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<p>Abstract: The aim of D5.1 is to benchmark, using a set of indicators produced in D3.1 and serving as the basis for a comparison between CESSDA and an “industry best” or “gold standard” organisation. The Inter-university Consortium for Political and Social Research (ICPSR) is taken as the gold standard and has been used as a benchmark organisation for CESSDA.</p> <p>D5.1 contains analysis of differences and a breakdown of actions that should be taken to bring CESSDA up to the level of the gold standard.</p> <p>The information in this document reflects only the author’s views and the European Community is not liable for any use that may be made of the information contained therein. The information in this document is provided “as is” without guarantee or warranty of any kind, express or implied, including but not limited to the fitness of the information for a particular purpose. The user thereof uses the information at his/ her sole risk and liability.</p>	



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Executive Summary

The aim of task 5.1 was to benchmark CESSDA against the comparable institution that is recognised as the “industry best” or “gold standard” organisation. The Inter-university Consortium for Political and Social Research (ICPSR) has been suggested as a benchmark for CESSDA, and is taken as the gold standard in the social sciences area.

Benchmarking requires a set of indicators to serve as the basis for a comparison between organisations. In order to produce a comparative report, CESSDA development model created and elaborated in the task 3.1 has been used. Consortium-level indicators have been derived from the development model created in T3.1/D3.1 . Adaptation was required as said model is meant as a heuristic tool for developing individual data archives, rather than evaluating a consortium. Other indicators, relevant to the organisational aspects of the consortium, have also been developed, including technical indicators originally not covered in the development model (added later).

The audit of the CESSDA member archives was supplied in task 3.2, namely in D3.2 and it provided a basis for evaluation of CESSDA’s performance, along with organisational and technical indicators established in; the report used both quantified estimates, and the explanations provided in D3.2. audit. This report (D5.1) also contains analysis of differences leading to a breakdown of what actions that can be taken to bring CESSDA up to the level of ICPSR as the gold-standard institution.

Abbreviations and Acronyms

CESSDA	Consortium of Social Science Data Archives
ICPSR	Inter-university Consortium for Political and Social Research
CESSDA SaW	CESSDA Strengthening and Widening project
CESSDA CDM	CESSDA SaW Capability Development Model
DOA	Description of Action
CPA	Capability Process Area
DOM	Digital Object Management (DOM)

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1. INTRODUCTION

The objective of CESSDA ERIC (Consortium of European Social Science Data Archives)¹ is to provide a comprehensive, distributed and integrated social science data Research Infrastructure (RI), which will facilitate and support research, teaching and learning of the highest quality throughout the social sciences in the European Research Area (ERA), and increase the impact of the activities of its members².

In order to strengthen and widen the existing research infrastructure and make it more comprehensive, efficient, effective, integrated and PanEuropean, a major upgrade is necessary. The aim of this upgraded infrastructure is to enable researchers to work together within and across research fields, regions and countries, developing leading edge research methods and tools to analyse all forms of data relevant to social science research. Huge portion of upgrade is being done within the framework of the CESSDA Strengthening and Widening (SaW) project.

One of the objectives of the CESSDA SaW project is to deliver a state of play evaluation of social science data archives and services in ERA countries, identifying gaps and bottlenecks in existing services, and produce national development plans to close the gaps and overcome present barriers³. The CESSDA SaW Capability Development Model (CESSDA CDM)⁴ is generated for this evaluation. It primarily aims at repositories, archives, infrastructures or other preservation initiatives that are providing preservation services. It doesn't aim at individual researchers, research projects or other loosely organised research activities or initiatives. It builds on the Reference Model for an Open Archival Information System (OAIS)⁵ and the European Framework for Audit and Certification, also known as Trusted Digital Repository EU⁶, as well as some other reference models.

CESSDA member countries as well as member countries of the widened CESSDA SaW network have been submitted to the evaluation according to the CDM, and country reports have been published in D3.2 Country reports on development potentials⁷. Summary report has also been completed and results were published in D3.6 Final integrated audit report. Both reports have been used to support the comparison process between CESSDA and the 'golden-standard' institution in the field - Inter-university Consortium for Political and Social Research (ICPSR⁸) at the University of Michigan, USA, according to main evaluation areas described in CDM.

¹ <https://www.cessda.eu>

² CESSDA ERIC Statutes, available at:

https://www.cessda.eu/content/download/1466/20924/file/STATUTES%20of%20CESSDA%20ERIC_2017.pdf

³ CESSDA SaW - description of goals in WP3 (GA, No. 674939).

⁴ <https://www.cessda.eu/Projects/All-projects/CESSDA-SaW/WP3/CESSDA-CDM>

⁵ <http://www.paradigm.ac.uk/workbook/introduction/oais.html>

⁶ <http://www.trusteddigitalrepository.eu/Trusted%20Digital%20Repository.html>

⁷ http://cessdasaw.eu/content/uploads/2017/07/D3.2_CESSDA_SaW_v1.3.pdf

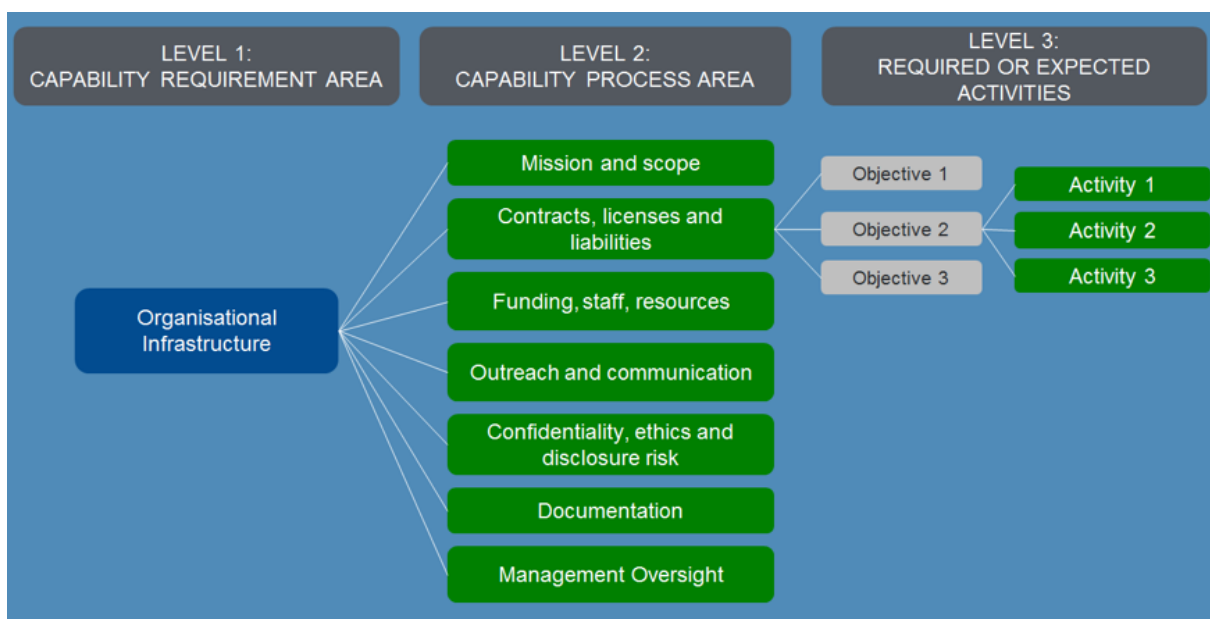
⁸ <https://www.icpsr.umich.edu/icpsrweb/>

2. CESSDA CDM - CAPABILITY PROCESS AREAS

In the SaW project Description of Action (DoA), it has been clearly stated that a set of indicators created for the CESSDA development model and elaborated in the task 3.1, has to serve as basis for comparison between CESSDA and ICPSR. The indicators used at the consortium level have been derived from the CESSDA SaW Capability Development Model (CESSDA CDM) and according to the description of the model, as provided in D3.1, model is “a structured collection of elements that identify and describe the characteristics of effective preservation processes and activities”⁹. The model provides a reference framework for aspiring/emerging archives and for established archives that wants to improve and/or strengthen their services. Model, as used in D3.1, focused on social science research data, but it is applicable for all organisations that preserve data, and make it available to a designated user community. It has been used for the assessment of CESSDA Service Providers and wider SaW consortium in order to aid in the improvement of the capabilities of existing and future CESSDA Service Providers.

In its essence, the CESSDA CDM aims to provide a structured view of processes across an organisation (at the level of a service provider or a research infrastructure); it can be used as a tool for enhancing processes: through setting goals, providing guidance for quality improvement, defining activities, and providing a benchmark for assessing and appraising current practices. The latter is the aim of this deliverable. The model focuses on three main subject areas - capability process areas-CPA (Figure 1)

Figure 1: Illustration of the CDM-model



Source: CESSDA SaW Deliverable 3.1 - Heuristic Maturity Development Model, p.12, available at: <http://cessdasaw.eu/content/uploads/2016/06/D3.1.pdf>

⁹ CESSDA SaW Deliverable 3.1 - Heuristic Maturity Development Model, p.5.

and principles of an organisation providing research data preservation services:

- Organisational infrastructure
- Digital object management
- Technical infrastructure

Area of Organisational Infrastructure consist of a number of sub-areas, areas that support the development and maintenance of a sustainable preservation organisation. The overall aim of this CPA is to have an appropriate organisational structure that fits the objectives, tasks and processes of the organisation¹⁰. Table 1 below presents the summary of capability requirements in the area of organisational infrastructure.

Table 1: Summary of Capability Requirements Area: Organisational Infrastructure

Id	Capability Process Area	Main Purpose
CPA1.1	Mission and scope	Depositors and users must be clear that preservation of, and continued access to, the data is an explicit role of the repository.
CPA1.2	Contracts, licenses and liabilities	Generic objectives and activities
CPA1.3	Funding, staff, resources	The repository has adequate funding and sufficient numbers of qualified staff managed through a clear system of governance to effectively carry out the mission .
CPA1.4	Outreach and communication	Generic objectives and activities
CPA1.5	Confidentiality, ethics and disclosure risk	The repository ensures, to the extent possible, that data are created, curated, accessed, and used in compliance with disciplinary and ethical norms.
CPA1.6	Documentation	Generic objectives and activities
CPA1.7	Management oversight	Generic objectives and activities

Source:

<https://www.cessda.eu/Projects/All-projects/CESSDA-SaW/WP3/CESSDA-CDM/Part-1-CRA1-Organisational-Infrastructure/CPA1.1-Mission-and-Scope>

¹⁰

<https://www.cessda.eu/Projects/All-projects/CESSDA-SaW/WP3/CESSDA-CDM/Part-1-CRA1-Organisational-Infrastructure>

Digital Object Management (DOM) refers to the following processes: selection, acquisition, ingest, management, and preservation. All are intended to maintain and provide access to digital information in an authentic form. DOM is closely related to the term “digital data curation (DDC)”, which relates to selection, preservation, maintenance, and archiving of digital assets, and it establishes, maintains and adds value to data for present and future use. The aim of both DOM and DDC is to “mitigate digital obsolescence, keeping the information accessible to users indefinitely”¹¹.

Table 2: Summary of Capability Requirements Area: Digital Object Management

Id	Process Area	Purpose
CPA2.1	Data acquisition and ingest	Decide what to preserve; Plan and execute the selection, acquisition and transfer of information products to the archive.
CPA2.2	Data preservation: storage, curation and planning	Provide the services and functions for the storage, maintenance and retrieval of data; Provide services, functions, recommendations and preservation plans to ensure that the information stored in the archive remains accessible to, and understandable by the Designated Community over the long term.
CPA2.3	Access / Provision	Provide the services and functions that support the users in determining the existence, description, location and availability of information stored in the archive, and allowing users to request and receive data.

Source:

<https://www.cessda.eu/Projects/All-projects/CESSDA-SaW/WP3/CESSDA-CDM/Part-2-CRA2-Digital-Object-Management>

Finally, area of Technical Infrastructure examines the technical requirements needed for an infrastructure to provide services to designated communities. It involves support technologies and services, as well as core technology used to deliver services to the communities.

This area is divided into five different Capability Process Areas (CPAs), and each has its own main purpose. CPAs identified in this part of the model are outlined in the Table 3 below.

