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Title

WP3 Milestone 3.2 DiSSCo Digital Maturity Self -Assessment Tool - Design Blueprint

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Abstract

This Milestone 3.2 report for DiSSCo Prepare Work Package 3 Task 3.1 sets out the initial design blueprint for a DiSSCo Digital Maturity Self-Assessment Tool, building on the analyses in the Milestone 3.1 report

'Improving Digital Capability - Case Studies and Analysis' (Hardy et al, Dec 2020) and in the Milestone 3.3. Report, including consideration of two existing tools in our sector. This tool is intended to support teams, institutions and national nodes in developing organisational readiness for provision of the DiSSCo services and data, helping them to identify and target areas for improvement. The aim is for this to tie in to future provision of training and support, as well as helping to identify the gaps at aggregate level where that training may be most useful. In addition, we believe there is a case for a platform that can support both this and the related Task 7.3 Policy Tool, such that these or other tools are consistent for users and can interact with one another where relevant, avoiding any duplication. This blueprint is intended for wider discussion among the DiSSCo members, so that tool content can be developed in more detail as part of the Deliverable for this Task.

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DiSSCo Digital Maturity Self - Assessment Tool - Design Blueprint

DiSSCo Prepare WP3 – Milestone 3.2

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Abstract

This Milestone 3.2 report for DiSSCo Prepare Work Package 3 Task 3.1 sets out the initial design blueprint for a DiSSCo Digital Maturity Self-Assessment Tool, building on the analyses in the Milestone 3.1 report 'Improving Digital Capability - Case Studies and Analysis' (Hardy et al, Dec 2020) and in the Milestone 3.3. Report, including consideration of two existing tools in our sector. This tool is intended to support teams, institutions and national nodes in developing organisational readiness for provision of the DiSSCo services and data, helping them to identify and target areas for improvement. The aim is for this to tie in to future provision of training and support, as well as helping to identify the gaps at aggregate level where that training may be most useful. In addition , we believe there is a case for a platform that can support both this and the related Task 7.3 Policy Tool, such that these or other tools are consistent for users and can interact with one another where relevant, avoiding any duplication. This blueprint is intended for wider discussion among the DiSSCo members, so that tool content can be developed in more detail as part of the Deliverable for this Task.

Key words

DIGITAL MATURITY, SELF ASSESSMENT,
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01 INTRODUCTION

A critical factor in the success of the Distributed System of Scientific Collections Research Infrastructure (DiSSCo) will be to enhance the digital capacity of members to a level necessary to scale up our European digital operations. This requires identifying the current capacity and processes across a range of topics (e.g. digital skills, digitisation, communication, leadership, governance, mentoring), and supporting institutions in their efforts to scale up their digital operations relevant to the delivery of DiSSCo services. These requirements need to operate across organisations of very different sizes and levels of existing digital capacity. To support this, we have proposed the development of a DiSSCo Digital Maturity Self-Assessment Tool that enables institutions to self-assess their digital maturity across a range of parameters and supports the DiSSCo Coordination and Support Office (CSO) in their efforts to level-up delivery of digital activities across DiSSCo members.

Milestone 3.2 was originally envisaged as providing a prototype dashboard of competencies - however the analyses undertaken in the Milestone 3.1 report 'Improving Digital Capability - Case Studies and Analysis' (Hardy et al, Dec 2020) and subsequently reported in Milestone 3.3, as well as discussion at the DiSSCo All Hands meeting in January 2021, indicated that a Digital Maturity Tool was more likely to be of lasting value, and this paper therefore sets out our initial view of the design blueprint for such a tool, to be further discussed and developed going forward.

There are key synergies for this tool with DiSSCo Prepare Work Package (WP) 2 Task 2.1 Training Strategy, which ideally could be informed by reporting data from this tool and provide links through this to relevant training and support in future. The other key link is to WP7 Task 7.3, which envisages a similar self-assessment tool in support of policy compliance - while this is a distinct tool with somewhat different functionality, it is important that these are developed consistently and ideally on the same platform.

