*Will the proposal, **once completed** be useful, from the interoperability point of view and utilised in two (2) or more EU policy sectors? Detail your answer for each of the concerned sectors.*	The FAIR data principles are domain neutral and the FAIR Data Maturity Model is by-design useful and can be utilised in any EU policy area. The FAIR Data Maturity Model is a generic and domain-agnostic instrument that allows organisations of any type, domain or policy area to obtain insight into generically defined findability, accessibility, interoperability and reusability enablers and manifestations. In addition, organisations can get key improvement recommendations.
*For proposals completely or largely **already in operational phase,** indicate whether and how they have been utilised in two (2) or more EU policy sectors.*	Not applicable

1.1.1.3 Cross-border

The geographical reach of the action, measured by the number of Member States and of European public administrations involved.

Question	Answer
*Will the proposal, **once completed,** be useful from the interoperability point of view and used by public administrations of three (3) or more EU Members States? Detail your answer for each of the concerned Member State.*	The FAIR Data Maturity Model is useful and can be utilised by public administrations, research organisations and businesses of any EU Member State. The FAIR Data Maturity Model is a generic and institutional level-agnostic instrument that allows organisations at any level (national, regional, provincial, municipal or national) to obtain insight into generically defined findability, accessibility, interoperability and reusability enablers, and manifestations. In addition, organisations can get key improvement recommendations., opportunities for reusing or providing services and key improvement recommendations.
*For proposals completely or largely **already in operational phase**, indicate whether and how they have been utilised by public administrations of three (3) or more EU Members States.*	Not applicable

1.1.1.4 Urgency

The urgency of the action, measured by its potential impact, taking into account the lack of other funding sources

Question	Answer
Is your action urgent? Is its implementation foreseen in an EU policy as priority, or in EU legislation?	The Digital Single Market Strategy and the European Cloud Initiative have recognised the importance of a FAIR-enabled data ecosystem by putting forward an FAIR Data Action Plan (published end 2017). The FAIR Data Maturity Model is an important instrument towards the implementation of the FAIR Data Action Plan, as it measures the readiness and implementation level of organisations vis-

	à-vis the FAIR data principles and provides concrete improvement recommendations.
How does the ISA^2 scope and financial capacity better fit for the implementation of the proposal as opposed to other identified and currently available sources?	The ISA^2 scope and financial capacity fit for the implementation of the FAIR Data Maturity Model since: • It contributes to a common understanding of the FAIR principles, (including interoperability) by providing an assessment methodology/model in line with the interoperability layers, principles and recommendations of the European interoperability Framework and European Interoperability Strategy. • It can be utilised as an instrument to monitor the implementation of the FAIR principles. • It is an interoperability solution that supports the implementation of EU policies and activities such as: Digital Single Market Strategy, European Cloud Initiative and European Interoperability Strategy. • Facilitates and promotes reusability since it is at the heart of the FAIR principles and of the Model in general.

1.1.1.5 Reusability of action's outputs

The re-usability of the action, measured by the extent to which its results can be re-used.

Can the results of the action (following this proposal) be re-used by a critical part of their target user base, as identified by the proposal maker? For proposals or their parts already in operational phase: have they been re-used by a critical part of their target user base?

Name of reusable solution to be produced (for new proposals) or produced (for existing actions)	FAIR Data Maturity Model (in electronic format) – Questionnaire and Recommendations
Description	The FAIR Data Maturity Model a self-assessment toolset that enables organisations to evaluate their readiness and implementation level vis-à-vis the FAIR data principles, along with the guidelines necessary to climb up the ladder of FAIR.

Reference	Not applicable
Target release date / Status	2019
Critical part of target user base	Organisations and data professionals who are involved in the production and management of public sector or research data and have to follow good data management and data stewardship practises (which include the notions of data collection, annotation, archival and long-term care, either alone or in combination with newly generated data).
For solutions already in operational phase - actual reuse level (as compared to the defined critical part)	Not applicable

1.1.1.6 Level of reuse of existing solutions

The re-use by the action (following this proposal) of existing common frameworks and interoperability solutions.