¹¹<https://www.cessda.eu/Projects/All-projects/CESSDA-SaW/WP3/CESSDA-CDM/Part-2-CRA2-Digital-Object-Management>

Table 3: Summary of Capability Process Area: Technical Infrastructure

Id	Capability Process Area	Main objective
CPA3.1	Risk Assessment	The generic objectives and activities of this CPA are found across other capability process areas and can be used within these CPAs.
CPA3.2	Technical Planning and Management	The organisation has sufficient and appropriate technical infrastructure resources, suitable skilled staff, software, technical services, and appropriate management plans to ensure that all functions and services of the repository are supported.
CPA3.3	Technical Resilience Infrastructure :	The objective of infrastructural technical resilience is to ensure that in the event of failure of a key infrastructural component that there is sufficient resources to ensure continuation of functions and services of the repository to its designated community in accordance with policies and service level agreements.
CPA3.4	Technical Resilience Security :	The objective of security technical resilience is to ensure that data, and in particular confidential data, is handled in a safe and trustworthy manner by the organisation and its staff.
CPA3.5	Technical Resilience Disaster Planning :	The objective of disaster planning (security risk management) is to have mechanisms and functions in place to assess and highlight specific risks to the continuity of the digital resources and holdings of the repository.

Source:

<https://www.cessda.eu/Projects/All-projects/CESSDA-SaW/WP3/CESSDA-CDM/Part-3-CRA3-Technical-Infrastructure>

Most of the activities needed to reach an objective of a capability requirement area, are evaluated in 6-point scale. For each activity specific descriptions for the different levels of maturity are defined, but there are some general/ generic properties that characterise each level. In some instances levels 4 and 5 are not described. This is because the activity is considered complete at level 3.

Table 4: CRA 6-point scale explanations

0-Not defined	There is no awareness, no activity, no evidence.
1-Initial	There is some awareness of the processes; activities are uncontrolled, disorganised and ad hoc. There is a reactive approach – actions are taken when things happen. There is no or little institutional commitment to processes and activities; there is no or little evidence on actions; nothing is written down. Roles and responsibilities are not defined.
2-Repeated/partial	There is a more active approach - tasks and actions are repeated. Processes and functions follow a regular pattern - different people are repeating the same tasks. However, responsibilities are left to individuals and processes are uncoordinated

	and error-prone. Some documentation and process descriptions may exist, but they are incomplete - core elements are missing.
3-Defined	The organisation has a calculative approach – systems and processes are in place; tasks are defined and are connected to processes and process descriptions. Roles and responsibilities are defined and connected to tasks; functions and mechanisms has been recognised, standardised and are being communicated to relevant stakeholders. Institutional commitment is significant.
4-Managed	The organisation has a proactive approach - staff training mechanisms and procedures are in place. Processes and activities are monitored and quantitatively assessed. Inconsistencies and incidents are recorded for quality and assessment purposes. Tasks and processes are integrated into high level policies and objectives, i.e. tasks/activities are institutionalised.
5-Optimized	The organisation has a proactive and predictive approach of systemised optimisation, based upon regular reviews of policies, procedures, and monitored activities. Outreach towards designated communities and other relevant stakeholders (e.g. funders, government, etc.) also contribute the the review process. The review and update processes are institutionalised.

Source:

<https://www.cessda.eu/eng/Projects/All-projects/CESSDA-SaW/WP3/CESSDA-CDM/Introduction/Model-Components/Three-levels>

3. CATEGORIES AND METHODOLOGY USED IN COMPARISON OF CESSDA ERIC CONSORTIUM AND ICPSR

CESSDA Development Model (CDM) was developed in Task 3.1 and later applied in Task 3.2 of Work Package 3, in order to deliver “a state of play evaluation of social science data archives and services in ERA countries, identifying gaps and bottlenecks in existing services, and produce national development plans to close the gaps and overcome present barriers. The CESSDA SaW Capability Development Model is generated for this evaluation. The model specifies a set of objectives for establishing and operating CESSDA services for the social sciences and provides a common framework for evaluation of compliance”¹². For self-assessment data collection purposes of task 3.2, a shortened version of CDM was used.

The assessment was reported in Deliverable 3.6 as a summary report on results of self-assessment of the active data archive services in CESSDA, and of potential CESSDA service providers. In comparison described later in this report, only CESSDA member countries’ DAS assessment results were used.

The purpose of the assessment was to assess the status of data services in each country and identify gaps related to minimum requirements from CESSDA service providers, to provide a base for comparisons across countries, and finally, as the basis for external benchmarking for Task 5.1 and comparison exercise with ICPSR.

For the assessment of ‘Organisational infrastructure’ two main factors were addressed from the shortened CDM:

1. Organisational sustainability requirements where specific objectives regarding Mission statement, Identification of types and formats of materials; Designated Community, Service Contracts and Liabilities; and Long-term viability of the repository.
2. The availability of documentation, knowledge, trainings and capacity development in research data management (RDM) where specific objectives such as Staff professional development; Appropriate expertise; Compliance to legal and community norms; and the general objective of Effective Documentation.

As stated in D3.2, data archiving services consist of people and technology. CESSDA-CDM defines Digital Object Management (DOM) as the “set of processes (selection, acquisition, ingest, management, preservation) required to maintain and provide access to digital information in an authentic form, for as long as required and across changing technical

¹² <https://cessda.net/eng/CESSDA-Services/Projects/Current-projects/CESSDA-SaW/Work-Packages/WP3/CESSDA-CDM/Introduction/Background-of-CESSDA>

environments. Application of CDM reported in D3.2, and a summary of it reported in D3.6, measured DOM according to the following categories:

- Documentation/metadata requirements
- Citations
- Conditions placed on content, deposit licences
- Legal transfer of custody; agreements on rights/responsibilities
- Completeness and corrections
- PiDs/locators
- Preservation strategies
- Metadata standards

On the other hand, 'technical infrastructure' of an organisation, or an infrastructure, provides the technical underpinnings for it to fulfil its functions and the provision of services to its designated communities. As such, this section of the model involved assessments on AAI, risk management procedures, technical planning and management, concluding with appropriate succession plans and /or contingency plans.

ICPSR conducted a complete self-evaluation following the original CESSDA CDM model (see Chapter 4), while scores for CESSDA have been derived from data collected on a limited set of indicators (see Chapter 5). Benchmarking comparison was thus done only on elements of the model where data on both CESSDA and ICPSR were available. The comparison was done on two levels; first, to present the level of CESSDA as a distributed organisation, median values of scores of individual countries' Service Providers were compared to ICPSR self-assessment data. Secondly, taking into account variation of CESSDA members with regard to (human) resources, ICPSR data was compared to CESSDA average and CESSDA members having most and least human resources (measured as FTE).

Resources and services provided centrally by CESSDA or currently under development (for example Training, Knowledge Platform, Product and services catalogue (PaSC), European Question Bank (EQB), as well as Technical Infrastructure) are not included in the evaluation. Thus, the self assessment represents in fact aggregated local Service Providers status.

Another challenge was presented in distributed versus centralised organisational structure between the two Consortia. Aggregated scores representing CESSDA ERIC might have resulted from a variation between different countries with more established data archives, and services more embedded in social sciences research data ecosystem, as opposed to countries where data archives have a weaker position. Differences in sources of financing, general support to RDM practices and other elements of broader DAS ecosystem in which CESSDA and ICPSR operate, should also be taken into account.

Both organisations are very different in terms of relative size, resources, and experience; CESSDA has been active from 1970s, but most of the time it was an informal network of data archives. From 2013, it was organised as distributed formal organisation with the legal entity (a hub) with the seat in Bergen, Norway. Current membership well reflects the membership

from the beginning; a combination of very mature and developed data archives, with many employees and a lot of competence built in, but also a number of small, immature archives that struggle with funding and support from the national institutions.

From the governance point of view, the possible difference can stem from the fact that CESSDA has no executive right to make decisions for all its Service Providers; decisions are made by the majority of member representatives as stated in the CESSDA Statutes. This might be different for ICPSR.

4. SUMMARY OF ICPSR' S SELF ASSESSMENT DATA

When the Inter-university Consortium of Political and Social Research (ICPSR) was founded in 1962, the membership constituted of twenty-one major American universities¹³. Today ICPSR is an international consortium consisting of more than 750 academic institutions and research organizations. Most US memberships involve individual institutions, but groups of institutions can also join collectively as a federation. Groups of institutions outside the US can join in a national membership of ICPSR, and presently there are more than twenty national memberships, mostly European. Two thirds of the CESSDA members have a national ICPSR membership¹⁴.

The purposes of the ICPSR are to promote and facilitate research and instruction in the social sciences and related areas, by acquiring, developing, archiving, and disseminating data and documentation for instruction and research; conducting related instructional programs; conducting such other activities as may be authorized in accord with the Bylaws; and obtaining the resources necessary to accomplish these purposes¹⁵.

ICPSR is a unit within the Institute of Social Research at the University of Michigan and is governed by the ICPSR council, a 12-person body elected by the members of ICPSR¹⁶. The fiscal year 2017 (July 2016-June 2017) membership dues contributed 22 percent of the organization's total revenue. The major source of fundings were sponsored project awards, accounting for just over half of the revenue¹⁷.

In 2011 ICPSR became one of the first six data repositories to receive the Data Seal of Approval¹⁸.

4.1 Organisational infrastructure

ICPSR conducted a self-evaluation following the complete CESSDA CDM model. As shown in table 1 the Capability Requirement Area (CRA) Organisational Infrastructure consists of seven Capability Process Areas (CPA). To each CPA belongs a series of related activities (RA). The activities are evaluated according to the 6-point scale (0-5) introduced in table 4. Two activities, Institutional sustainability and Funding, are considered complete at level 3.

In total 36 activities are related to Organizational Infrastructure. For 26 of these activities ICPSR reach the highest level. Of the remaining ten activities, eight are considered as

¹³ <http://www.icpsr.umich.edu/icpsrweb/content/about/history/timeline.html>

¹⁴ <http://www.icpsr.umich.edu/icpsrweb/membership/administration/institutions>

¹⁵ <http://www.icpsr.umich.edu/icpsrweb/content/about/governance/constitution.html>

¹⁶ <http://www.icpsr.umich.edu/icpsrweb/content/about/governance/council.html>

¹⁷ <http://www.icpsr.umich.edu/files/ICPSR/about/annualreport/2016-2017.pdf>

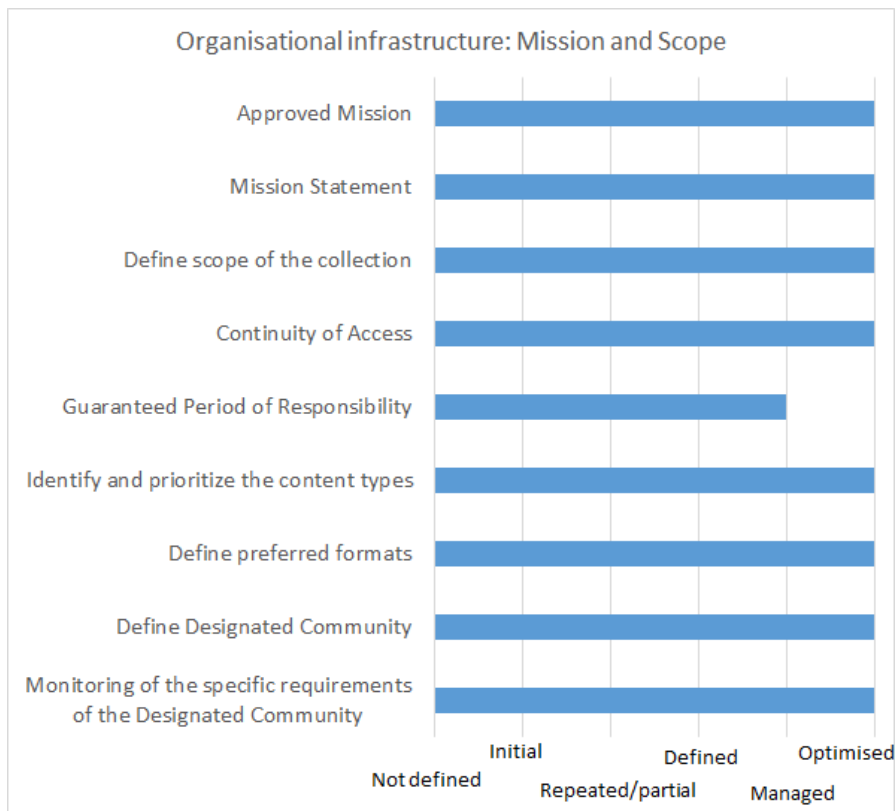
¹⁸ <http://www.icpsr.umich.edu/icpsrweb/content/about/history/timeline.html>

managed (4) and two, Non-compliance measures and Removal of Digital Objects from the Data Holding, as defined (3).

