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DiSSCo Prepare WP3 D3.1 Summary Insights and Recommendations on DiSSCo Competencies and Digital Maturity

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Abstract
This Deliverable report summarises the key insights and recommendations from DiSSCo Prepare Task 3.1, which looked at digital skills, competencies and capabilities across individuals and organisations, as part of the wider Work Package on capacity enhancement. This task looked at insights from previous DiSSCo linked projects; a wide range of competency framework examples; sources of data about individual and organisational capabilities; and capacity building for organisations leading to the key recommendation of a DiSSCo Digital Maturity Tool. These insights are already being used as inputs to other Tasks in DiSSCo Prepare, showing the key role of capability in the broadest sense in underpinning the DiSSCo digital transformation.

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Summary Insights and Recommendations on DiSSCo Competencies and Digital Maturity

DiSSCo Prepare WP3 – Deliverable 3.1

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Contribution to DiSSCo RI

Task 3.1 contributes across all of the readiness dimensions of the DiSSCo RI, particularly organisational readiness, by providing insight into the individual competencies and the organisational capabilities that will underpin a successful DiSSCo transformation in the broadest sense, from leadership behaviours to digital capabilities. As set out in the Abstract and below, these insights are already actively feeding in to a range of other DiSSCo Prepare Tasks.

Key words

DIGITAL MATURITY, CAPABILITY, COMPETENCY, LEADERSHIP, SKILLS

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01 Introduction

Task 3.1 of DiSSCo Prepare focused on improving digital skills and competencies across DiSSCo facilities as part of the data readiness dimension of the project. This also has an extremely close relationship with the organisational readiness dimension, and the subtasks rightly identified that digital transformation requires organisational change and a wide range of skills including communication, policy, leadership and governance as well as specialist digital, data and technology skills. The task therefore covered a lot of ground, including:

- Outputs of previous work;
- Competency frameworks for individuals;
- Capacity building and organisation change for institutions, ideally including customised recommendations;
- Data sources about individual and institutional 'clusters' of skills and knowledge;
- One or more digital dashboards or platforms in support of this.

The Milestone 3.1 and 3.3 reports[1] from this task together examine the insights from previous DiSSCo-linked projects; analyse over 10 competency and skills frameworks from within and beyond the collections sector as well as several tools and approaches used to assess organisational digital capabilities and maturity; share case studies of digital transformation from The Finnish Museum of Natural History (Luomus) and other DiSSCo members; and discuss the sources of competency and capability data, the limitations on these and how they might be leveraged in future.

Based on these in-depth analyses, and discussions at the DiSSCo All Hands meeting in January 2021, it became clear that a new DiSSCo competency framework was not likely to be used at this stage, and that work could most usefully focus on a DiSSCo Digital Maturity Self-Assessment Tool through which teams and organisations of all sizes could straightforwardly self-assess to identify tailored areas for improvement; and DiSSCo could understand key gaps, offer training and support, and measure progress in capability development. Milestone 3.2 therefore published the high level design blueprint[2] for such a tool, capturing the functional and non-functional requirements and a first indication of content.

This deliverable report summarises the key points and recommendations across the previous Milestones and discussions; and is delivered alongside Milestone 3.4 which provides a more detailed description of content for the proposed Digital Maturity Tool[3]. While Task 3.1 could not deliver such a tool within the provided time and resources, development will now be taken forward alongside development of the Policy Tool proposed in Task 7.3, ensuring a consistent platform and approach, and this development project will act as the pilot for distributed working to be reviewed under Task 3.3.

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[1] Hardy, H., Koivunen, A., Juslén, A., Groom, Q., Mergen, P., Berger, F., Giere, P., Figueira, R., & Cartaxana, A. (2021). DiSSCo Prepare Milestone report MS3.1 "Improving Digital Capability - Case Studies & Analysis". DiSSCo Prepare. https://doi.org/10.34960/W8F3-H851
Hardy, H., Koivunen, A., Groom, Q., Huybrechts, P., Mergen, P., Berger, F., Giere, P., Figueira, R., Arsénio, P., & Cartaxana, A. (2021). DiSSCo Prepare Milestone report MS3.3 "DiSSCo Capabilities – Additional Case Studies & Analysis". DiSSCo Prepare. https://doi.org/10.34960/APH7-RF10

