FAIR DATA WORK @ DANS

Implementing Metrics, Reviews, and More

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Abstract – Ever since the origin of the FAIR data guiding principles, various members of the DANS staff have been involved in a variety of activities on thinking about their implications and implementing them. This paper presents an overview of the fruits of our work so far and sketches our ideas for the years to come. We were involved as co-authors of the original publication on the FAIR principles, developed and tested FAIR metrics, worked on tools to rate the FAIRness of datasets, on a FAIR checklist for researchers, we evaluated how our own data archives score on FAIRness, we compared the principles to the requirements of the Data Seal of Approval and the CoreTrustSeal, explored the applicability of the FAIR principles to Software Sustainability, prepared guidelines for FAIR data management, and we lead the prominent Horizon 2020 FAIRsFAIR project in the context of the European Open Science Cloud.

Keywords – FAIR data, repositories, CoreTrustSeal, research data management

Conference Topics – 3. Exploring New Horizons; 5. The Cutting Edge

I. INTRODUCTION

At a Lorentz workshop in Leiden in January 2014, the idea of the FAIR guiding principles was born [1]. They were formulated as a minimal set of community-agreed guiding principles to make data more easily discoverable, accessible, appropriately integrated and re-usable, and adequately citable [2]. In the FAIR Data approach, data should be:

Findable – Easy to find by both humans and computer systems and based on mandatory description of the metadata that allow the discovery of interesting datasets;

Accessible – Stored for long term such that they can be easily accessed and/or downloaded with well-defined license and access conditions (Open Access when possible), whether at the level of metadata, or at the level of the actual data content;

Interoperable – Ready to be combined with other datasets by humans as well as computer systems;

Reusable – Ready to be used for future research and to be processed further using computational methods.

DANS vice-director Ingrid Dillo was one of the 53 co-authors of the paper published in Nature Scientific Data [3]. Since that very beginning, various members of staff at DANS contributed to the FAIR success story, and to putting the principles into practice. This proves to be a highly stimulating but by no means straightforward process. To support others on their road to FAIR data in this paper we will outline our activities and their results so far, and we will end by outlining the next steps.

II. FAIR AND DATA SEAL OF APPROVAL

When DANS was set up in 2005 by the Royal Netherlands Academy of Arts and Sciences (KNAW) and the Netherlands Organization for Scientific Research (NWO), one of our tasks was to think of criteria for trustworthy digital repositories (TDR). At that time, there were other initiatives to formulate an ISO standard, which resulted in ISO 16363 in 2012, and the German nestor seal, which was codified as DIN 31644 in 2013. We considered these initiatives as laudable, but also as ambitious and difficult to apply in a scientific context, and therefore aimed at a limited number of core criteria, which became the Data Seal of Approval (DSA) in 2010. The DSA relies on peer review for the assessment of repositories aspiring to comply. We started their development by defining five principles, which bear a remarkable resemblance to the FAIR principles. Data in a DSA-certified repository:

1. can be found on the internet

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2. are accessible
3. are in a usable format
4. are reliable
5. can be referred to

These five DSA principles are refined into 16 guidelines [4], whereas the four core FAIR elements are expanded into 15 (sub) principles [3].

Despite the similarity, there are some differences as well. First, the DSA principles were designed to be applied to repositories, whereas the FAIR principles refer to data and metadata at an unspecified level of aggregation. In addition to that, for the DSA the *long-term* preservation of and access to data is central, a viewpoint that is not explicit in FAIR.

Second, the FAIR principles explicitly aspire to be applicable both by humans and by machines or automated processes, whereas the DSA does not mention this.

Third, "a usable format" can be considered as an aspect of either interoperability or reusability (or both). The idea was that data in a DSA certified repository should be in a format that would make data usable across software platforms and time.

Fourth, reliability (DSA) is not the same as reusability (FAIR), but there is similarity in intention: the core idea is that re-users of data can rely on their integrity, precision and validity, aspects that are not explicitly mentioned in the FAIR principles.