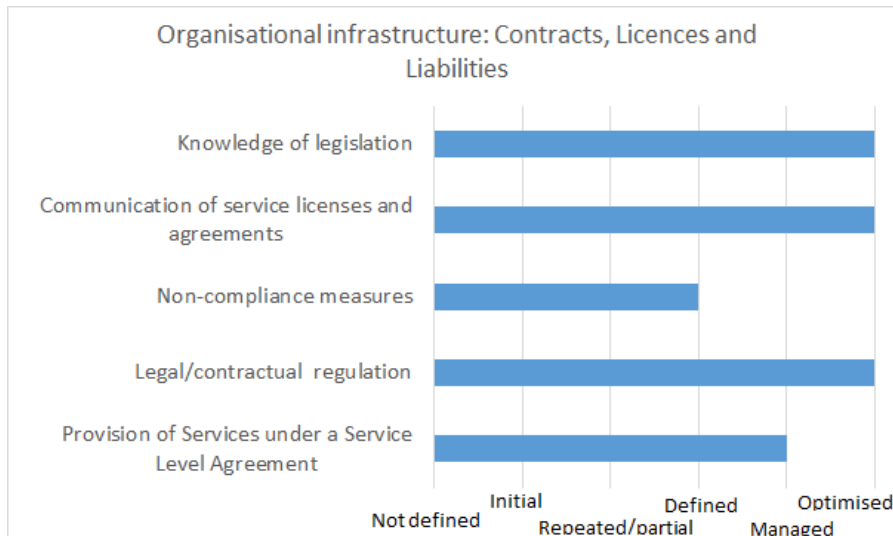
The defined level for Non-compliance measures states that there are documentation on measures in the case of non-compliance with conditions of access and they are part of the conditions of use and are communicated with the users.

Removal of Digital Objects from the Data Holding is considered at a defined level if there is a clear and publicly available policy for the removal of items, and that the procedure is defined and communicated to all stakeholders before the initiation of the procedure for removal.

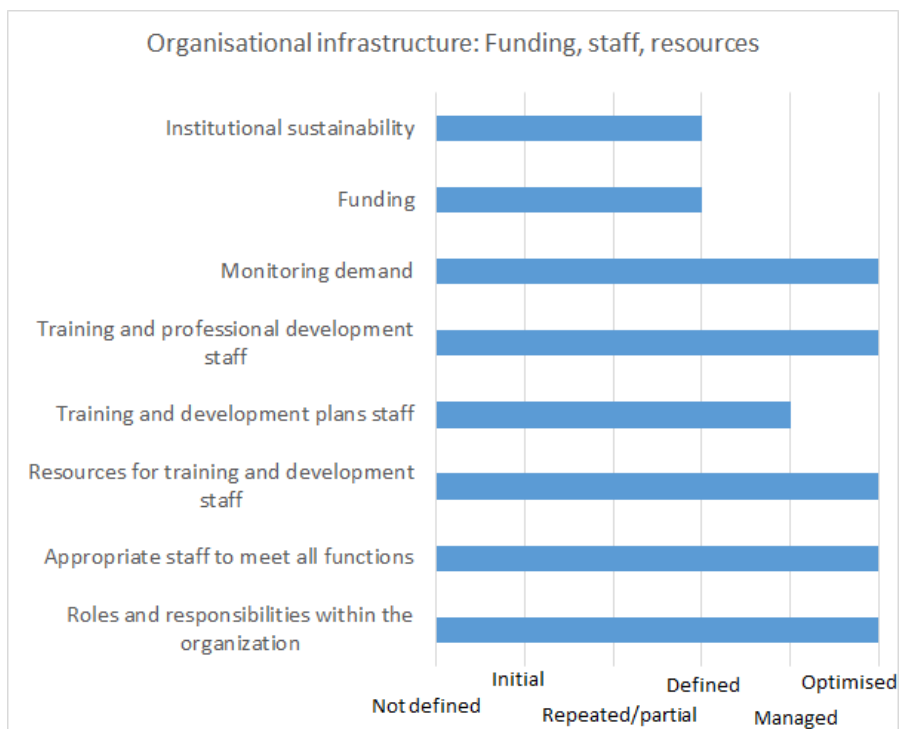
Figure 2: Organisational infrastructure I



As reported by ICPRS, the scope of the collection is regularly under review but perhaps even more now than ever before due to the new types of data of interest for social scientists (e.g. video data, biomedical data, etc.). For the 'Continuity of Access', the importance of Data-PASS project: <http://www.data-pass.org/> was emphasised.

Figure 3: Organisational infrastructure II

ICPSR commented that ‘Non-compliance measures’ are usually applied to restricted-use data agreements.

Figure 4: Organisational infrastructure III

Funding model is unique compared to most CESSDA archives since ICPSR has no ongoing national funding. This might result in a more top-down rather than bottom-up or network-driven development and governance process that is common for CESSDA-member countries compared to ICPSR.

Figure 5: Organisational infrastructure IV

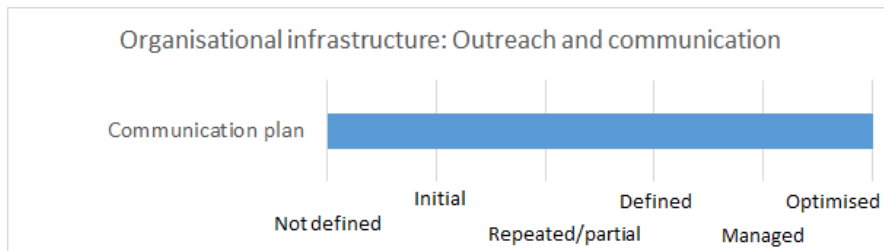
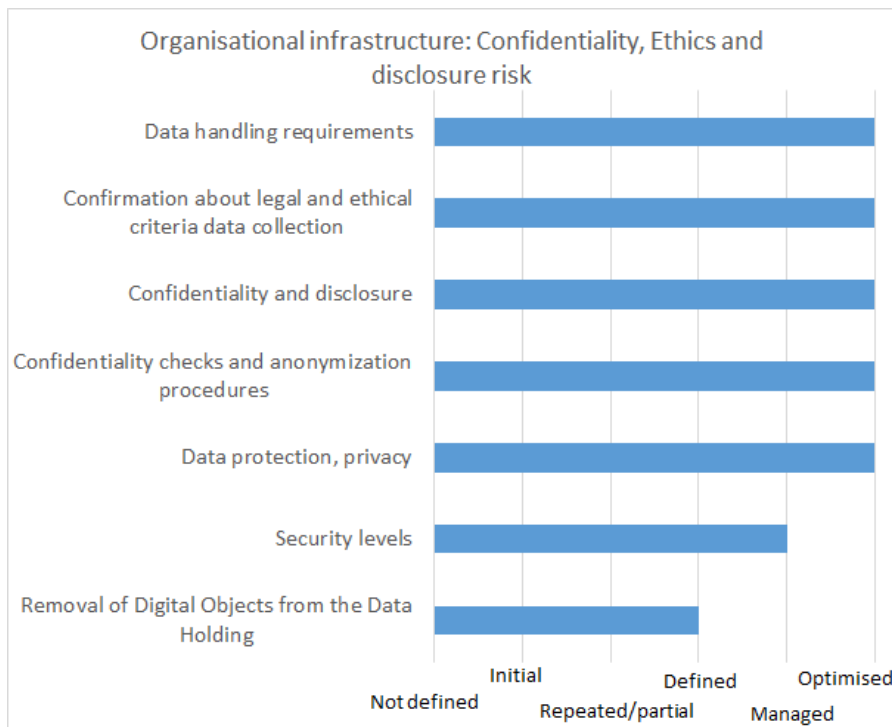


Figure 6: Organisational infrastructure V



For 'Removal of Digital Objects from the Data Holding', at the ICPSR the: De-accession policy is currently under review.

Figure 7: Organisational infrastructure VI

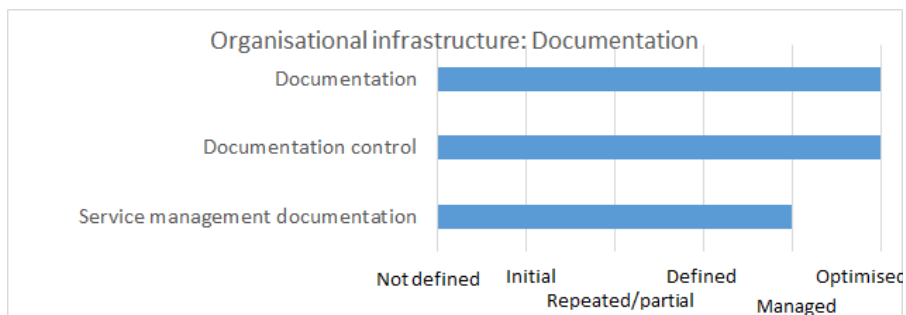
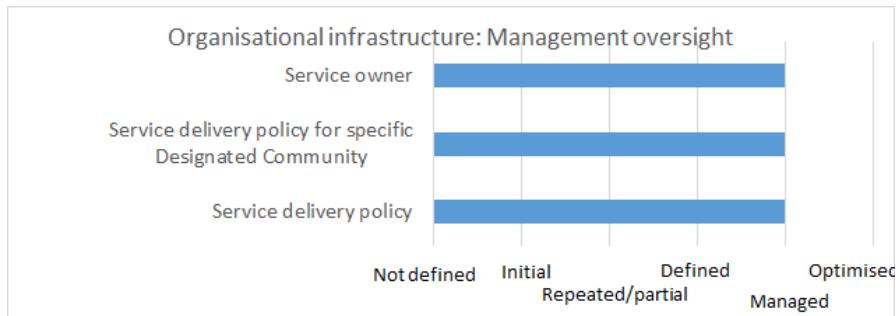


Figure 8: Organisational infrastructure VII



4.2 Digital object management

The second Capability Requirement Area focuses on Digital Object Management (DOM) and consists of three Capability Process Areas, see table 2. 34 activities are related to DOM. For all DOM activities level 5 (Optimized) are the highest level that can be achieved.

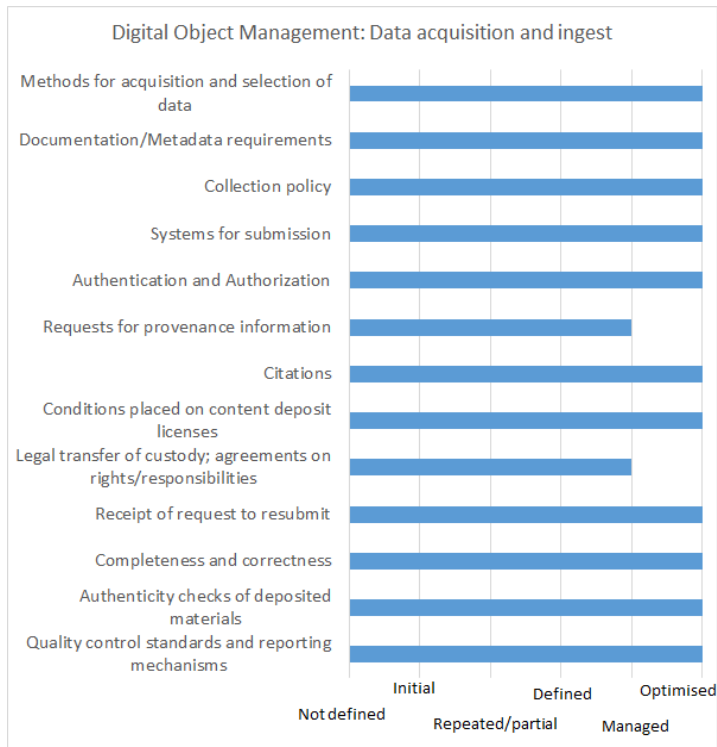
ICPSR has reached an optimized level for 25 activities within DOM and for further six activities, a managed level has been reached. Three activities are considered to be on a defined level. All of the activities with the lower level of maturity are found in the CPA Data preservation: storage, curation, and planning.