[2] Hardy, H., Koivunen, A., Groom, Q., Mergen, P., Berger, F., Figueira, R., Arsénio, P., & Cartaxana, A. (2021). DiSSCo Prepare Milestone report MS3.2 "DiSSCo Digital Maturity Self-Assessment Tool - Design Blueprint". DiSSCo Prepare. https://doi.org/10.34960/Q1MZ-ZF45

[3] https://doi.org/10.34960/3a39-b979

02 Summary insights and recommendations

2.1 Individual roles, skills and competencies

Analysis of over 10 competency frameworks, including the EUColComp project and framework for collections management; institutional frameworks currently in use among DiSSCo members; the UK Civil Service competency framework; the Skills Framework for the Information Age (SFIA); and various EU open science and data frameworks, suggests that the most successful frameworks are those aligned with and embedded in key processes such as recruitment; performance management / appraisal; progression and promotion; and individual skills development and training. It is unlikely, at least at this stage, that DiSSCo can provide a framework to be embedded in this way across the range of relevant countries and institutions, many of which may be mandated to use a particular approach, while others may not have any experience of applying such a framework previously. This was the experience of EUColComp, where we could not find any evidence of the framework being used in any systematic way after it was produced.

We have therefore not attempted to produce a new DiSSCo competency framework within this Task, however we do believe there is useful learning to be taken from our analysis, which can inform future Tasks in DiSSCo Prepare including Task 2.1 training strategy and Task 4.1 DiSSCo Cost Book. Development of the Digital Maturity Tool as proposed will also help to identify current use and experience of competency frameworks and where there may be room for future development.

While competency frameworks vary in their level of detail, they have a lot in common. Almost universally, they set out not only the skills and behaviours (and/or sometimes knowledge, values and attitudes) that are key requirements for individuals working in an organisation or sector/profession; but the various levels at which these apply - whether these levels are something like 'high / medium / low' or specifically link to job grades or roles (between three and eight levels seems usual). They also typically provide examples or statements of what good or excellent looks like, and sometimes of what would be seen if the competency was lacking or negative.

Our research identifies instances of closely related vocabulary and concepts around the levels of competency, relating to job grades or levels of seniority in an organisation or profession and the increase in autonomy, complexity and cognitive burden with increasing seniority. Vocabulary from four major sources is compared in Table 1 below - association of these levels to one another is our own, based on conceptual and vocabulary fit. This has been shared with Task 4.1, the Costbook for DiSSCo, where there is a need to define a limited number of job levels or types as a universal reference point for the staff costs of different institutions - as a result, definitions will be included for each suggested level for the Costbook spreadsheet, and these definitions will continue to be developed through feedback as the Costbook is tested with National Nodes.

Table 1: Comparison of competency level vocabulary

	Dreyfus & Dreyfus	**NHM London**	**EC DigComp**	**SFIA**
More junior/ lower competence	Novice	Assist & follow	Foundational	Follow
				Assist
	Competence	Enable & apply	Intermediate	Apply
				Enable
	Proficiency / practitioner	Acts on own initiative	Advanced	Ensure/advise
More senior /higher competence	Expertise	Responsible / advises and guides / consultant		Initiate/influence
	Mastery	Accountable / external leadership & influence	Highly specialised	Set strategy/ inspire/ mobilise

While vocabulary and concepts around competencies and groups of competencies themselves is more varied depending on the purpose and sector for each framework, there are nonetheless elements in common. The DiSSCo Blueprint[4] used the concept of 'functional groups' - clusters of competencies needed to perform a stage or set of tasks, whether or not this mapped to one or more existing roles in any given institution, albeit these were discussed primarily in relation to digitisation. Similar clusters are often reflected in the examples that we analysed, where groupings are made of job roles ('job families') and/or of groups of skills themselves. The Belgian Dictionary of Competencies for instance distinguishes skills groupings of Leadership; Interpersonal relationships (including direct line management); information management; task (or operational delivery) management; and personal functioning (managing one's own time, outputs and development), as well as an additional technical skills grouping.