Finally, citability was seen as such a fundamental criterion, that it was treated separately in the DSA principles; in the FAIR principles, citability is equally important, but it is treated as an aspect of Findability (F1). Both DSA and FAIR stress the importance of data citation and referencing via persistent identifiers.

On the basis of this comparison, it was our conviction that the DSA and FAIR principles are not only similar, but also complement each other. DSA focusing on long term preservation and access of data in trustworthy repositories, FAIR stressing interoperability, applicability for machines, and focusing on data and metadata in whatever context, either in a curated repository or otherwise.

III. FAIR Data Assessment Tool

It is exactly this complementarity that led us to explore how the FAIR principles do apply to datasets within TDRs. In other words, rather than focusing on *making* data FAIR, we focused on measuring the FAIRness of *existing* data. For this purpose, we used our former data review approach and operationalized the FAIR principles in the form of an online questionnaire [5]. The idea was that answering the questions would result in a FAIRness rating of datasets stored in any DSA-certified archive. However, operationalizing the FAIR principles and making them independent of one another proved to be no easy task. Some of the principles address the same or overlapping aspects of a data set, i.e. are interdependent, and some of them are hard to interpret, even with the help of the available explanations [6]. Moreover, some of the principles include qualitative or subjective elements, such as "broadly applicable language for knowledge representation" (I1); "richly described with a plurality of accurate and relevant attributes" (R1). Sometimes the specification of a principle can even be challenged, e.g. "(Meta)data use vocabularies that follow the FAIR principles" (I2), which results in an endless loop.

We had especially great difficulty to find valid operationalizations for Reuse. For practical reasons, we decided to move some of the principles from the R to other FAI-letters under the assumption: if data is findable, accessible and interoperable, it is by definition reusable (or: F + A + I = R). We also decided to include a measure of openness, not just of metadata, but also of datasets themselves, whereas the FAIR principles explicitly state that open data *per se* is not a FAIR requirement: there can be valid reasons for data not to be openly accessible (e.g. for privacy reasons), and in such cases the metadata (which should always be open) should explain why and specify the access conditions. In spite of this, we thought that researchers wanting to reuse data would like to see immediately if a dataset is open or not on the basis of the FAIR data assessment tool *FAIRdat*. For this purpose, we devised a FAIR badge with scores from 1 to 5 stars on the *F-A-I*, and decided to use the *R* as an average reusability score of the dataset under assessment.

Figure 1. Example of a FAIR badge designed for FAIRdat

A prototype was set up in SurveyMonkey (R) in 2017 [7] and tested by colleagues on a couple of datasets in the DANS archive, and next in an international setting by four sister archives (see Table I).

TABLE I.
Test assessments with FAIRdat tool of datasets in other repositories than DANS EASY.

Name of Repository	Number of Datasets reviewed	Number of Reviewers	Number of reviews
VirginiaTech	5	1	5
Mendeley Data	10	3 (for 8 datasets) 2 (for 2 datasets)	28
Dryad	9	3 (for 2 datasets) 2 (for 3 datasets)	16
CCDC	11	? (no names) 2 (for 1 dataset)	12

Source [8].

Finally, we presented and tested the prototype at the Open Science FAIR in Athens [9] and received feedback from 17 participants in the workshop we organized on that occasion.

All in all, the feedback was mixed, which corresponded to our own experiences. Most people liked the idea of the FAIRdat approach a lot, but there were critical voices as well. The simplicity of the well-documented tool was a pro, and most people found the star-ratings useful. Criticisms concerned: the subjectivity in some questions; misunderstandings about the intention of some questions; worry that data that could not be open for valid reasons would never receive a high overall FAIR score; the (perceived) absence of questions under Reusability; unclarity about the target audience for the questionnaire (researchers, data specialists, data archive staff?).

One other element we found difficult to resolve was that many research datasets consist of multiple data files/objects, and that the questions targeted the whole dataset, whereas sometimes different individual files would be assessed differently. Moreover, some FAIRdat questions asked were already solved at the level of the repository, and were actually not necessary.