02 Overview of the proposed tool

2.1 Statement of Purpose

DiSSCo Prepare Task 3.1 will develop an online self-assessment tool which allows a DiSSCo Partner to map their team's or organisation's digital maturity against a scale of suggested elements; define which of those elements are relevant to their desired progress and set progress objectives. It will also allow the DiSSCo CSO to see the overall state of digital maturity and gaps across all DiSSCo Partners, contributing to monitoring, and where possible will provide links to relevant guidance, support and training.

2.2 Users

In the first instance, a DiSSCo digital maturity tool would be aimed primarily at current DiSSCo Partners (consortium members) who are collections-holding institutions, as they lead and contribute to DiSSCo Prepare and future stages, and as they build towards offering data and services via the DiSSCo infrastructure. There is an overlap between consortium member institutions and DiSSCo National Nodes - some Nodes are single institutions. The tool aims to work for Nodes, institutions, and for teams within wider organisations (for example a digitisation team). These are all known in the requirements below as 'institutional users'.

It is possible that in future the tool may also be applicable to additional institutions or teams who are DiSSCo members or wider end users of DiSSCo services, however it is too early to understand their likely needs and they are not included at present.

Finally, we expect that the DiSSCo CSO will be users of reporting data from the tool - their needs are distinct from those using the tool for self-assessment and improvement. They are referred to as 'reporting users' in the requirements below.

2.3 User needs analysis

A significant catalogue of user needs/stories have been identified as part of DiSSCo Prepare WP1 - these have been reviewed for this milestone, against the categories in the Global Biodiversity Information Facility (GBIF) self-assessment survey (see section 2.4.1 below). As these user needs refer broadly to the needs of users for DiSSCo services, they do not translate directly into user needs for the proposed digital maturity tool - however they indicate areas where digital maturity of consortium members will be needed to underpin the success of the DiSSCo services themselves, and which therefore shape the content of a digital maturity assessment.

In particular, the analysis of WP1 user needs suggested that end users of future DiSSCo services will be interested in the areas set out in the table below, which may be relevant to reflect in a digital maturity tool. It should be noted that many of these areas are not mutually exclusive and are the subject of other DiSSCo work packages that will plan and develop standards, tools and services - section 2.4 below sets out in more detail how these might be interpreted as content in the proposed tool, aiming to avoid duplication.

Area to cover	Further description
Availability of data at collection and specimen level, as well as data / image types such as whether 3D images are available	This is likely to be covered primarily in the DiSSCo Collections Digitisation Dashboard, however this tool is likely to include, for example, questions about resources for digitisation as below.
Data quality, mobilisation and use	Use of standards; quality assurance; licensing processes; use of persistent identifiers; policies including open data policies and exceptions (detail about compliance with policies will be part of the tool envisage in Task 7.3).
Digitisation	Progress on digitisation - resources/ team structures; variety of collections for which workflows exist; sharing best practices
Infrastructures	Institutional and National infrastructures of relevance e.g. what kind of Collections Management Systems are in place; ability to supply data e.g. to aggregator infrastructures
Monitoring and reporting	Availability and use of analytics e.g. understanding use of data; internal and external reporting e.g. to funders
Skills, resourcing and structures	Organisational structures and teams; skills and capacity; resourcing levels; leadership (including programme/project and digital/technology leadership)
Use and availability of tools and processes	What facilities do organisations have and use to generate data? Are tools and processes such as AI/machine learning; annotation and crowdsourcing used and/or available to DiSSCo service users?

2.4 Outline of tool content and structure

This milestone document is intended both to capture the blueprint for further development of this proposed tool, and to act as a consultation document to understand the views of DiSSCo members and what will make this tool most useful to them. For that reason, we are including here an initial description of the proposed content areas within this tool and the broad structure and functionality that will create the user journey. We hope that this will help people to understand how the tool may be used; whether it is actionable and beneficial; and identify any potential overlap or duplication with other tools or services so that these can be amended and avoided. The provision and use of the envisaged DiSSCo services requires digital transformation from institutions to be able to develop and connect with these infrastructures, and to provide data and services through them - so the themes of this tool are broad in support of that transformation.