A key distinction that emerges between frameworks is between those that attempt to generalise competency as far as possible for wide applicability, and those that try to be highly role-specific - an example of this is the difference between featuring 'digitisation' as a competency area (role specific) versus breaking this out into constituent skills under wider competencies e.g. workflows under operational management; collections handling; and data competencies. There are competing drivers within DiSSCo in this respect - generalisation supports usefulness to the wide range of teams and organisations in the project, however some of the areas where skills are likely to be lacking are those of high specificity, particularly in the digital, data and technology area. The furthest example of generalisation examined which is nevertheless a comprehensive framework is the UK Civil Service competencies, designed to be used across a very wide range of departments and roles. These extrapolate out to the broadest processes as a starting point - e.g. suggesting clusters of competencies focused on setting direction; engaging people; and producing results. However, they

[4] https://doi.org/10.3897/rio.6.e54280

now sit alongside other measures for recruitment, development, etc. including detailed role-based professional job frameworks. A similar combination would likely meet DiSSCo needs best if in future a specific DiSSCo competency framework is desired. Thinking in broad terms about the challenge of the DiSSCo transformation suggests key areas of focus around change leadership, flexibility and problem solving, and collaboration / partnership.

Across the range of frameworks reviewed, as well as the work of the previous DiSSCo-linked projects, in general terms the following clusters of competence emerge regularly as relevant to DiSSCo (albeit they can be grouped in various different ways):

Table 2: Key competency clusters for DiSSCo

1	Leadership and management of people, resources and change, including governance, programme and project management and decision making
2	Strategy and policy
3	Communication and influencing (internally and externally), including training and developing others, collaboration, and scientific communication including publications
4	Operational and service delivery including digitisation workflows
5	Data and information skills, including data curation/management/stewardship for data quality, data architecture & standards, and data analysis & use
6	Digital and technological skills, including architecture, development, infrastructure and support
7	Collections management and curation, including collections 'technical' skills and specialisms or scholarship such as taxonomic skill or integrated pest management
8	Additional specialisms including legal, finance / procurement and HR

The proposed DiSSCo Digital Maturity Tool will seek to cover all of these except for 7, collections management and curation, where there is assumed already to be a high level of maturity and of insights based on previous work. More detail can be found in the Milestone 3.4 report about the suggested content for the tool.

2.1.1 The RI Train framework and the EMBL-EBI Competency Hub

One additional competency framework has been reviewed for this deliverable, since it focuses specifically on, and was developed in partnership with, Research Infrastructure leaders. This RI Train framework[5] aims to support the definition of a set of reference competencies ideally observable in managers of research infrastructures achieving a successful performance. To do so, it seeks to specify the relevant knowledge, skills and behaviors, as well as illustrating both the effective and some of the ineffective behaviours to be shown by RI managers. Competencies are organized in three broad areas:

1. Leading the organization, including strategy, planning, finance, compliance, staff leadership/management and advocacy;
2. Engagement with and beyond the organization, including communication, collaboration, negotiation and championing diversity; and