In short, it was necessary to take one step back to rethink our approach and how to improve the prototype [10].

IV. FAIR METRICS

In the meantime, in the summer of 2017 a small group of FAIR insiders of the first hour came together in Leiden to operationalize the principles into metrics. Peter Doorn was invited to participate [11]. The group had a number of intense discussions on how to measure FAIRness. The ambition was also that the metrics should not be implemented by asking humans, as in the DANS FAIRdat approach, but by machine processes, as automatic as feasible. The group started by formulating points of departure for the metrics, which were to be clear, realistic, discriminating, measurable and universal [12]. A metric form was devised, stating for each metric:

- Metric Identifier
- Metric Name
- To which principle does it apply?
- What is being measured?
- Why should we measure it?
- What must be provided?
- How do we measure it?
- What is a valid result?
- For which digital resource(s) is this relevant?
- Examples of application across types of digital resources
- Comments

The group ended up with 14 exemplar metrics, which were published on GitHub to stimulate debate, to invite submissions of further metrics, and to test them [13]. A paper describing the metrics was published in Nature Scientific Data [14] after the preprint was first uploaded to bioRxiv [15]. Although the FAIR metrics exercise is both intellectually challenging and stimulating, the applicability of most metrics to concrete data sets seems as yet an aspiration rather than a reality.

As DANS did not see a short-term opportunity to implement the FAIR metrics, we decided to move into new directions which would provide more immediate practical results. These are:

- a FAIR checklist for researchers (section V)
- a revision of the FAIRdat tool (section VI).
- a self-audit of compliance of the DANS-EASY archives with the FAIR principles (section VII).
- an evaluation of the correspondence between the CoreTrustSeal (CTS) and the FAIR principles, including a gap-analysis (section VIII).

V. "FAIR ENOUGH" CHECKLIST

Even though the FAIR principles at the level of the four letters have an immediate appeal to many, partly perhaps because of the clever acronym, the more detailed principles are not easily understood by the

non-initiated or by non-data specialists, that is: by most researchers. Therefore, we decided to create a simple questionnaire form explaining the core ideas behind FAIR, enabling researchers to do a self-check on the data they are working with, aiming more at awareness raising and educating researchers about the principles than following them to the letter.

The "FAIR Enough" checklist is a short and concise questionnaire for researchers who are planning to deposit their data in a repository. It covers FAIRness at different levels: the repository, the metadata, the dataset, and files or objects within a dataset. It is set up using Google Forms and is currently in beta [16].

The questions are formulated in terms that aim to be understandable for non-data specialists. There is no one-on-one correspondence to the more detailed FAIR principles, although the four core elements are covered. The checklist offers brief explanations of terms and concepts, including reference to trustworthy repositories and CoreTrustSeal. At the end, an indication of the FAIRness is obtained as an overall score. Recommendations are provided for questions resulting in negative answers with respect to FAIR, so that researchers can take measures to make their data more FAIR.

VI. FAIR Data Review Tool (2nd prototype)

On the basis of the testing and evaluation of our first prototype of the FAIR data assessment tool, we worked on a second version, that is now also available as a Google Form. It explicitly focuses on data in a CTS-certified TDR. We first devised a table with all 15 FAIR (sub)principles, and determined at which level they can be best assessed [17].

As will be argued in section VIII, TDRs compliant with CTS take care of virtually all FAIR principles. Only for a minority of the principles, especially those with subjective elements, there are variations for data within a repository. For example, all datasets in a CTS repository "are assigned a globally unique and persistent identifier" (F1). But the degree to which "(meta)data are richly described with a plurality of accurate and relevant attributes" (R1) can vary from dataset to dataset: some data in a TDR are better documented than other.

Moreover, most FAIR principles adhere to both data and metadata, and hence for those principles that may have different scores within a repository, we formulated questions for data and metadata separately. Therefore, in the new data review tool, the questions cover the FAIR data principles, in so far as they are not already guaranteed by a CTS-certified data repository.