Question	Answer
Does the proposal intend to make use of any ISA[2], ISA or other relevant interoperability solution(s)? Which ones?	The proposed action will make extensive use of the Interoperability Maturity Model (IMM). The IMM is an operational solution used for assessing and improving the interoperability maturity of a Public Service. Also, it will identify FAIR-related enablers and manifestations taking into account interoperability solutions produced by other ISA[2] Actions including: 'Promoting semantic interoperability amongst European Public Administrations', 'Access to Base Registries', 'Catalogue of Services', Common assessment Method for Standards and Specifications' and 'Sharing and Reuse'.
*For proposals completely or largely **already in operational phase**: has the action reused existing interoperability solutions? If yes, which ones and how?*	Not applicable

1.1.1.7 Interlinked

Question	Answer
Does the proposal directly contribute to at least one of the Union's high political priorities such as the DSM? If yes, which ones? What is the level of contribution?	The action contributes significantly to the Digital Single Market Strategy and European Cloud initiative of the EU. The Digital Single Market Strategy and the European Cloud Initiative have recognised the importance of a FAIR-enabled data ecosystem by putting forward an FAIR Data Action Plan (published end 2017). The FAIR Data Maturity Model is an important instrument towards the implementation of the FAIR Data Action Plan, as it measures the readiness and implementation level of organisations vis-à-vis the FAIR data principles and provides concrete improvement recommendations. The FAIR Data Maturity Model will facilitate and promote a cross-border and cross-sector data sharing and reuse and will contribute to growth and accelerate innovation in a global digital economy.

8.14.6 PROBLEM STATEMENT

The problem of	The lack of a methodology that allows organisations to evaluate the readiness and implementation level of their datasets, projects and data infrastructures vis-à-vis the FAIR data principles (Findability, Accessibility, Interoperability and Reusability) and provides concrete recommendations on how to improve it.
affects	The potential of public administrations, researchers, businesses and citizens to share and reuse data in a cross-border and cross-sector way.
the impact of which is	Limited ability of humans and machines to automatically find and use cross-border and cross-sector data, which is a prerequisite for harnessing the high quantity of data produced at EU level and for improving the reusability of this data in the public sector, science and industry.
a successful solution would be	A maturity model that measures the readiness and implementation level of organisations concerning the FAIR data principles, having a nature which is at the same time descriptive, prescriptive and comparative.

8.14.7 IMPACT OF THE ACTION

1.1.1.8 Main impact list

Impact	Why will this impact occur?	By when?	Beneficiaries
Contribute to growth and accelerate innovation in a global digital economy	Data is becoming increasingly important for all aspects of the European economy. The FAIR Data Maturity Model improves the readiness and capability of public sector and research organisations to open up their data in a way that creates potential benefits which are clearly recognised in the European	2019	Public administrations, research organisations, businesses

	Commission's investment plan for Europe. A specific example of the economic impact of opening up data is the Copernicus earth observation system.		
(+) Savings in money	The proposed action will ensure money savings to organisations as it will deliver a reusable solution for measuring the FAIRness of their data. Also, it will contribute to the improvement of organisations in their readiness and implementation level of the FAIR principles, which will lead to money savings from the reuse of high-quality data, the combination of data sets across borders or disciplines and the avoidance of duplication.	2019	Public administrations, research organisations, businesses, universities, researchers
(+) Savings in time	The proposed action will ensure time savings to organisations aiming to implement the DAIR principles. Also, it will accelerate the achievement of the objectives of the Digital Single Market Strategy and European Cloud initiative of the EU.	2019	Public administrations, research organisations, businesses, universities, researchers
(+) Better interoperability and quality of digital public service	The readiness of organisations to implement the FAIR principles is related with their capability to produce / maintain / reuse more interoperable and of high quality public services.	2019	Public administrations, research organisations, businesses, universities, researchers
Increased transparency	The FAIR Data Maturity Model increases the internal visibility inside public sector or research organisations,	2019	Public administrations, research organisations,

	allowing other actors to view the data they produce or manage. Especially for research organisations, it can have a positive impact for the scientific principle of credibility, replication and further research. The FAIR Data Maturity Model can help to increase the reproducibility of research, which currently can be as low as 10-30% in key areas, such as cancer research. The scientific community has repeatedly experienced instances of misconduct and erroneous analyses, which may endanger whole scientific fields.		businesses, universities, researchers