The defined level for Authentication measures indicates that authentication measures and mechanisms are in place, that they are formalised and defined in written documents and that all roles and responsibilities are defined.

A defined level for the evaluation of content and preservation environment indicates that evaluations are formalised and performed at regular intervals, that they are performed in line with formalised processes and procedures, that all processes and procedures refers to and are in line with strategies and policies, and that recognised tools (PLATO and/or DRAMBORA) may be applied regularly.

Monitor technology is the third activity on a defined level. This means that feedback is accomplished through periodical surveys, formal review processes, and/or via community workshops or other formalised meeting points, that systems for registering feedback are in place and outputs of monitoring are formally reported. A role is responsible for gathering, monitoring and analysing changes in technology and best practices.

Figure 9: Digital Object Management I



For 'Methods for acquisition and selection of data' at ICPSR there are specific internal positions for Director and Manager of Data Acquisitions.

For 'Conditions placed on content deposit licenses', depositors mainly agree to adhere to conditions stated in ICPSR terms of deposit.

Figure 10: Digital Object Management II

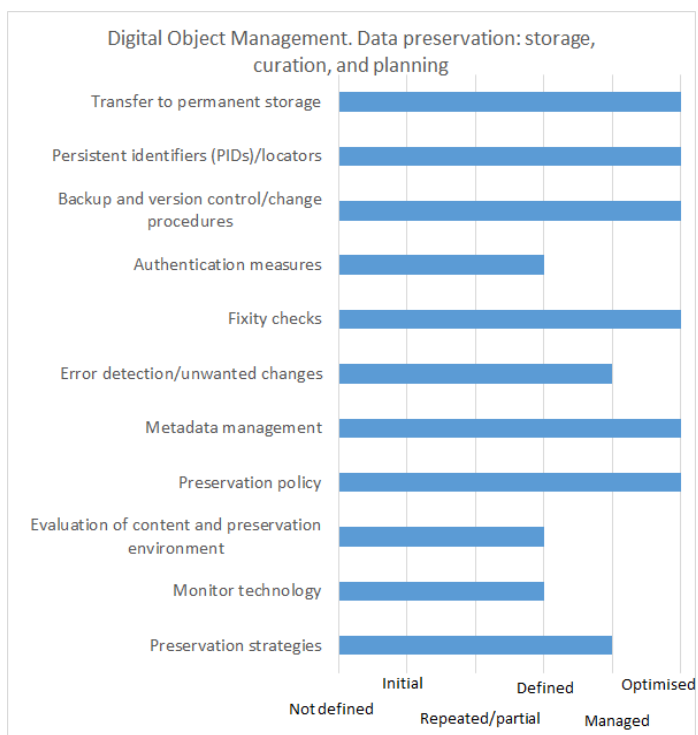
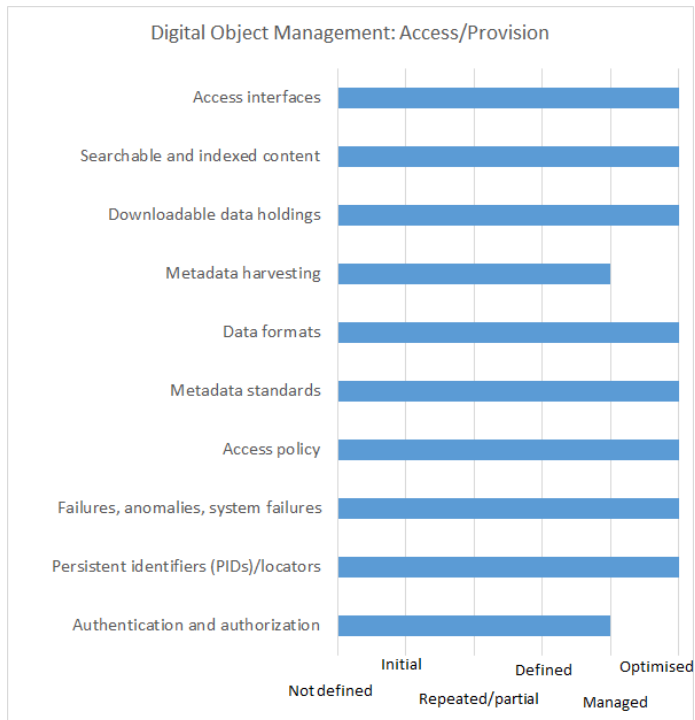


Figure 11: Digital Object Management III

According to ICPSR, another area that may undergo considerable change in the future due to interest in new types of data from their Designated Community is 'Data formats'.

4.3 Technical infrastructure

The third Capability Requirement Area is Technical Infrastructure and it consists of five Capability Process Areas described in table 3. 18 activities are related to the Technical Infrastructure. For all activities level 5, Optimized, are the highest level that can be achieved. ICPSR reaches an optimized level for twelve of the activities, and a managed level for the six remaining activities.

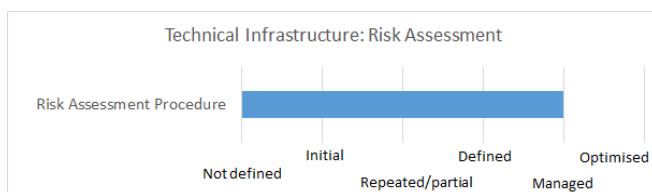
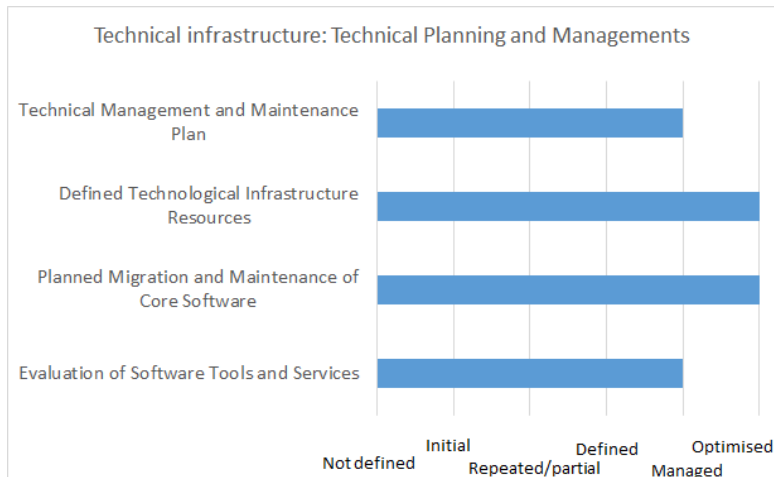
Figure 12: Technical infrastructure I

Figure 13: Technical infrastructure II



The area of 'Evaluation of Software Tools and Services' also depends upon discussions with officials at the University of Michigan, ICPSR host institution.

Figure 14: Technical infrastructure III

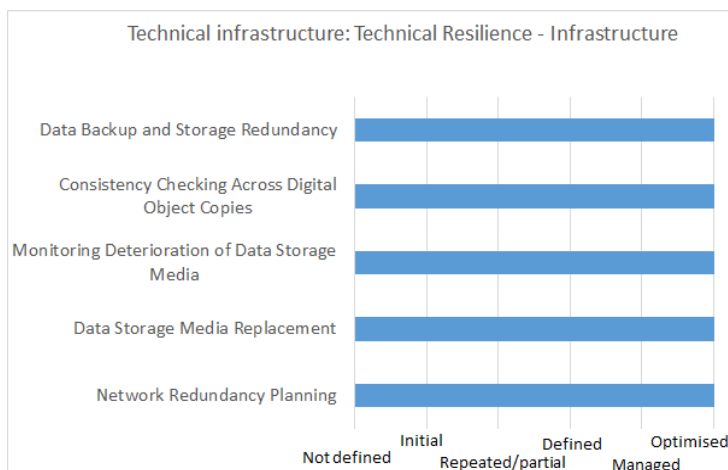


Figure 15: Technical infrastructure IV

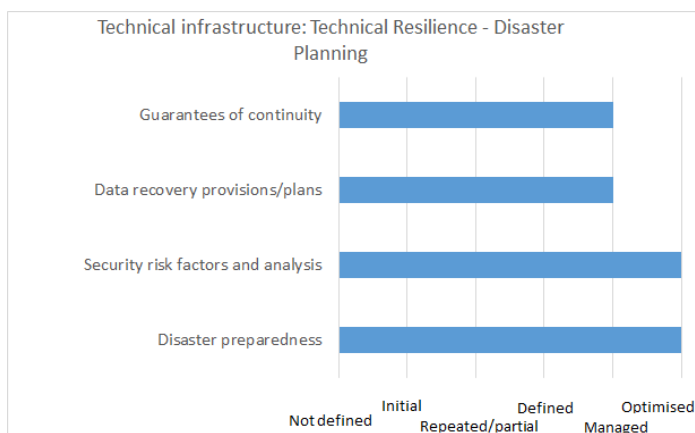
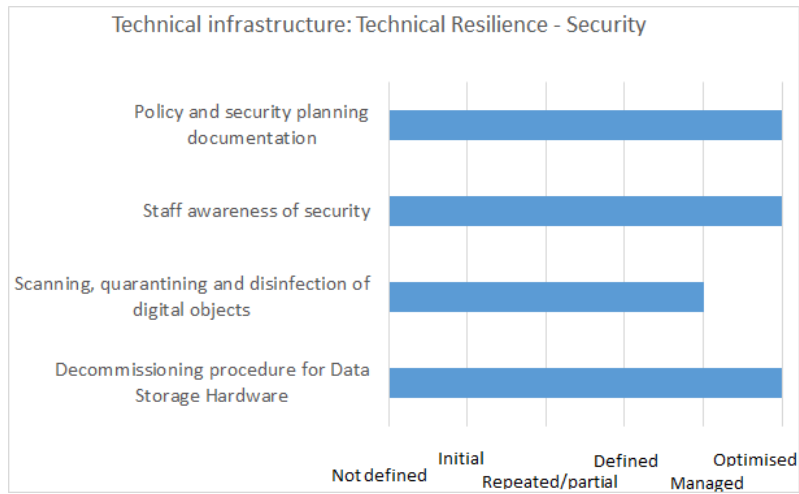


Figure 16: Technical infrastructure V



In total the maturity 88 activities were measured. For 63 activities ICPSR reached the highest level of maturity, 20 activities reached the second highest level and only five activities were evaluated as defined. For explanation of the maturity levels, see table 4.

5. SUMMARY OF CESSDA DATA

Data for CESSDA is aggregated from self-reported scores on CESSDA ERIC¹⁹ member countries, 15 in total: Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Netherlands, Norway, Portugal, Slovakia, Slovenia, Sweden, Switzerland, United Kingdom. Austria which is a member now (service provider AUSSDA), did not have an operating data archive at the time of data collection, so CDM-based part of the country self-assessment was not filled in.

Focus of this chapter is to provide an overview, description and explanation of variety (or lack of it) of self-assessment scores of CDM elements among CESSDA ERIC service providers. The aim of the description is to make comparison to ICPSR (next two chapters) easier to understand. This chapter is therefore related to D3.6, but should not be seen as a summary of that deliverable.

In general, the variety in self-assessment among CESSDA ERIC members could be explained by variation of maturity, as DAS having operated longer tend to have acquired organisational sustainability in terms of financing schemes and human resources; have acquired experience and established more elaborated routines, are better equipped technically. As long as CESSDA ERIC stays open to new members (which in some cases involve considerable effort supporting establishing DAS from proto-activities or no previous activity at all), there will always be room for variety reflected in the aggregated self-assessment, even with the new members fulfilling the minimum CESSDA ERIC Service Provider requirements (as stated in Annex of the Statutes²⁰). The variety and the gaps could also be more explicit regarding objectives and activities related to growth of organisation, and objectives and activities regarded as secondary in relation to provision of basic day-today DAS functions.