[5] https://competency.ebi.ac.uk/framework/ritrain/1.0

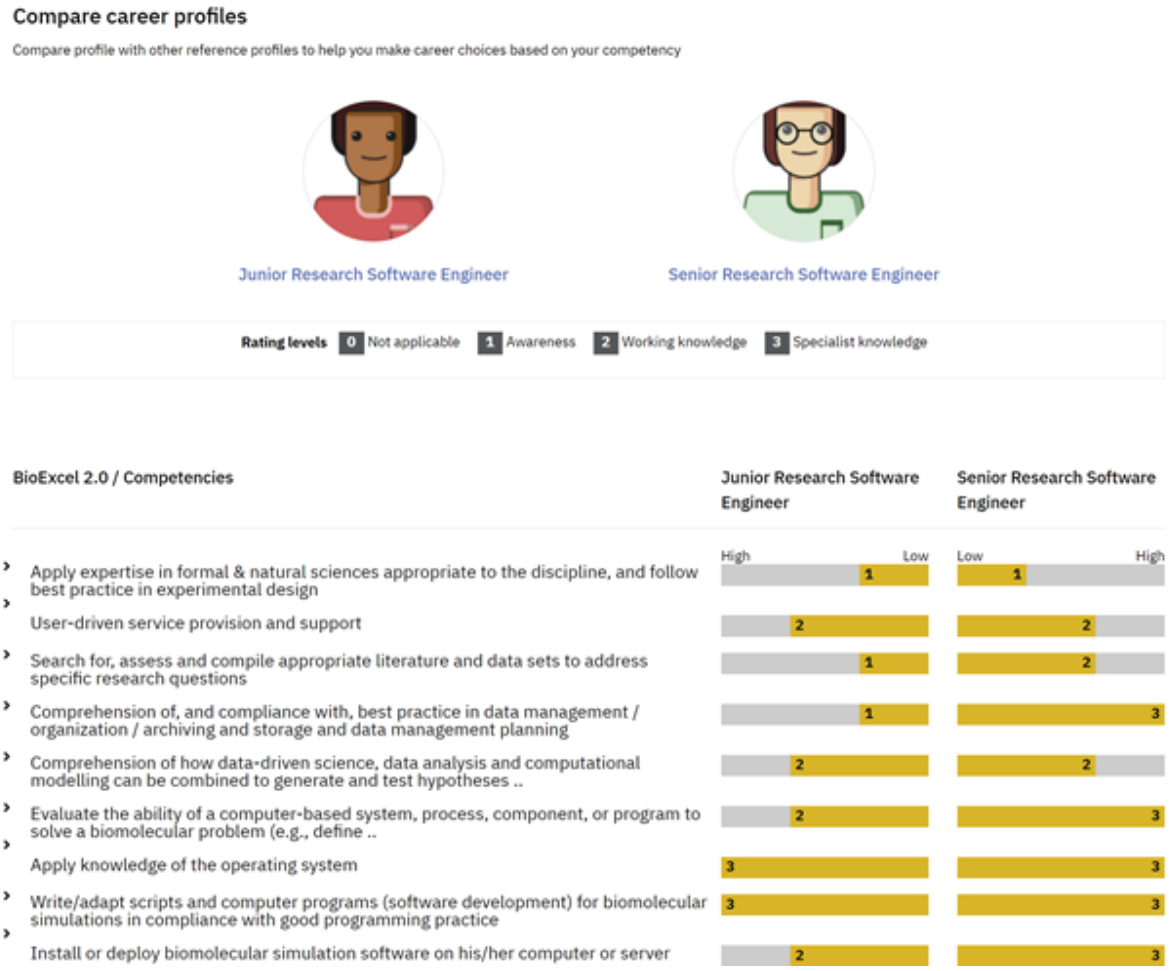
3. Professional conduct, including integrity, accountability and responsible decision making.

While aspects of this framework might sometimes be seen in organisational values or other elements of performance management, the overall vocabulary and direction of this framework is very similar to the others reviewed and has also informed the summary above, as well as the inclusion of communication as a key section within the proposed Task 3.1 Digital Maturity Tool.

This competency framework is housed with a range of others on the '*Competency Hub*'[6], a web-based tool to support the creation and management of competency frameworks developed by the EMBL-EBI Training Team with support from the BioExcel and PerMedCoE Centres of Excellence. These competency frameworks were designed to be used by the training communities who developed them, and openly available to anyone. We met with EBI to discuss this hub, and for the most part it seems that training was in place first at least to some extent, with the competency frameworks following. Many of the other frameworks on this hub are very detailed and specific - for instance, the BioExcel framework 2.0 for professionals in the field of computational biomolecular research[7]. While this makes them somewhat less relevant to DiSSCo in general terms, several offer an interesting functionality of career profiles. Preset profiles such as 'junior research software engineer' are available which are mapped to the relevant competencies and levels and can be compared (e.g. you can compare junior and senior profiles, or different roles, in terms of their competency mapping and levels) as shown at Fig. 1 below, or there is an option to create your own tailored profile. This functionality goes beyond what we have seen in other frameworks reviewed for this Task, and would be worth further consideration if at any point in the future DiSSCo produces a standardised framework of roles and competencies.