1.1.1.9 User-centricity

The FAIR Data Maturity Model will be created in an open and iterative way, with the active and continuous engagement of its potential users in all development phases. This engagement will be supported by the organisation of interactive sessions where all potential types of users will contribute to the definition of the exact scope and functioning of the model. It will include their involvement to the review and the evaluation phases of the model by providing their feedback and it will also cover the collection of their preferences regarding the delivery and maintenance of the model. All types of users (from all public/private sector and research domain disciplines) are equally foreseen to be engaged.

8.14.8 EXPECTED MAJOR OUTPUTS

Output name	FAIR Data Maturity Model (in electronic format) – Questionnaire and Recommendations
Description	The FAIR Data Maturity Model a self-assessment toolset that enables organisations to evaluate the readiness and implementation level of their datasets, data infrastructures and projects vis-à-vis the FAIR data principles, along with the guidelines necessary to climb up the ladder of FAIR.
Reference	
Target release date / Status	2019

Output name	FAIR Data Checklist
Description	The FAIR Data Checklist will be a lightweight version of the FAIR Data Maturity Model, aiming to raise awareness on the main aspects related with the FAIR principles.
Reference	
Target release date / Status	2019

8.14.9 ORGANISATIONAL APPROACH

1.1.1.10 Expected stakeholders and their representatives

Stakeholders	Representatives	Involvement in the action
Public administrations	ISA^2 Coordination Group	
Research community	FAIR Data Expert Group: established and managed by DG RTD GO-FAIR initiative: community-driven initiative focusing on the FAIR-related implementation needs of existing research networks and consortia Community-driven initiatives at international, European and Member States level (e.g. GO-FAIR, Research Data Alliance, CODATA etc.)	

1.1.1.11 Identified user groups

User Group	Description
Service Owners	Responsible for setting up and maintaining a public service
Public sector and research organisations	Organisations that capture, generate, manage, share, protect and preserve public sector and/or research data
Data experts	Data professionals that ensure the proper capturing, generation, management, sharing, protection and preservation of public sector and/or research data
Researchers	They generate, process, make accessible, curate and store data, according to the data management plans and supported by data experts

1.1.1.12 Communication and dissemination plan

The main communication channel for all activities related with the FAIR Data Maturity Model will be the collaborative platform Joinup. Joinup will host the model and all supporting documentation.
For ensuring the user engagement, from both the public sector and research domain, during the development phases, the FAIR Data Maturity Model will be presented to workshops, conferences and other events organised by DG DIGIT and DG RTD. The exact communication plan will be defined during the initiation phase of the proposed action.
In addition, the model will be presented to the ISA^2 Coordination Group and its members will be used as proxy for disseminating it further to the Member States.

1.1.1.13 Key Performance indicators

Provide a list of KPIs allowing the measurement of the progress and completions of milestones and the action. In case of an on-going action with already identified metrics[57] indicate the current values.

Description of the KPI	Target to achieve	Expected time for target
Conduction of assessments using the FAIR Data Maturity Model	30	2019

1.1.1.14 Governance approach

The ISA^2 Coordination Group will set the general strategic directions of the Action and will ensure that it will be aligned with all relevant actions at European and /or national level.
DG RTD A6, which is responsible for the European Open Science Cloud and the creation of the FAIR Data Action Plan, will identify the priorities, organise the activities and safeguard the proper execution of the FAIR Data Maturity Model development and communication plan.
In coordination with the ISA^2 Programme Management Team (DG DIGIT D2), it will report the progress and the results of the Action to the ISA^2 Coordination Group.