2.4.1 Review of existing tools

Two existing questionnaires or tools - the GBIF Capacity Self-Assessment tool¹ and the UK Arts Council Digital Culture Compass² - have been assessed in considering the functionality and coverage of a DiSSCo digital maturity self-assessment tool. Details of this assessment can be found in the report for Milestone 3.3 of this Task. In summary, this analysis pointed towards the need for a DiSSCo tool that if possible can:

- Be useful to users at a team, institution or National Node level - can be used autonomously to help in institutional planning;
- Provide a standardised and relatively simple assessment of digital maturity that touches on a wide range of areas from leadership to infrastructure;
- Allow for assessment of gaps that will support DiSSCo in planning, training and support;
- Link to training or other support and resources that are available;
- Enables users to target areas for improvement and specify areas that are not relevant to them or their institution.

2.4.2 Digital maturity tool content outline

Based on the analysis of user needs and of existing tools and surveys, we suggest the following flow and content as the outline framework for the tool. This is draft content for consultation within DiSSCo - order, topics and details of drafting and scoring are all likely to be subject to further change and will be developed as part of the Deliverable for this task. Functionality in terms of requirements is captured in sections 3 and 4 below.

	Topic	Proposed content / questions / scoring
1.	Registration / user set-up	<p>Introductory content about what and who this tool is for and how to use it.</p> <p>User to enter:</p> <ul style="list-style-type: none"> • Name • Email address • Password (self-chosen) • Institution (drop down list of DiSSCo partner institutions associated with identifiers) • Consent to T&Cs / data use - potentially including consent that their contact details be shared with anyone else completing a self-assessment associated with the same institution <p>NB we assume further details of organisational profile do not need to be collected via this tool but will be present elsewhere e.g. on ELViS if relevant.</p>
2.	Starting a self-assessment	<p>When logged in, user to enter:</p> <ul style="list-style-type: none"> • Whether they are primarily completing the tool on behalf of a National Node; Institution or team/division within an institution

¹ <https://www.gbif.org/tool/6Y2Sqk8XokHUqIFun6TLxX/online-capacity-self-assessment-tool-for-national-biodiversity-information-facilities> (accessed 08:39 30/4/21 by Helen Hardy)

² <https://digitalculturecompass.org.uk/using-the-tracker> (accessed 08:39 30/4/21 by Helen Hardy)

		<ul style="list-style-type: none"> If team, the team name for which the user is submitting an assessment
3.	Strategy	<p>On strategy, areas to cover may include:</p> <ul style="list-style-type: none"> Organisational values and culture e.g. to what extent these allow the organisation to be flexible and innovative in response to change; Organisational strategy e.g. to what extent this recognises the value of digital collections/collections data; to what extent there is a link from the strategy to planning and to team and individual objectives; To what extent strategies and plans are based on evidence and data, and to what extent they set measurable outputs/targets; To what extent strategies, plans and/or culture value diversity and inclusion (of both staff and users).
4.	Policy	<p>On policies, this tool will need to reference the DiSSCo Policy Self-Assessment tool. Ideally, with an integrated architecture it may be possible to identify automatically whether the institution has completed the policy tool and either prompt them to complete it or provide a summary of current compliance.</p> <p>Alternatively, this tool could ask directly whether the institution has completed the DiSSCo Policy Self-Assessment tool; or could pose a more general statement e.g. 'We are compliant with DiSSCo policies - fully; partially; not yet' and point to the tool as support for those who answer partially or not yet.</p>
3.	Leadership	<p>Areas to cover may include:</p> <ul style="list-style-type: none"> To what extent there is clear ownership of key activities relating to digitisation or to DiSSCo in a wider sense To what extent leadership have, and measure, the necessary competencies to lead and support change and innovation, or plans and support in place to reach these To what extent leaders communicate effectively and work collaboratively to achieve strategic goals To what extent decision making is aligned with strategy and takes account of relevant evidence/data
4.	Resources and organisation (digital, data and technology)	<p>Areas covered could include:</p> <ul style="list-style-type: none"> To what extent there are teams specific to digitisation, data curation, infrastructure, IT support etc To what extent these teams work together to achieve digital strategy Whether the resources available for e.g. digitisation are sufficient to deliver strategic aims/ plans and targets To what extent other wider teams in the organisation are aware and supportive of DiSSCo and/or digitisation activities Availability of infrastructure e.g. wifi, data storage, remote working, system security etc