One of the criticisms often voiced about the FAIR principles is that they do neither cover aspects of data quality such as completeness, precision/accuracy and validity, nor the logic of the data organization. Therefore, we added some questions covering these aspects as well.

The new FAIR Data Review Form is aimed at both data specialists and at researchers reusing data from a CTS-certified trustworthy data repository. It is also used for reviewing data belonging to data papers submitted to the Research Data Journal (RDJ) for the Arts and Humanities [18].

Reviewers are requested to answer 18 questions about how they rate the data and accompanying documentation or metadata. The questions are divided over four sections:

- General quality and FAIRness of the data: Q1 - Q8
- Quality of the metadata (i.e. description and documentation of the data): Q9 - Q14
- Further FAIR characteristics of the data (set and objects): Q15 - Q16
- Further FAIR details on the metadata: Q17 - Q18

In addition to providing a rating, reviewers can add qualifying remarks. The answers will result in an overall rating of the data reviewed, but the reviewer is also asked to give a summary verdict. With the consent of the reviewer, the data review can be published. In this way, we aim to give the author of the data paper and data users an impression of the fitness for reuse of the data.

VII. FAIRness of DANS Archives

Soon after the publication of the FAIR principles, three staff members of *4TU.Researchdata* evaluated the compliance of a sample of 37 repositories, online databases, and research infrastructures with their interpretation of the FAIR principles [19]. The DANS EASY archive was one of them. In the interpretation of the authors, DANS EASY complied with 11 principles, did not comply with two (I2: (meta)data use vocabularies that follow FAIR principles; and R1.2: (meta)data are associated with their provenance), whereas compliance was not clear for two more (A2: metadata are accessible, even when the data are no longer available; and R1.3: (meta)data meet domain-relevant community standards); see the underlying dataset [20].

We carried out a self-assessment on the basis of the FAIR principles as well, and also found some room for improvement [21]. In our self-audit, we distinguished data from metadata, as they have different FAIR characteristics (or rather: there are different

implications with respect to their compliance with the FAIR guiding principles). With respect to metadata, in our evaluation DANS EASY complies with the FAIR principles, except R1.2: "(meta)data are associated with detailed provenance". Which metadata and documentation was entered and edited by whom and when is something to be taken into consideration.

Three FAIR principles explicitly apply to metadata and not to actual research data (F2, F3 and A2). However, it is not legally permitted nor ethically responsible to demand that all data in the archive comply with principle F4: "data are registered or indexed in a searchable resource": data that are legally protected cannot be indexed in a searchable resource, because that would violate their protection! Therefore, we claim that this principle needs to be more precisely specified.

Another problematic principle is A1: (meta)data are retrievable by their identifier using a standardized communications protocol. In the case of DANS EASY, the data are retrievable via the metadata, because the identifier is part of the metadata, not of the data. In our opinion, this demand should also be more precisely formulated in the principles. Finally, there are four principles that only partially apply, because of variations within datasets or/and within the archive:

F1: "(meta)data are assigned a globally unique and persistent identifier": Individual files do not get a persistent identifier; the PID resolves to the data description page (i.e. the metadata).

I2: "(meta)data use vocabularies that follow FAIR principles": Controlled vocabularies used for metadata are few; whether or not vocabularies are used on the level of data depends on the dataset.

I3: "(meta)data include qualified references to other (meta)data": whether or not datasets have references depends on the dataset.

R1.3: "(meta)data meet domain relevant community standards": whether or not such standards are used depends on the dataset (same as with principle I2) and whether such community standards exist at all.

To conclude, the (self-)assessment of data archives in the light of the FAIR principles is a useful exercise: it provides guidance on the improvement of archival systems and procedures, and in some cases it brings to light where the specification of the principles themselves can be improved.