[6] https://competency.ebi.ac.uk/
[7] https://competency.ebi.ac.uk/framework/bioexcel/2.0/profiles/

Fig. 1: Comparison of two roles in the BioExcel 2.0 Competency Framework[8]



2.1.2 Competencies and the DiSSCo training strategy

One of the key linkages for Task 3.1 is to inform Task 2.1, the DiSSCo training strategy. Another key input into this is the recently completed SYNTHESYS+ work on training, summarised in *D2.3 Catalogue and recommendations for development of a proactive, efficient and evolving DiSSCo training programme* (Castelin et al., 2021). This report identifies the role that collections-holding institutions have had over time in delivering training focused on collections, research, policies and more recently digital areas. It identifies a taxonomy of Key Training Areas (KTAs), comprising eight top level areas:

- History of collections;
- Basic knowledge related to collections (including documentation)
- Specimen (including sampling/collecting, care, digitisation and specimen-based research);
- Data;
- Equipment use;
- Policy & legislation (including compliance with international conventions);
- Training multipliers (train the trainer and citizen science); and

[8] https://competency.ebi.ac.uk/framework/bioexcel/2.0/profiles/compare/7262/7263

- Text & Media (knowledge transfer including exhibitions).

These are then branched to provide more detailed training topics such as data standards & interoperability. The majority of existing training identified focused on the 'specimen' area, with sizeable sets also for data and policy. Perhaps unsurprisingly, the largest subcategories in existing training are collections management and taxonomy.

In addition, the report analyses the Implementation Readiness Levels (IRLs) for the five DiSSCo Prepare Dimensions of scientific, technological, data, organisational and financial readiness, which were used to identify 29 training objectives, matched to the relevant dimension. A mapping of existing training across these shows that the majority of existing courses are against the scientific and data dimensions.

The IRL training objectives are detailed and generally also map well to and provide coverage of the key competency clusters outlined at Table 2 above. They have extensive coverage of collections-related competency areas, as would be expected and is already reflected in existing training, as well as coverage of digitisation and data workflows; many aspects of data and technology; policies; governance; management including resources and planning; communications; and finance. Milestone 3.4 notes which IRL training objectives are most relevant to the various areas of the proposed Digital Maturity Tool, to help the development and alignment of training and support to this tool in future.

There are some areas such as policy, however, where the emphasis of the IRL training objectives, and of existing training, is more around compliance, or around the kinds of training that support people to do their day to day job (e.g. training in particular systems or data tools). While this is very important, and many of the objectives do go broader than this, we recommend that in order to take the fullest possible approach to the DiSSCo training strategy in relation to competencies, training must consider all aspects of personal development relevant to delivering DiSSCo. An example would be to consider what kinds of training could support a culture and skillset of innovation in processes and services, and of resilience to change - for example supporting current and future leaders in such approaches.

2.2 Finding competencies and capabilities

It is not straightforward even within, let alone between, organisations to understand where competencies or clusters of capability can be found. This is relevant to DiSSCo, however, because of the variety of organisations involved – not every role or organisation will require the same span of competences, and part of the benefits of a network should be the ability to draw on expertise elsewhere. Task 3.1 therefore included work to assess existing sources of data about competency, while recognising the significant limitations on these.

We tested five online resources - LinkedIn, ResearchGate, WikiData, GitHub and ORCID - to determine their potential for indicating the competences of institutions and their staff. Each system has a unique set of data and means of access. None of the platforms had the full range of data or services that would fully meet this need or cover the range of competencies listed above. For example, none were able to select the full range of institutions, who their staff were or what their staff do. Wikidata is the most versatile, because the data and API are open and particularly because the data are accessible to edit. Therefore, if data are wrong, out-of-date or missing, they can be added. However, Wikidata has a notability requirement for people and will never have granular details of a person's skills. ResearchGate and LinkedIn are professional networking services and contain a lot of information related to skills and competencies. However, the data are all self-

reported and are therefore, rather patchy and often out of date. Furthermore, programmatic access to the data is limited without paying for the service – although that may be an option in future if the data are considered sufficiently useful. Using ORCID is attractive, at least for researchers, and although the data are self-reported they are of high quality and link people to their publications and other outputs. Likewise, GitHub is perhaps only useful for people in information technology, however, for this sector there is a lot of information that could be extracted, though only by inference from the repositories that a person contributes to. In conclusion, none of the resources we examined could give us a full picture at the institutional level, however, the data in these resources is abundant and might be useful to examine the museums and herbaria sector in general. Consistent use of ORCID and appropriate institutional identifiers within DiSSCo, and linking these to Wikidata or other resources as relevant, will help to improve the pool of reliable and accessible information over time.