8.14.10 TECHNICAL APPROACH AND CURRENT STATUS

The FAIR Data Maturity Model will be a generic-purpose model (i.e. not specific to a certain discipline or type of data), which will be developed following a progressive approach via a number of iterations. In each iteration, the current structure and content of the model will be examined and validated in order the model to evolve to a revised version.
The FAIR Data Maturity Model will be built on top of existing efforts at national and/or sectorial level to develop evaluation criteria for the FAIR Data principles (e.g. FAIRmetrics.org, DANS, DTL, Springer Nature etc), aiming to create a solution for broader adoption that will combine the most salient of their characteristics. In addition, it will align with community-driven initiatives at international, European and Member States level (e.g. GO-FAIR, Research Data Alliance, CODATA etc.) and complement other

[57] For examples see the ISA2 dashboard https://ec.europa.eu/isa2/dashboard/isadashboard , **effectiveness** tab.

endeavours (e.g. funded by the H2020 work Programme 2018-2020) that support the FAIR Data uptake and compliance across borders and across sectors/disciplines.
The development process will consist of the following phases:

a. Scoping: during the first phase, the exact scope of the model will be defined including the objectives, the usage and the purpose of the model. Similar models will be systematically analysed in order to identify components that could be reused either as they are or after applying some improvements, aiming to avoid the duplication of efforts.
b. Stakeholders identification: the definition of the scope will be followed by the identification of the main actors who will be related with the model from three perspectives: development process, execution and interest in the results.
c. Design: this phase will define and define all aspects with regard to the architecture, the structure and the body of a model. The design phase will answer questions such as:
    - How many different maturity stages will be foreseen?
    - How many dimensions or layers will the model assess?
    - Will be any documented maturation paths?
    - How many questions will be included in the model?
    - What will be the type of dependencies in the implementation of the foreseen model's capabilities or attributes (implicit / explicit)?
    - Which techniques will be used for the population of the model (e.g. literature review, case study interviews, focus groups etc.)?
    - Will be the measurement of the maturity quantitative and/or qualitative?
d. Testing: the model will be verified and validated following a well-defined evaluation methodology.
e. Delivery: when the main building blocks of the model will be constructed, various characteristics regarding its distribution will be decided such as: what kinds of materials will be publicly available, in what format etc.

8.14.11 COSTS AND MILESTONES

1.1.1.15 Breakdown of anticipated costs and related milestones

Phase: Initiation Planning Execution Closing/Final evaluation	Description of milestones reached or to be reached	Anticipated Allocations (KEUR)	Budget line ISA/ others (specify)	Start date (QX/YYYY)	End date (QX/YYYY)
Initiation	Scoping Stakeholders identification	10K 20K		Q2/2018 Q3/2018	Q2/2018 Q3/2018
Planning	Design process definition	20K		Q3/2018	Q4/2019
Execution	Design (phase 1) Testing (phase 1) Distribution (phase 1)	70K 15K 15K		Q1/2019 Q3/2019 Q4/2019	Q3/2019 Q3/2019 Q4/2019

Execution	Design (phase 2) Testing (phase 2) Distribution (phase 2)	100K 25K 25K		Q1/2020 Q3/2020 Q4/2020	Q3/2020 Q3/2020 Q4/2020
	Total	300K			

1.1.1.16 Breakdown of ISA^2 funding per budget year

Budget Year	Phase	Anticipated allocations (in KEUR)	Executed budget (in KEUR)
2018		150	
2019		150	
2020			

8.14.12 Planning for the tendering procedures to be launched for the action

Call for tenders foreseen Global amount in KEUR	Call for Tenders Duration in years	Indicative planning of publication (QX/YYYY)
250	1	Q2/2018

8.14.13 ANNEX AND REFERENCES

Description	Reference link	Attached document
[1] FAIR Data principles	http://www.force11.org/group/fairgroup/fairprinciples	
[2] Digital Single Market Strategy	http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1447773803386&uri=CELEX:52015DC0192	
[3] European Cloud Initiative	http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52016DC0178&from=EN	