VIII. FAIRness of CoreTrustSeal

As mentioned above, the principles on which the Data Seal of Approval (DSA) was based bear a striking resemblance to the FAIR guiding principles, and the same is true for the successor of DSA, the CoreTrustSeal). We already discussed the subtle differences, and the same applies to CTS. Mokrane and Recker made a detailed mapping of the alignment of the 15 FAIR principles to the 16 CTS requirements. They write: "the proximity of objectives between the certification of trustworthy data repositories and the implementation of FAIR Principles calls for a close examination of their overlaps and complementarities. The characteristics of the data repositories assessed by means of the CoreTrustSeal requirements position TDRs as enabling FAIR data. In particular, the concept of FAIR data cannot be decoupled from the characteristics of the data infrastructure necessary for inferring compliance of the data object with some of the FAIR Principles (mostly under F and A). In addition, CoreTrustSeal TDRs can usefully be considered as having reached baseline FAIR compliance at the data collection level for other principles (mostly under I and R)." [22]. Their comparison is summarized in Figure 2 below. They conclude that in the next revision of the CTS requirements, the FAIR principles should be reflected even more explicitly.

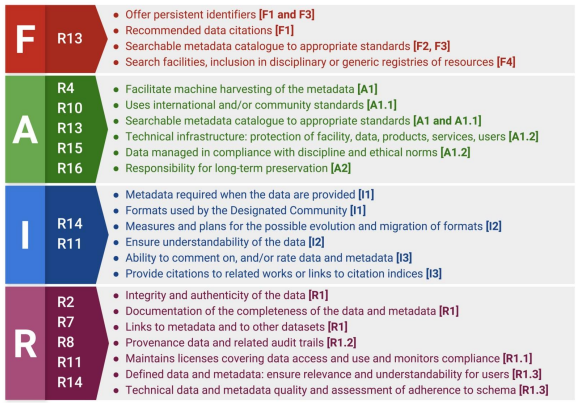

Figure 2. A mapping between the FAIR Guiding Principles and the CoreTrustSeal Requirements.
Source: [22].

IX. Guidelines for FAIR Data

Although the FAIR principles have attracted a substantial following among many groups of stakeholders, a lot of explanation, training and advocacy is still needed. DANS contributed to this expertise development in a variety of ways and in various national and international projects, in conference contributions, workshops, webinars, training courses, brochures, etc. Here we restrict ourselves to two examples: first, the "Data Management Expert Guide", an online training module offered by the Consortium of European Social Science Data Archives (CESSDA) contains extensive information for social scientists wanting to make their data FAIR [23]; second and similarly the "Guidelines

to FAIRify data management and make data reusable" developed in the context of the Parthenos Project focus on humanities scholars [24].

X. APPLYING FAIR TO SOFTWARE

Although the FAIR guiding principles originated with research data in mind, it is worthwhile to investigate their applicability to other research outputs, especially software [25]. Software sustainability is an emerging topic in digital preservation. DANS is not yet equipped to support software up to par with data archiving, but it is devoting an increasing amount of attention to it [26, 27, 28, 29], and we think there is an urgent need for a European or International Software Sustainability Infrastructure (SSI). We are collaborating with organizations such as the Software Heritage Archive at INRIA in France and the Software Sustainability Institute in the UK to raise the awareness about this need.

Preserving software obviously involves more than just archiving the code. In order to keep software running, much more is required. In 2010 NASA published a report proposing Reuse Readiness Levels (RRLs) for software[30]. In 2011 SSI [31] and in 2016 CLARIAH [32] defined sets of criteria for assessing software sustainability, maintainability, (re)uasability and overall "quality". Both organizations also provide an online (self) assessment tool.

In Table III at the end of this paper a comparison of the good practices proposed by CLARIAH and SSI is presented and these are mapped to the FAIR principles (Table II is a summary for ease of reference). The table shows that many of the recommendations already in use today to assess software for reuse readiness and sustainability can be matched to the FAIR principles.