2.3 Organisational readiness and the Digital Maturity Tool

As mentioned in Chapter 1 above, we identified a DiSSCo Digital Maturity Self-Assessment Tool as the most useful next step, operating at the team or institutional rather than individual level, given that there are a large number of existing competency frameworks but with poor usage; organisations are constrained in their ability to adopt new frameworks; and there are severe limitations on the potential for any kind of automated dashboard of where competencies or capabilities can currently be found.

We reviewed similar existing Tools or surveys from GBIF[9] and the UK Arts Council[10], incorporating relevant learnings into our thinking. We have also now reviewed the Digitisation Guide from the Atlas of Living Australia[11], which includes a Digitisation Maturity Model at Annex 6. This lists six digital maturity levels (from '0 – Disorganised' to '6 - On the look out / continuous improvement') against six core digitisation activities: Making digital; Databasing; Managing data; Sharing data; Using technology; and Governing digitisation. This Guide is a useful resource for digitisation teams and the Maturity Model provides helpful examples of what levels might look like. Overall, the vocabulary and concepts in this guide are very similar to those reviewed in looking at other competency frameworks and tools, for example talking about increased standardisation and measurement at higher levels of maturity.

Building on the design blueprint[12] for the proposed DiSSCo Digital Maturity Tool, a more detailed specification for the Tool content is being published at the same time as this report[13], including:

- the levels against which users will assess their current and target capability;
- the categories/sections and subcategories that will form the structure of the assessment, building on the initial table in the blueprint document;
- examples of full category content;
- more depth about the requirements for accessing the tool and reporting; and
- an example of sections of the tool in Google Forms.

A development team is being established to work on this Tool alongside the DiSSCo Policy Tool (DiSSCo Prepare Task 7.3). This will be a distributed team and will therefore act as a pilot of distributed technology work, which will be reviewed and discussed as part of work on secondments

[9] https://www.gbif.org/tool/6Y2SqK8XokHUqIFUn6TLxX/online-capacity-self-assessment-tool-for-national-biodiversity-information-facilities
[10] https://digitalculturecompass.org.uk/using-the-tracker/
[11] https://www.ala.org.au/wp-content/uploads/2011/10/Digitisation-guide-120604.pdf
[12] https://doi.org/10.34960/Q1MZ-ZF45
[13] https://doi.org/10.34960/3a39-b979

and distributed working practices (Task 3.3). A key future step will be to establish the best way to use this tool to support institutions and individuals, e.g. through linking to available training and resources whether provided through DiSSCo or more broadly.

03 Conclusions and Next Steps

The analysis of roles and competencies in Task 3.1 is already in active use as part of wider DiSSCo preparation, including defining standard staff seniority levels for the allocation of staff costs as part of the Costbook for DiSSCo (Task 4.1); and as an input to the DiSSCo training strategy as part of Task 2.1.

While we do not recommend that a DiSSCo competency framework or any dashboard to automate searching for competency or capability in individuals or organisations should be progressed at this time, we do recommend that a library of relevant role/job profiles be set up in the DiSSCo Knowledgebase[14] (currently a beta version). Role profiles are a feature of some of the more advanced competency frameworks we looked at, and it is more likely that roles specific to DiSSCo needs can be identified. In the first instance, this could be a place to share examples from individual institutions (e.g. the job description used for hiring digitisers at an institution), but over time it may be useful to create more standardised DiSSCo versions. It is not yet clear where in the Knowledgebase this would sit - it could be a distinct high-level area like DiSSCo Policies, or a subset of a category such as training and human resources, or organisational resources. Language may also be a barrier here, but in the first instance collection of role profiles in their language of origin can be a starting point, and it should be possible to produce useable, if not completely precise, translations using free software packages.

The proposal for a Digital Maturity Tool will be taken forward to development as set out above - there will need to be additional development resources available to continue developing and updating this after the first iteration, as DiSSCo itself develops e.g. as more support and training becomes available. Co-development with the DiSSCo Policy Tool on a common platform will enable a consistent user experience and suitable integration with wider DiSSCo infrastructure, including the DiSSCo Knowledgebase and ELViS[15]. As a minimum, we recommend that a PDF of the content from the Digital Maturity Tool should be stored in the Knowledgebase for reference and updated when relevant – ideally, however, the tool will draw actively from the Knowledgebase e.g. to point users to relevant support material.

[14] https://know.dissco.eu/
[15] https://elvis.dissco.eu/