		<ul style="list-style-type: none"> • Availability of technology support <p>This section will include the possibility of outsourcing aspects of these needs.</p>
5.	Competencies and skills	<p>Areas covered could include:</p> <ul style="list-style-type: none"> • To what extent the institution uses any competency frameworks for recruitment, appraisal, progression etc • To what extent individuals or teams are encouraged to identify skills gaps and whether support is available to fill these (e.g. training) • To what extent the organisation has processes in place to measure or monitor competencies and fill gaps/ raise standards • To what extent key digital competencies/skills are available, internally or via outsourcing • To what extent it is possible to recruit individuals with the right competencies and skills (e.g. are digital skills present in job descriptions; are salaries sufficient to attract suitable candidates); are there career paths and opportunities that keep those individuals in the organisation over the medium-long term) • To what extent does skills transfer and informal learning take place e.g. are there shadowing, mentoring or internal secondment schemes; or regular ways to disseminate knowledge such as talks, demonstrations or tours? • To what extent are key competencies narrowly or broadly available e.g. are they focused in one or two key people and are there succession plans in place?
6.	Data management and mobilisation	<p>This section could serve as a pathway to other DiSSCo resources such as Minimum Digital Information about a Specimen (MIDS) standards, as well as referencing external standards where relevant</p> <p>Areas covered could include:</p> <ul style="list-style-type: none"> • Whether the institution has its own platform to provide access to data, and whether this meets relevant accessibility standards • Whether the institution is able to provide data to National or International aggregators • How effectively the institution's collections management system(s) supports these kinds of data provision • What standard of digital preservation is possible for the Institution • Whether the institution has data leads/owners • Whether there are governance and processes in place for managing data quality • The extent to which the institution values data and manages data as an asset

7.	Digital processes and services	<p>This area is intended to point towards future DiSSCo needs such as the capability to offer digitisation on demand. Areas to cover may include:</p> <ul style="list-style-type: none"> • To what extent digital workflows exist to support key collections management processes such as acquisitions and loans • To what extent 'loans' are offered digitally • To what extent digitisation (data capture and 2D imaging) is available as a service/ on demand with defined service levels • To what extent enhanced digitisation (e.g. 3D imaging, various analyses) are available on demand with defined service levels • Whether costs of such services are modelled and understood, and whether any cost recovery or charging model is in place
8.	Programme and project management	<p>This could be a separate category or fall within one of the categories around leadership or organisation/resources - it would aim to capture to what extent the team or institution had access to appropriate programme and project management skills/competencies to plan and deliver change and digitisation projects; and can use different tools and approaches including e.g. Agile, Prince2 and digital working tools.</p>
9.	Measurement and reporting	<p>Areas to cover may include:</p> <ul style="list-style-type: none"> • To what extent data are collected and analysed e.g. to measure how collections data are accessed and used (such as citation) • To what extent these data are then used in reporting and decision making e.g. to prioritise projects • To what extent appropriate tools are in place for data collection, analysis and reporting • To what extent user needs for data are understood and monitored
10.	Fundraising & Development	<p>Areas to cover may include:</p> <ul style="list-style-type: none"> • To what extent the organisation feels able to make the case for digitisation to governments or to private/corporate donors • To what extent digitisation is a priority for fundraising (if further resources are needed)

03 Functional Requirements

Functional requirements specify something a system should do (e.g. transactions, authentication, reporting). These requirements also constitute acceptance criteria for the tool. These requirements are likely to be amended and expanded following consultation on the tool content, but capture the core requirements.