The SSI and CLARIAH criteria under the respective categories of "Usability" and "Sustainability & Manageability" are the most relevant ones in the context of FAIR. A substantial difference, however, is that the FAIR principles are formulated at a more general and less operational level than the SSI/CLARIAH criteria. It is therefore obvious that their numbers of (sub)criteria are much higher: SSI has 73 criteria for Usability and CLARIAH has 42; for Sustainability & Manageability they have 130 and 45 criteria, respectively. Here we should remark that CLARIAH distinguishes different support situations, in which the applicability of the criteria varies: software for end users and "experimental" software, which can be either actively supported or be unsupported. Anyhow, the number of software criteria is a multiple of the number of FAIR principles (and also of the FAIR metrics).

Grouped into categories, it is nevertheless fairly well possible to map most main criteria (reflected as questions in [31, 32] and in Tables II and III) to the main FAIR principles. The FAIR principles do not cover aspects of project management, buildability and installation/ deployment, and the FAIR principles do not cover security and privacy, elements that seem to be most related to Reusability. In this way, we would arrive at four rather operational principles for the Findability of software, 3 for Accessibility, 4 for Interoperability and 8 for Reusability; perhaps we would need an extra "principle" to take care of project management, buildability and installation/deployment of software.

TABLE II.
Mapping of main categories for software sustainability to the FAIR principles (summarized)

Main SSI/CLARIAH criteria for software sustainability	**FAIR principle**
Is the software easily understood?	F
Is there comprehensive well-structured documentation?	F
Is it straightforward to build from source on a supported system?	Not covered
Is it straightforward to install and deploy on a supported system?	Not covered
Is it easy/intuitive to learn how to use its functions?	R
Does the software perform well?	R
Is the project/software identity clear and unique?	F
Is it easy to see who owns the project/software?	A
Is an appropriate licence adopted?	A
Is it easy to understand how the project is run and the development of the software managed?	Not covered
Is there evidence of a current/future user community?	R
Is there evidence of current/future ability to download?	A
Is it easy to test the correctness of the source code?	R
Is the software usable on multiple platforms?	I
Is there evidence of current/future developer support?	R
Is the software easy to understand at the source level?	F
Is the software easy to modify and to contribute changes to developers?	I
Is there evidence of current/future development?	R
Is the software interoperable with other required/related software?	I
Does the software comply to requirements for integration into the community (CLARIAH) infrastructure?	I

To what extent is the software reusable?	R
Are security and privacy dealt with adequately?	R? (Not covered)

In order not to make the number of requirements too high, it seems useful to rank them in terms of their importance, using the "MoSCoW criteria" (Must/Should/Could/Won't have). If we do this, we could concentrate on a limited number of requirements: 9 core requirements and about 10 additional ones, with a few decisions left open at this stage.

One of the directions we took, in collaboration with the Netherlands eScience Center (NLeSC), was setting up a "FAIR software route", advising what steps researchers can take to make sure that their research software is "FAIRly" sustained. The NLeSC Research Software Directory and the DANS NARCIS portal will be adapted and expanded to serve this purpose [33, 34].

XI. Outlook: FAIRsFAIR Project

The European project FAIRsFAIR [35], which is led by DANS, aims to supply practical solutions for the use of the FAIR data principles throughout the research data life cycle. FAIRsFAIR addresses the development and realization of a knowledge infrastructure on academic quality data management, procedures, standards, metrics and related matters, which are all based on the FAIR principles. This knowledge infrastructure will be an essential part of the European Open Science Cloud or EOSC. The EOSC itself is envisaged as a research data commons, including all disciplines and member states, associated countries and global initiatives. It is to be sustainable in the long-term, based on sound and transparent data stewardship, in which re-use of scientific outputs is the default. Hence the importance of FAIR principles and practices.