5.1 Organisational infrastructure

In general, majority of CESSDA member archives have most of the activities characterising organisation infrastructure *"Repeated/partial"* level, meaning that *"tasks and actions are repeated. Processes and functions follow a regular pattern - different people are repeating the same tasks. However, responsibilities are left to individuals and processes are uncoordinated and error-prone. Some documentation and process descriptions may exist, but they are incomplete - core elements are missing"*²¹. Thus *repeated/partial* level indicates existing practice, even if not

¹⁹ There are some differences in D3.2 and D3.6 that use the formal status of CESSDA membership at the moment of data collection to define CESSDA member countries. In task 3.2., a category "Aspiring" was used, for ERA countries with functioning data archive outside CESSDA. For the purposes of D 5.1, a more useful approach is to include all CESSDA ERIC countries and the countries where all the entry requirements are fulfilled and membership is just a formality soon to be accomplished.

²⁰ https://www.cessda.eu/content/download/1466/20924/file/STATUTES%20of%20CESSDA%20ERIC_2017.pdf

²¹ Accessed at:

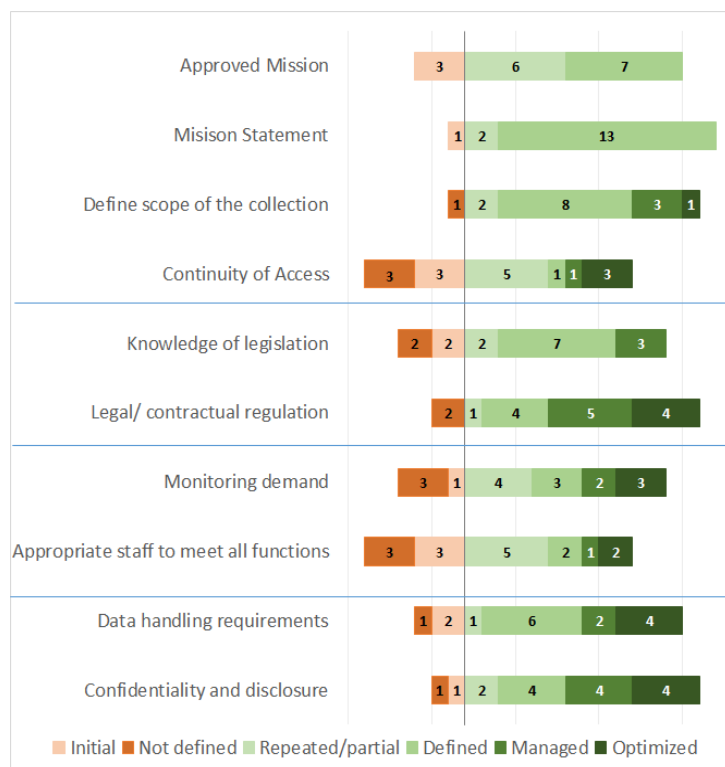
<https://www.cessda.eu/eng/Projects/All-projects/CESSDA-SaW/WP3/CESSDA-CDM/Introduction/Model-Components/Three-levels>

formalised, monitored and managed, so it could be interpreted as the first acceptable level of activity to be developed further.

Continuity of access, appropriate staff to meet all functions are self-assessed as *not defined* or *initial* in 6 CESSDA member archives, indicating that some of CESSDA members are struggling with ad hoc, project-like organisational settings that are problematic to sustainability, that could also be characteristic to newly established archives. Continuity of access seems to be rather polarised in CESSDA: 4 out of 16 countries have it on *managed* or *optimised* level, while 6 have *not defined* it, or it is on an *initial* level (there is no evidence of a continuity of access, or there are no contingency plans or only informal intent/agreements). Monitoring the demand is polarised as well - with 4 countries having it on *not defined* level, and one - on *initial*, there are also 5 countries having it on *managed* or *optimised* level.

Other activities with varying level of maturity are related to monitoring demand (in 3 countries, the level is *not defined*, in 1 - *initial*) and knowledge of legislation (in 2 countries , the level is *not defined*, in 2 - *initial*). The differences regarding the monitoring demand could be related to general lack of resources and ad hoc solutions, while differences with regard to knowledge of legislation could be related to availability of legal support to the archive, related to human resources available and -or institutional affiliation (in a larger organisation, it is ir typically easier to get access to legal support). The polarisation might also be facilitated by awareness related to introduction of GDPR in May 2018, and it could be that the coming changes contributed to self-assessment being more critical by some service providers.

Figure 17: Scores on organisational infrastructure elements of CESSDA ERIC members, number of countries



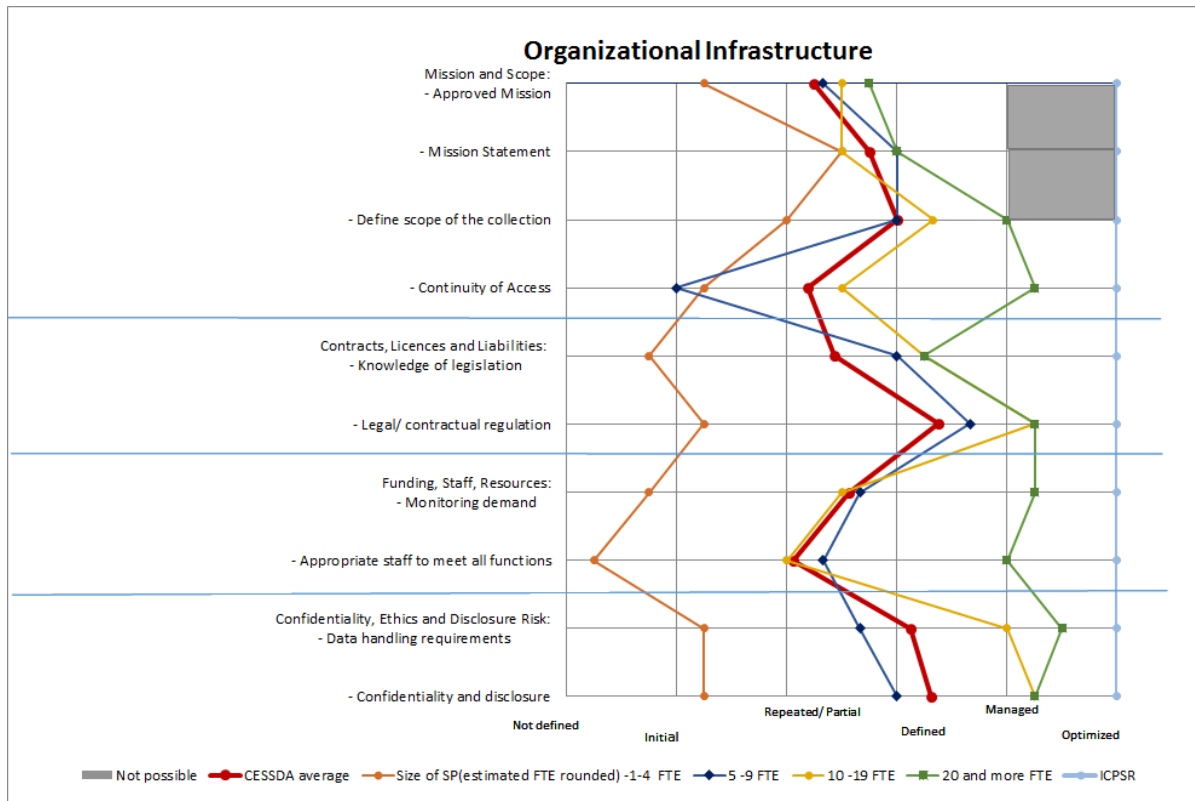
In measurement of "Approved Mission" and "Mission Statement" categories "Managed" and "Optimized" were not used. All 16 countries provided scores, except for "Define scope of collection" with 15 countries providing scores.

Larger archives in terms of estimated FTE in general demonstrate higher maturity of organisational infrastructure in self assessment. If the smallest CESSDA ERIC SPs (estimated FTE rounded 1-4) have most of the organisational infrastructure indicators self-assessed below *repeated/partial* level (with the exceptions of Mission statement between *repeated/partial* and *defined*, and scope of collection on *repeated/partial* level) - all being rather new DAS or new CESSDA ERIC members, the largest (estimated FTE rounded 20 and more) have most organisational infrastructure elements between *managed* and *optimised* maturity levels (with the exceptions of knowledge of legislation estimated between *defined* and *managed*, mission statement on highest measured level - *defined*, and approved mission, between *repeated/partial* and *defined* as the highest level measured).

For the middle sized archives (FTE rounded 5-9 and 10-19), average scores of self-assessment on almost all activities/ objectives are on *repeated/partial* or higher level of maturity. For archives sized 5-9 FTE rounded, the only activity below *repeated/partial* level is continuity of access (on average, on *initial level*), same level as archives sized 1-4 FTE rounded. Planning for continuity of access might be considered as a relatively secondary activity if compared to day-to-day functioning of DAS, so it might be prioritised down in situation of scarce resources. Two other activities with gaps in maturity for this group of archives in relation to those sized 10-19 and 20 and more FTE rounded, are data handling requirements with regard to confidentiality, ethics and disclosure risk (on average, between *repeated/partial* and *defined* level compared to being between *managed* and *optimized* for larger archives). With regard to the rest of activities within organisational infrastructure dimension, archives sized 5-9 and 10-19 score on average on the same maturity level. CESSDA SPs sized 10-19 and 20 and more FTE rounded, have on average similar maturity levels for knowledge of legislation, legal/contractual regulations, data handling requirements and confidentiality and disclosure, but data archives with 20 and more FTE are on average more mature on defining scope of collection, continuity of access, monitoring demand, and most importantly - having appropriate staff to meet all functions, that seem to be one of the key factors behind variety of maturity.

Organisational infrastructure activities with highest polarisation of maturity levels among CESSDA ERIC providers were continuity of access, appropriate staff to meet all functions, monitoring demand and knowledge of legislation. Except for knowledge of legislation, where the maturity level seems to be similar to all CESSDA SPs except for the smallest ones (1-4 FTE rounded), the maturity of others is related to size, and even middle/sized archives seem to have a gap with regard to continuity of access.

Figure 18: Average values on organisational infrastructure indicators by size of service provider (SP)



Source: CESSDA SaW deliverables D3.2 and D3.6, 2017

Size of a Service Provider (estimated FTE rounded) was estimated for the purposes of D3.6. (see 2.1. of the deliverable) in four categories:

1-4 Belgium, Hungary, Portugal, Slovakia;

5-9 Czech Republic, Greece, Slovenia;

10-19 Denmark, Finland, Sweden, Switzerland;

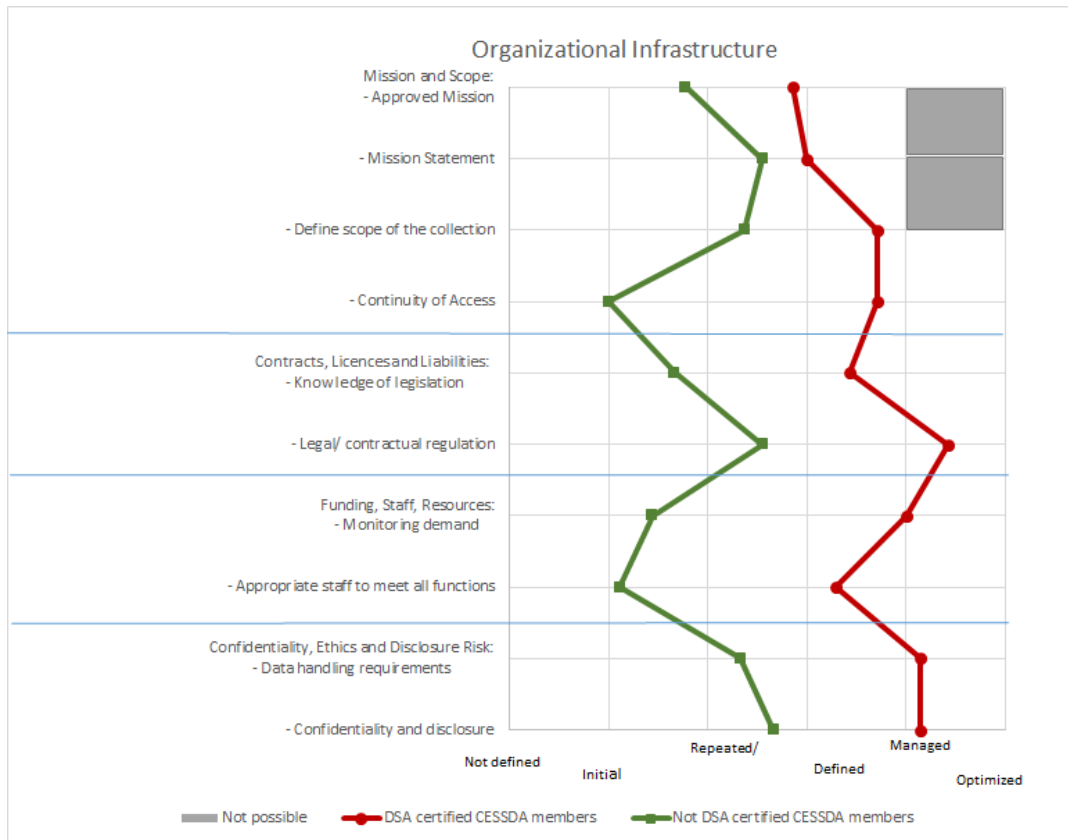
20 and more - Germany, Netherlands, Norway, United Kingdom.