1.	Institutional user can create an account with a user ID and password
2.	Institutional user can login to an account by visiting the tool or via a persistent link generated to each self-assessment which is shared with the user
3.	Institutional user can update an existing self-assessment or launch a new self - assessment, specifying for new assessments whether they are completing it primarily on behalf of a National Node, an institution or a team within an institution
4.	Users must select their DiSSCo Partner Institution which then links their account, assessment and reports to an institutional ID
5.	Institutional user can complete the self-assessment, completing questions and sections in any order
6.	Institutional user can enter notes to explain their responses to each section
7.	Institutional user can save progress at any time and come back to the self assessment via the tool homepage or via the persistent link for the relevant self-assessment
8.	An Institutional user's self-assessment progress is auto-saved after a defined period and/or at defined points e.g. end of section
9.	The tool allows for updates to the content (e.g. an administrator can add, amend or delete questions and sections, though this is not expected to happen frequently)
10.	An update to the content will not result in loss of data previously entered by the user. The user will see the questions / content as they were when a previous answer was entered, but if updating this answer will see any updates to the questions.
11.	Self-Assessment tool prepopulates with previously submitted responses when an institutional user logs in or uses the appropriate persistent link
12.	Users will be alerted to other self-assessments from their institution and provided with a contact point for these (having agreed to this at sign-up – they will not have access to these except through the contact point)
13.	Institutional users can work collaboratively on the self-assessment.

14.	Institutional user can select as part of their self-assessment whether [sections] of the tool are relevant to their use case or not, and can change this at any time
15.	Institutional user can generate a report summarising their responses to the tool at any time - this may include graphic representations of their progress.
16.	Institutional user can specify the current level and their desired level in 12 months for all questions
17.	Tool will automatically prompt Institutional users via email to view and update their responses, at a frequency determined by the user or CSO administrators
18.	Reports are versioned with dates
19.	Within each question/section and/or within the institutional user reports, institutional users can be directed to links to relevant information and guidance as appropriate, that will open in a separate window.
20.	Administrator can add reporting user(s)
22.	Reporting users can explore and download summary data about tool use (e.g. which institution IDs have one or more associated assessments; how many users are primarily representing Nodes, whole institutions or teams within institutions); and about levels of digital maturity to help identify strengths and gaps (likely to be needed to node level - to be determined).

04 Non-functional Requirements

Non-functional requirements specify how a system should work (e.g. performance, scalability, interoperability, data integrity). This set of non-functional requirements have been taken from the DiSSCo Policy Tool Design Blueprint to ensure alignment.

Category	Requirement
Accessibility	The system should follow the W3C Web Content Accessibility Guidelines (WCAG) 2.0 (https://www.w3.org/TR/WCAG20/).
Availability	The system should be always available during the hours it is most popular. Any maintenance where the system needs to be taken offline should be done outside these times.
	The geographic location of the server should not impede the availability of the system. This means a location with a good quality connection and with minimal network restriction should be chosen.
Backup and recovery	The system should be responsible for taking backups of data, such that it may be restored to a working state.
	The system should backup data very frequently (e.g. every hour) to avoid any data loss.
	The system should backup in a short period of time (e.g. one minute) with minimal disruption.
	In the event of a disaster, the latest backup should be immediately restored, such that the system is offline for less than one hour.
Capacity and scalability	The system must store data effectively and must anticipate the time remaining until all available storage is filled up.
	As the system gets used more often, by more people, the storage available will need to increase.
	The system should be able to scale to the requirements of the full DiSSCo user base without degradation in performance.
Data integrity and validation	System datastores, user interfaces and APIs should be UTF-8 compliant.
	The data store should be able to apply appropriate constraints to maintain the integrity of the data according to the defined data model.
	The data store and interfaces should be able to validate data to ensure compliance with the data model definitions.
Documentation	The system should be accompanied by comprehensive user, installation and administration guides.
	The system should use open source components, and any code generated should be made publicly available under an agreed open source license.
Flexibility and extensibility	The system architecture should be extensible and modular, so that extensions to the original scope can be easily incorporated.