The FAIRsFAIR project addresses stakeholders ranging from research communities, research infrastructures and SMEs to research funders and publishers, analyzing current data policies and making recommendations for FAIR-enhancing policies, practices and data services. It plays a key role in the development of global standards for FAIR certification of repositories, strengthening certification schemas such as CTS, and will also support repositories in implementing these, recognizing the fact of different maturity levels. Data stewards and data scientists will be trained, also with a view to providing training themselves ("train the trainer"). A FAIR competence framework for higher education and a virtual competence center with experts in disciplinary communities will neatly combine formal learning with everyday learning-on-the-job. With its 22 partners and a duration of three years (2019-2022), FAIRsFAIR will foster a FAIR data culture including the uptake of good practices in making and keeping data FAIR. For project leader DANS this is a great platform to contribute our earlier products and expertise to.

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TABLE III
Mapping of main categories for software sustainability to the high-level FAIR principles (i.e. the letters)

CLARIAH Number	CLARIAH Criterion	SSI Criterion	Explanation	FAIR letter	No. of SSI Criteria	No. of CLARIAH Criteria	MoSCoW
5	**Usability**	**Usability**			**73**	**42**	
5.1	Understandability	Understandability	Is the software easily understood?	F	11	6	M
5.2	Documentation	Documentation	Comprehensive well-structured documentation?	F	25	12	M
5.4	Buildability	Buildability	Straightforward to build from source on a supported system?	?	11	4	W
5.5	Installability	Installability	Straightforward to install and deploy on a supported system?	?	19	10	W
5.3	Learnability	Learnability	Easy/intuitive to learn how to use its functions?	R	7	5	C
5.6	Performance	-	Does the software perform well?	R	-	5	C
6	**Sustainability & Manageability**	**Sustainability & Manageability**			**130**	**45**	
6.1	Identity	Identity	Project/software identity is clear and unique?	F	8	3	M
6.2	Copyright & Licensing	Copyright	Easy to see who owns the project/software?	A	7	3	M
	-	Licencing	Adoption of appropriate licence?	A	5	-	(M)
6.14	Governance	Governance	Easy to understand how the project is run and the development of the software managed?	R	2	?	W
6.4	Community	Community	Evidence of current/future community?	R	11	3	?
6.3	Accessibility	Accessibility	Evidence of current/future ability to download?	A	12	7	M
6.5	Testability	Testability	Easy to test correctness of source code?	R	19	4	S
6.6	Portability	Portability	Usable on multiple platforms?	I	17*	3	C
6.7	Supportability	Supportability	Evidence of current/future developer support?	R	21	2	W
6.8	Analysability**	Analysability**	Easy to understand at the source level?	F	20	8	M**
6.9	Changeability	Changeability	Easy to modify and contribute changes to developers?	I	14	6	W

6.12	Interoperability	Evolvability	Evidence of current/future development?	R	5	1	W
6.12	-	Interoperability	Interoperable with other required/related software?	I	6	-	S
6.13	Interoperability for community (CLARIAH)	-	Does the software comply to requirements for integration into the community (CLARIAH) infrastructure	I	-	?	C
6.10	Reusability	-	To what extent is the software reusable?	R	-	3	W***
6.11	Security & Privacy	-	Are security and privacy dealt with adequately?	R?	-	2	S
* Several PC/Mac platforms are mentioned, no platforms for mobile devices							
** Combine with understandability/documentation							
*** Is defined by all the other criteria							

Notes:

- The numbers in the table in the column "CLARIAH number" refer to the sections in the CLARIAH Guidelines 31]. SSI [30] doesn't not number their criteria.
- The columns "CLARIAH criterion" and "SSI criterion" give the headings in the two original guidelines [31, 32].
- The column "Explanation" gives a question to be answered for each criterion.
- The column "FAIR letter" gives our proposed mapping of SSI/CLARIAH criteria to a a FAIR letter.
- The columns "No. of SSI Criteria" and "No. of CLARIAH Criteria" indicate how many (sub-)criteria both organizations specify for each (main) criterion. For example, SSI has a total of 73 (sub-) criteria for "Usability" and CLARIAH has 42, etc.
- The column MoSCoW gives our proposed urgency of the criteria using the priority rules "Must have", "Should have", "Could have" and "Won't have".