Information on Austria and France was not available.

In measurement of "Approved Mission" and "Mission Statement" categories "Managed" and "Optimized" were not used. All 16 countries provided scores, except for "Define scope of collection" with 15 countries providing scores.

It is also reasonable to expect some variation according to certification status of DAS. The analysis of average scores of maturity assessment indicate that for DSA-certified CESSDA ERIC members, most of the organisational infrastructure activities are on *defined* level or above (with the exception of approved mission, but as it has been measured in 4-point scale, the average maturity level is close to the maximum value), indicating that achieving a certification level for CESSDA ERIC member archives is a result of, or contributes strongly, to maturity of organisational infrastructure.

Figure 19: Average values on organisational infrastructure indicators by certification status (DSA) of CESSDA member



Source: CESSDA SaW deliverables D3.2 and D3.6, 2017

In measurement of "Approved Mission" and "Mission Statement" categories "Managed" and "Optimized" were not used. All 16 countries provided scores, except for "Define scope of collection" with 15 countries providing scores.

As DSA-certified CESSDA ERIC members are considered here Czech Republic, Finland, Germany, Netherlands, Norway, Sweden and United Kingdom.

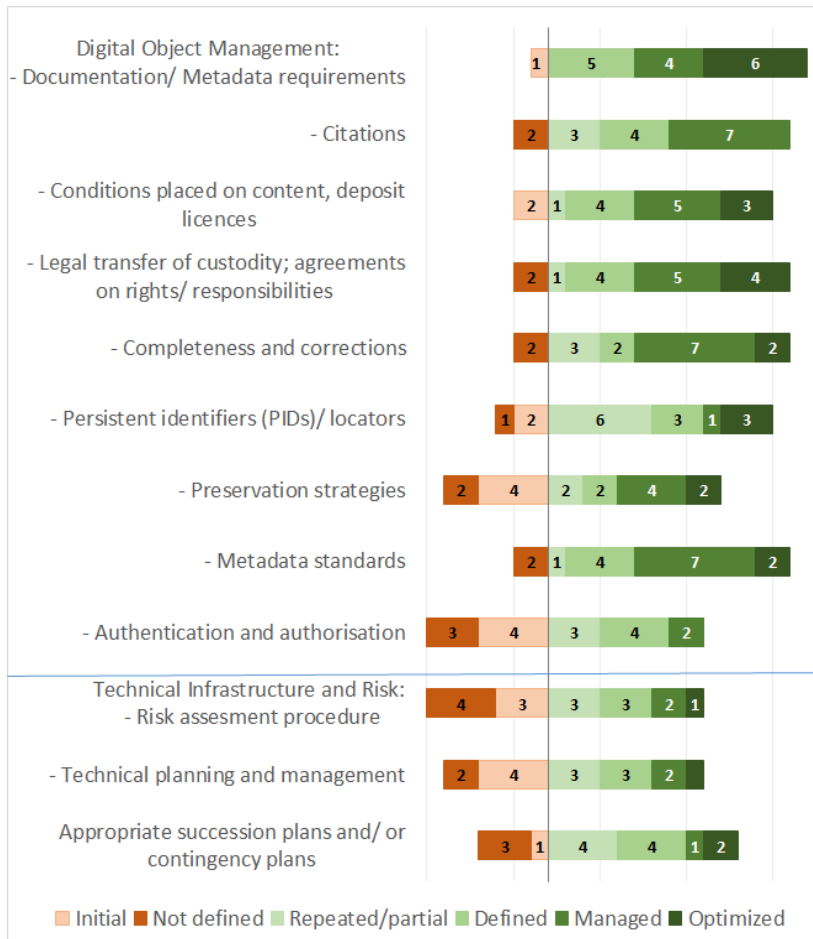
As not (yet) DSA-certified CESSDA ERIC members are considered here Belgium, Denmark, France, Greece, Hungary, Portugal, Slovakia, Slovenia and Switzerland.

5.2 Digital object management and technical infrastructure

Similar to organisational infrastructure dimension, most of the activities characterising digital object management (DOM) for majority of CESSDA ERIC members are on "*Repeated/partial*" level, indicating existing practice, even if not formalised, monitored and managed, so it could be interpreted as the first acceptable level of activity to be developed further. There are two exceptions - two activities with uneven level of maturity: authentication and authorisation (*not defined* for 3, and *initial* for 4 CESSDA ERIC member archives out of 16 that provided data), and preservation strategies (*not defined* for 2, and *initial* for 4 CESSDA ERIC member archives). On the other hands, activities like documentation/metadata requirements are on *managed* or *optimized* level for 10 countries, legal transfer of custody, agreements of rights

and responsibilities; completeness and corrections as well as metadata standards - on *managed* or *optimized* level for 9 countries, and conditions placed on content, deposit licences - in 8 countries.

Figure 20: Scores on digital object management and technical infrastructure elements of CESSDA ERIC members, number of countries



Source: CESSDA SaW deliverables D3.2 and D3.6, 2017

All 16 countries provided scores, except for “Conditions placed on content, deposit licences”; “Technical planning and management” and “Appropriate succession plans and /or contingency plans” with 15 countries providing scores.

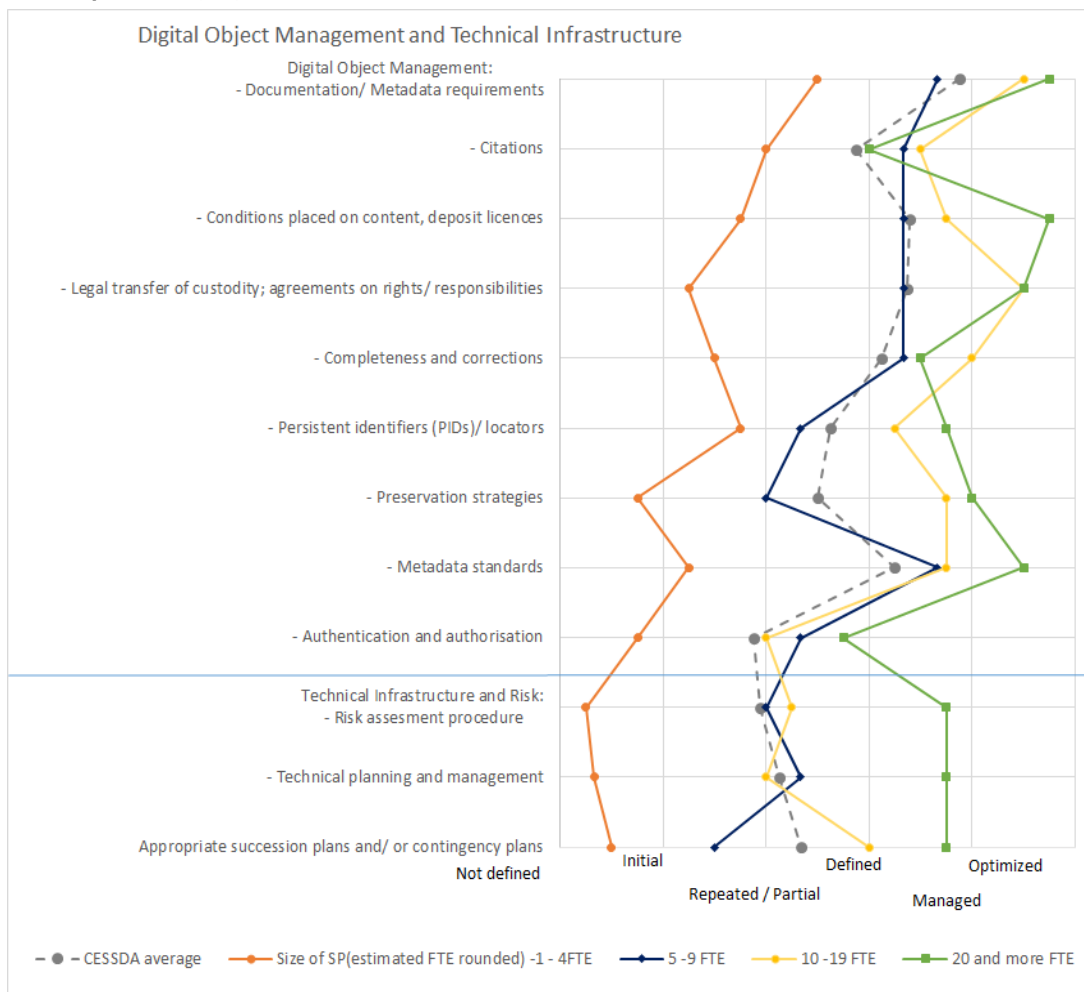
In technical infrastructure and risk dimension three activities_objectives was assessed, two of these with varying maturity levels. Risk assessment procedure was *not defined* in 4 and *initial* in CESSDA member archives, and technical management and planning - *not defined* in 2, and *initial* - in 4 countries. This might be related to varying degrees of entrustment of technical infrastructure and risk activities to other institutions, for example, host institution (if archive is part of a university or research institute).

With regard to DOM and technical infrastructure activities, smaller archives (1-4 FTE) indicate on average consistently lower level of maturity in all assessed activities, and, except

for documentation and metadata requirements and citations (assessed between *repeated/partial* and *defined*, and on *repeated/partial* level respectively) these are assessed below *repeated/partial* level, with elements from technical infrastructure and risk being assessed lowest - between *not defined* to *initial*.

For middle-sized and large archives (5 FTE and above) the self-assessment on average does not manifest large variation regarding maturity of activities related to citations (between *defined* and *managed*), completeness and corrections (between *defined* and *managed*), metadata standards (between *defined* and *optimized*) and authentication and authorisation (between *repeated/partial* and *defined*). Medium-sized to large archives (10-19 and 20 and more FTE rounded) have most of DOM activities (except for authentication and authorisation) on average on *defined* level or above. Large archives (20 and more rounded FTE) are on average considerably more mature with regard to conditions placed on content, deposit, licences and metadata standards (both assessed as between *managed* and *optimized*).

Figure 21: Average values on digital management and technical infrastructure indicators by size of service provider (SP)



Source: CESSDA SaW deliverables D3.2 and D3.6, 2017

Size of a Service Provider (estimated FTE rounded) was estimated for the purposes of D3.6. (see 2.1. of the deliverable) in four categories:

1 - 4 Belgium, Hungary, Portugal, Slovakia;

5 - 9 Czech Republic, Greece, Slovenia;

10 - 19 Denmark, Finland, Sweden, Switzerland;

20 and more - Germany, Netherlands, Norway, United Kingdom.