	The system should support ongoing modifications and additions to the data schema and user interfaces without compromising the integrity of the core architecture. As much as possible, this should be possible through system configuration rather than code customisation.
Interoperability	The system should include a RESTful API with CRUD capabilities and appropriate security and authentication. Ideally the same API should be available for external integrations as the system uses for its own user interfaces.
	The system should be able to present and handle data in formats that are compatible with other DiSSCo services and core architectural components.
Localization	The system should provide the potential for managing the languages of DiSSCo member countries, although the initial interface will be developed in English.
	The system should support regional data formats (e.g. dates and currencies).
Maintainability	Accepted standards and design patterns should be used in the construction of the base architecture.
	The code should be built modularly, such that independent parts accomplish independent tasks. Common coding styles should be used.
Performance	Over reasonably common internet connection speeds, the server should respond to client requests in less than one second.
	Interactions with the server which require processing, such as login and requesting thumbnails of images, should take less than three seconds.
	Querying the database should take less than one second.
Mobility and compatibility	The system should be installable on operating systems that are appropriate for the production environment of a DiSSCo service.
	The system should be compatible with all major browsers (Chrome, Firefox, Edge and Safari).
	During the development process the implications of providing compatibility with major mobile browsers will be explored, as well as the need to scale appropriately for mobile device screen sizes and resolutions.
	The system should be installable on physical or virtual hardware that are appropriate for the production environment of a DiSSCo service.
Regulatory	The system should restrict visibility of sensitive and personally identifiable information to appropriate authenticated users.
Reliability	The system should meet or exceed 99.99% uptime.
Security and privacy	Users must be logged on to add, edit or delete data and files.
	The system should employ user- and role-based access control.
	Users must be accredited members of an institution to edit the data and files for that institution.
	Passwords must not be stored within the system or revealed to users.
	The system should make use of encryption to ensure that data is stored securely. For example, passwords should be stored as SHA1 hashes. Connections should be encrypted to prevent unauthorised listening of communication.
Support	End user and administrative support should be available to users during normal European hours of working.

Usability	Users should be able to learn to use the system without requiring assistance or dedicated training.
	The system should look visually engaging, be attractive to users, and use a consistent design throughout, to encourage use and inspire the confidence of users.
	Tools, information, documents and functionality should be easy to find without reference to guidance.
	Users should be able to navigate the system, workflows and functions with a minimised number of clicks and other interface interactions.
	The system should be easy to remember, so that the casual user is able to return to the system after some period of not having used it, without having to learn everything all over again.
	95% of users should rate the system as enjoyable to use.
	The system should use validation and workflows to minimise the ability of users to make errors.

05 Dependencies and issues

This is not the only tool that will be developed as part of DiSSCo - in particular Task 7.3 are completing a similar blueprint for a Policy Self-Assessment tool. That tool has similar but distinct functionality as it requires document upload and comparison against a defined metadata schema, This digital maturity tool is not intended to have a compliance function, but may require a metadata schema.

In addition, a key linkage for Work Package 3 has always been to work on training and support within DiSSCo, and it would be very useful to be able to associate a digital maturity self-assessment tool with resources and training. This is also likely to significantly improve take up of the digital maturity tool, which may otherwise struggle to gain traction as a discretionary offering, even though it is designed to add value to institutional planning.

These factors suggest that a platform approach will be more useful and future-proof than a standalone digital maturity assessment tool, which by itself could be little more than a 'survey' type format. The timeframe and approach for developing a tool based on this blueprint will need to take account of that.

In addition, development resources within Task 3.1 are extremely limited and unlikely to be able to develop more than the most basic version of a digital maturity tool by the Task deliverable deadline of July 2021.

06 Next Steps & Conclusion

This blueprint outlines the functional and non-functional requirements for the DiSSCo digital maturity tool, as well as the synergies with related activities. This document will be used to share thinking and possible content and functionality for a digital maturity self-assessment tool within the DiSSCo community, in order to develop content in more detail as part of the Deliverable for this Task. Further work will also be undertaken to link this tool more closely to the competencies that may be required under DiSSCo, for example via further analysis of key vocabulary and roles, which will build on the analyses of competency framework examples in Milestones 3.1 and 3.3. Fields for the tool will be evaluated to see if they can adopt definitions or controlled vocabularies from community standards, and work will be undertaken to clarify consistent levels for scores across the tool. We will have further discussions to understand how the tool may be able to link to support and training in future.

Owing to the need to link to training and support, and the need to support and develop a common platform for related use cases such as DiSSCo Task 7.3 Policy tool, it is unlikely that this tool can be fully developed in time for the Deliverable of this Task in July 2021. Work is underway to establish a pathway to take tool development forward within the DiSSCo Prepare Work Packages.