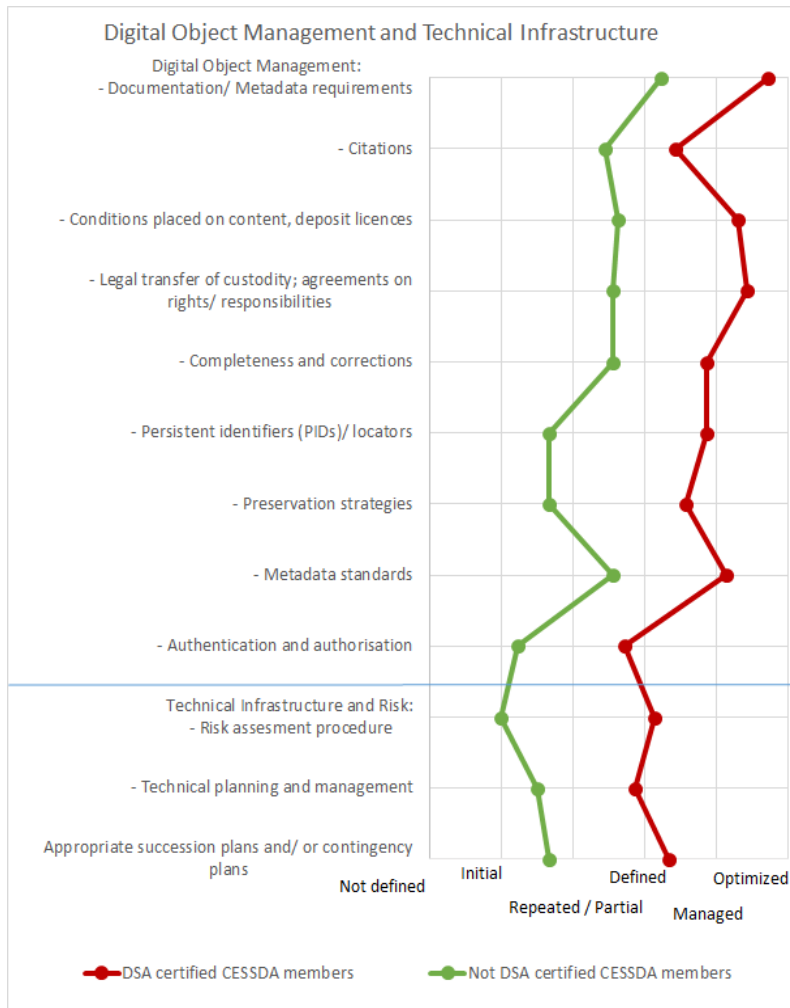
Information on Austria and France was not available.

All 16 countries provided scores, except for “Conditions placed on content, deposit licences” ; “Technical planning and management” and “Appropriate succession plans and /or contingency plans” with 15 countries providing scores.

Self-assessment of maturity of technical infrastructure and risks shows a similar distribution of variety with respect to size (in FTE rounded) that is related to resources available and might be related to stage of development and thus - priorities. For example, for a small, new archive there are other priorities than succession plans (that might be more important for a more established, larger DAS). CESSDA SPs with 20 and more FTE rounded assess technical infrastructure and risk activities being between *defined* and *managed*, and small SPs (1-4 FTE rounded) - as between *not defined* and *initial*. Medium-sized archives (5-9 and 10-19 FTE rounded) assess maturity of risk assessment procedure and technical planning and management as on average between *repeated/partial* and *defined*. More variation is seen with regard to succession and contingency plans, with archives sized 5-9 assessing it between *initial* and *repeated/partial*, and archives sized 10-19 FTE - as on average *defined*.

Accomplished certification (DSA) is related to higher maturity of DOM and technical infrastructure, the gaps in maturity being widest in activities like persistent identifiers (PIDs)/locators, preservation strategies, risk assessment procedures, legal transfer of custody and conditions placed on content, deposit, licences.

Figure 22: Average values on digital management and technical infrastructure indicators by certification status (DSA) of CESSDA member



Source: CESSDA SaW deliverables D3.2 and D3.6, 2017

All 16 countries provided scores, except for “Conditions placed on content, deposit licences”; “Technical planning and management” and “Appropriate succession plans and /or contingency plans” with 15 countries providing scores.

As DSA-certified CESSDA ERIC members are considered here Czech Republic, Finland, Germany, Netherlands, Norway, Sweden and United Kingdom.

As not (yet) DSA-certified CESSDA ERIC members are considered here Belgium, Denmark, France, Greece, Hungary, Portugal, Slovakia, Slovenia and Switzerland.

Concluding, it can be seen that variety of maturity among CESSDA ERIC members can be seen with regard to:

- organisational infrastructure activities/objectives of continuity of access, appropriate staff to meet all functions, , to some extent also monitoring demand and knowledge of legislation;

- DOM activities/objectives of preservation strategies and authentication and authorisation
- And all three technical infrastructure and risk activities /objectives.

Some of the variation can be explained by the size of the SP (in FTE rounded), as smaller SPs (FTE 1-4) in almost all activities has on average lower self-assessed maturity level, and large SPs (20 and more FTE) has a higher level of maturity.

As CESSDA ERIC is expanding and open to new members, there will always be variation with regard to the size, resources and activities to be prioritized within SP and country, and this should be taken into account, when comparing the results to ICPSR.

6. ANALYSIS OF DIFFERENCES

In this chapter, aggregated median values of CESSDA ERIC SP self-assessments are benchmarked to the respective scores on selected elements of the model measured in both ICPSR and CESSDA.

In this analysis of differences, two aspects have to be taken into account. Firstly, meaning of the differences in maturity levels: as CESSDA is a federated organisation with its member organisations having different levels of maturity, as long as self-assessment will be built on aggregated SP assessments, there will always be some diversity. So, as described in the previous chapters, some of the variety of maturity within CESSDA ERIC is inherent in its structure as a federated and open organisation of country-nominated Service Providers that each operate in own country with different structural preconditions for social sciences, different policy framework and legal regulations for data sharing and access to data, as well as different data sharing cultures (see D3.2 and 3.6 for more detailed information). Besides, these aspects of broader ecosystem of DAS operation - structure of social sciences sector, policy and funder requirements, data sharing culture - are to some extent different for ICPSR as well if compared to ERA countries. Therefore the benchmarking analysis should aim to explain the differences, and focus on the relevant gaps to be addressed by CESSDA, and not the ones stemming from organisational, cultural, etc. differences. For example, CESSDA ERIC members are often organizationally embedded in another, larger organisation and thus some of the organisational and technical infrastructure elements might fall outside the DAS activities, as these are being provided for by another part of the organisation, while ICPSR has its own organisational specificities in covering the scope of the CDM activities. ICPSR receives infrastructure support from the University of Michigan, as a host institution, in areas such as providing the means for data curators to work in a "secure" environment and to prepare data collections for release. University also provides access to legal advice (i.e. for restricted data use agreements).

The aim of this chapter is therefore to identify and explain biggest differences and identify gaps to be addressed by CESSDA ERIC.

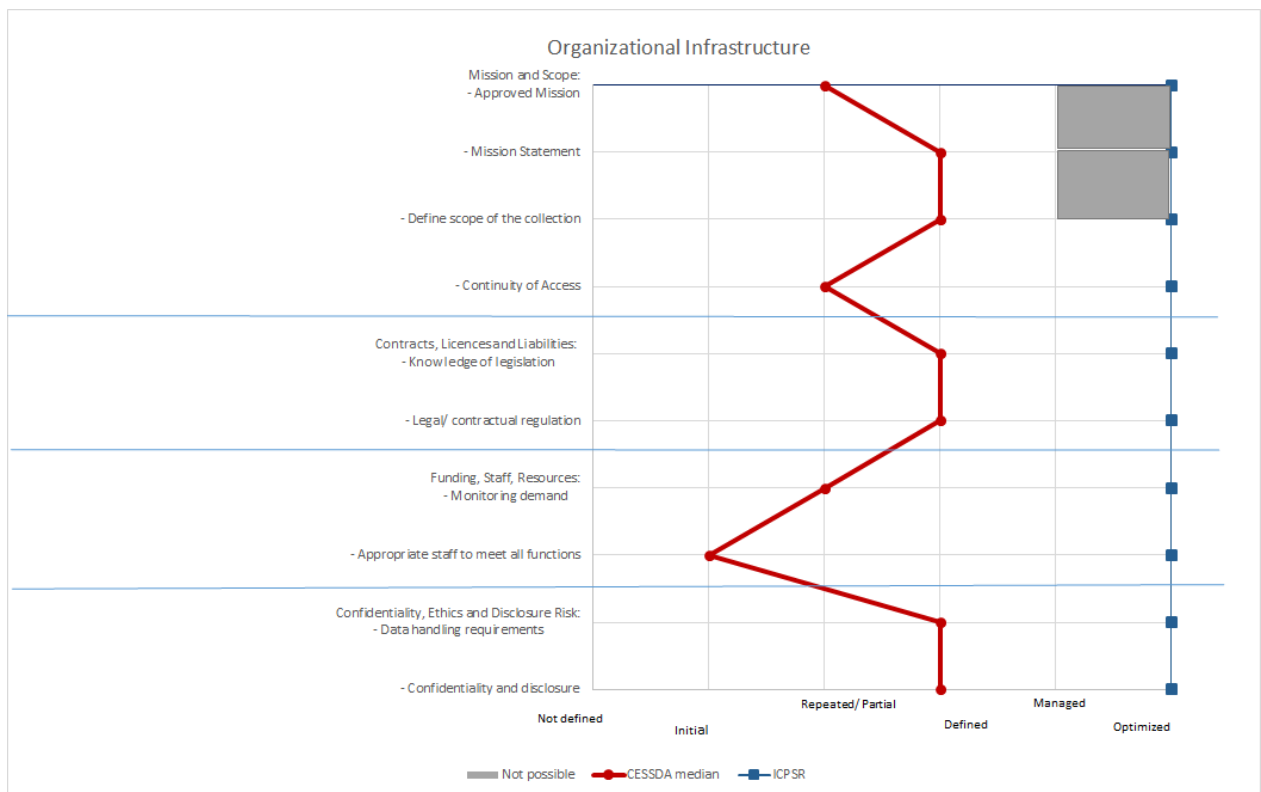
6.1 Organisational infrastructure

CESSDA ERIC members manifest a wider variation of maturity across the organisational infrastructure activities/objectives included in benchmarking than ICPSR (has all the selected aspects on *optimized* level). One aspect to consider is the limited scope of activities from organisational infrastructure dimension used here. There are some activities that ICPSR has assessed as being below the highest maturity level, non-compliance measures, removal of digital objects from the data holding (more on ICPSR in Chapter 3), but these were not assessed for CESSDA ERIC members, so the maturity of these activities cannot be benchmarked.

Another possible explanation to consider is that ICPSR is an established organisation with a long history and thus has achieved a considerable institutional maturity, that cannot be said

about all individual CESSDA ERIC members, and is reflected in the median values in the graph below (keeping in mind the variation between size and certification status of CESSDA members, it is still important to mention, that only half of CESSDA members has approved mission and continuity of access above *repeated/partial* level, and half has assessed human resources - appropriate staff to meet all functions - as being on *not defined* or *initial* level).

Figure 23: Maturity of organisational infrastructure, ICPSR and CESSDA median



Source: CESSDA SaW deliverables D3.2 and D3.6, 2017

Only elements where there is data from both ICPSR and CESSDA SaW survey are included. For CESSDA, in measurement of "Approved Mission" and "Mission Statement" categories "Managed" and "Optimized" were not used. All 16 countries provided scores, except for "Define scope of collection" with 15 countries providing scores.

As analysis of variation between CESSDA members in previous chapters showed, maturity of organisational infrastructure is a characteristic of larger (in terms of FTE) and older (having operated longer) archives, but having achieved certification (DSA) is also important for maturity of organisational infrastructure.

6.2 Digital object management (DOM) and technical infrastructure

Median assessment of maturity for CESSDA ERIC member countries for all DOM and technical infrastructure items is on *repeated/partial* level or above. It means that about half of CESSDA members assess persistent identifiers/locators, preservation strategies and authentication and authorisation activities being on this level, but the rest of assessed

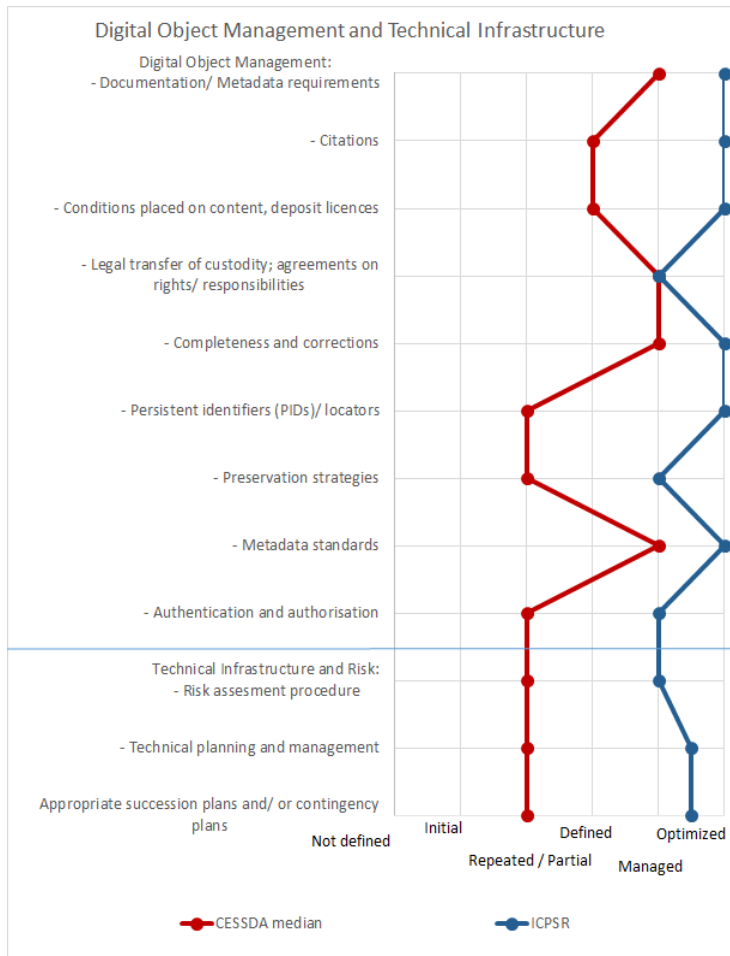
activities at least half considers to be on *defined* or *managed* level. Technical infrastructure activities/objectives are on *repeated/partial* level for at least a half of CESSDA members. For ICPSR, all the DOM and technical infrastructure activities/objectives are between managed and optimized.

Thus, the maturity of DOM and technical infrastructure activities/objectives, with the exception being legal transfer of custody (median value for CESSDA ERIC members and ICPSR assessment both on *managed* level) , is assessed higher for ICPSR than median among CESSDA ERIC countries. One of possible explanations for differences in maturity levels in assessment of technical infrastructure (CESSDA ERIC median - *repeated/partial*, ICPSR - between *managed* and *optimized*) might be that many CESSDA members do not maintain the technical infrastructure themselves, but might often rely to host institution to provide these activities.

The other differences - a gap of a size of one maturity level with regard to documentation /metadata requirements, completeness and corrections, and metadata standards (median for CESSDA members - *managed*, ICPSR's self-assessment - *optimized level*) could be explained by the inevitable internal variation among CESSDA members and taking into account that half of members have a maturity level above.

Other - larger gaps between median CESSDA ERIC SP and ICPSR maturity level assessment - are related to citations, conditions placed on content, deposit licences (both CESSDA median - *defined*, ICPSR - *optimized*), preservation strategies and authentication and (both CESSDA median - *repeated/partial*, ICPSR - *managed*), the largest being between self-assessment of maturity regarding persistent identifiers/locators (CESSDA median - *repeated/partial*, ICPSR - *optimized*). These gaps and possibilities to address them should be looked at in more detail (see also D3.6.).

Figure 24: Digital object management and technical infrastructure, ICPSR and CESSDA median

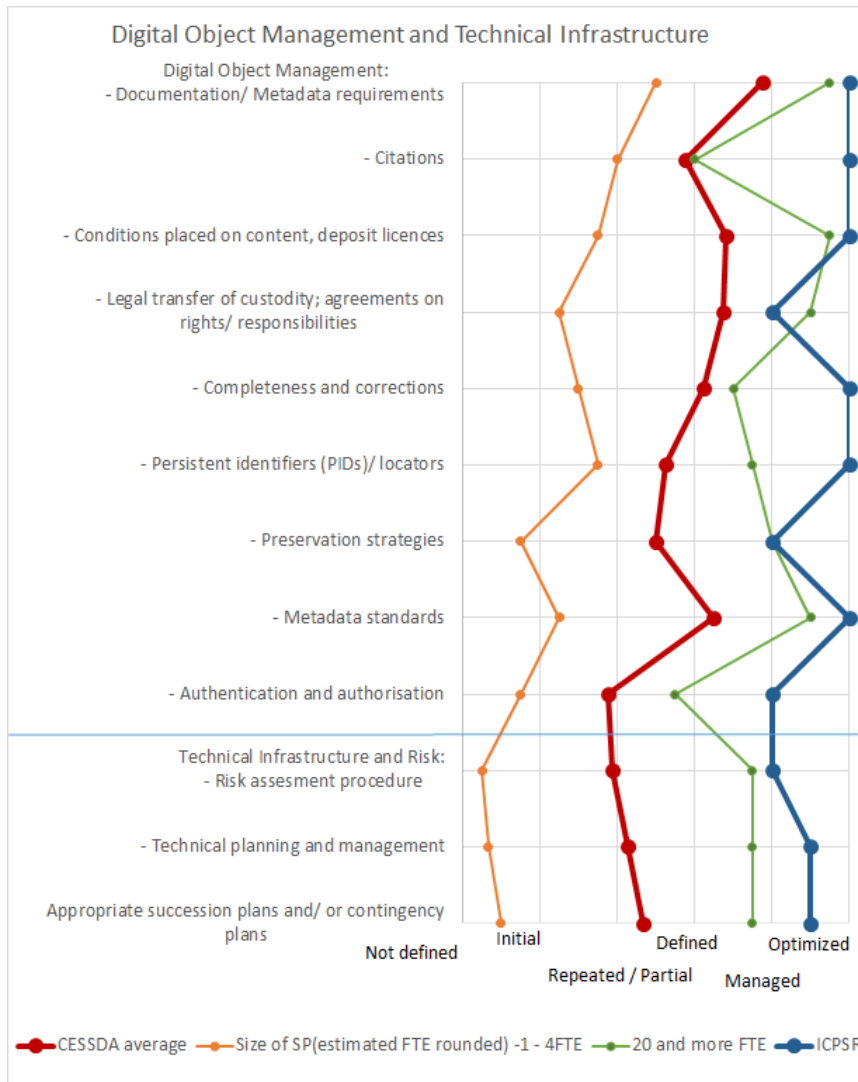


Source: CESSDA SaW deliverables D3.2 and D3.6, and self-evaluation provided by ICPSR, 2017

Only elements where there is data from both ICPSR and CESSDA SaW survey are included. All 16 countries provided scores, except for “Conditions placed on content, deposit licences”; “Technical planning and management” and “Appropriate succession plans and /or contingency plans” with 15 countries providing scores.

Comparing maturity of DOM and technical infrastructure of ICPSR with larger CESSDA ERIC archives (in terms of FTE rounded, *mean* value), largest gaps between more resourceful CESSDA members and ICPSR are with regard to citations, completeness and corrections, persistent identifiers and authentication and authorisation, so the above identified gaps with regard to gaps in maturity of citations, persistent identifiers and authentication and authorisation, if compared to ICPSR, are seen among CESSDA ERIC members, irrespective of size. Maturity of conditions placed on content, deposit licences and preservation strategies, that can be seen between CESSDA median and ICPSR, disappears when comparing larger CESSDA ERIC archives (in terms of FTE rounded, *mean* value) and ICPSR. Larger CESSDA members (by mean value) are also closer to ICPSR in maturity regarding technical infrastructure (between *defined* and *managed* compared to ICPSR with *managed* to *optimized*).

Figure 25: Digital object management and technical infrastructure, ICPSR and CESSDA average as well as biggest and smallest CESSDA SPs



Source: CESSDA SaW deliverables D3.2 and D3.6, and self-evaluation provided by ICPSR, 2017

Only elements where there is data from both ICPSR and CESSDA SaW survey are included. For CESSDA, all 16 countries provided scores, except for “Conditions placed on content, deposit licences”; “Technical planning and management” and “Appropriate succession plans and /or contingency plans” with 15 countries providing scores.

Size of SP(estimated FTE rounded) was estimated for the purposes of D3.6. (see 2.1. of the deliverable) in four categories:

1 - 4 Belgium, Hungary, Portugal, Slovakia;

5 - 9 Czech Republic, Greece, Slovenia;

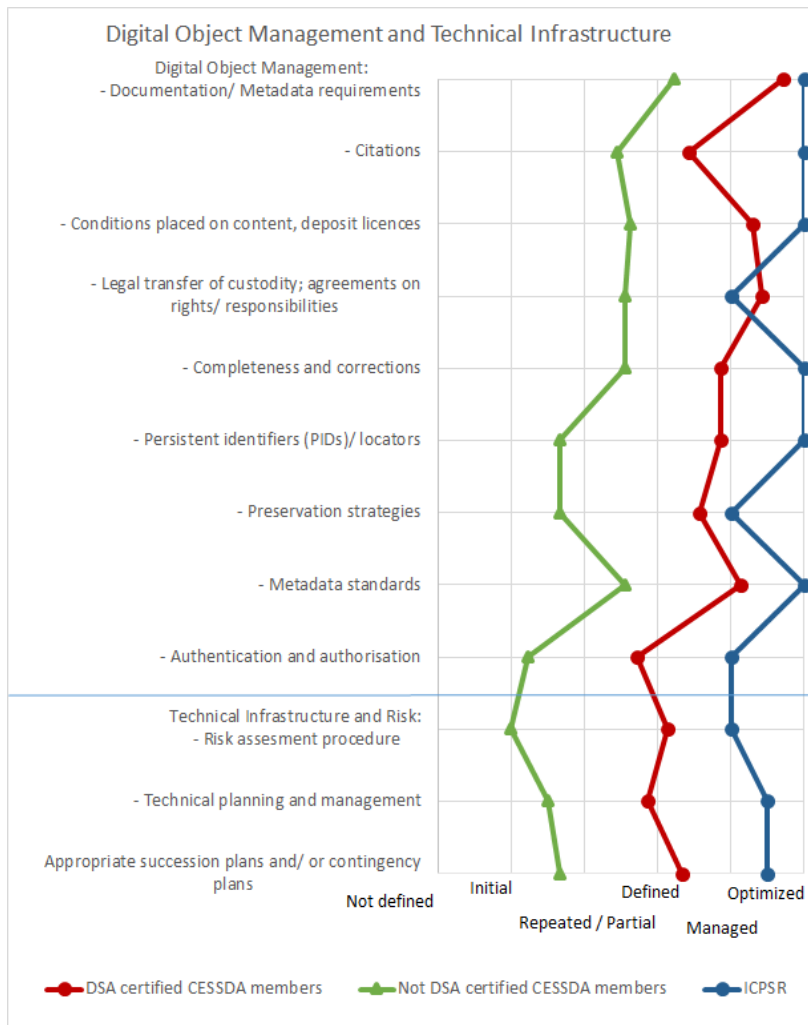
10 - 19 Denmark, Finland, Sweden, Switzerland;

20 and more - Germany, Netherlands, Norway, United Kingdom. Information on Austria and France was not available.

When comparing maturity of CESSDA members certified by DSA (average value) and ICPSR, the already mentioned gaps - with regard to citations, authentication and authorisation,

PIDs, completeness and corrections as well as all technical infrastructure and risks activities/objectives.

Figure 26: Digital object management and technical infrastructure, CESSDA average by certification status (DSA) of CESSDA member and ICPSR



Source: CESSDA SaW deliverables D3.2 and D3.6, and self-evaluation provided by ICPSR, 2017

Only elements where there is data from both ICPSR and CESSDA SaW survey are included. For CESSDA, all 16 countries provided scores, except for “Conditions placed on content, deposit licences”; “Technical planning and management” and “Appropriate succession plans and /or contingency plans” with 15 countries providing scores.

As DSA-certified CESSDA ERIC members are considered here Czech Republic, Finland, Germany, Netherlands, Norway, Sweden and United Kingdom.

As not (yet) DSA-certified CESSDA ERIC members are considered here Belgium, Denmark, France, Greece, Hungary, Portugal, Slovakia, Slovenia and Switzerland.

Summarizing the results of benchmarking aggregated CESSDA ERIC SP maturity assessment against ICPSR according to selected elements of CDM, it can be seen as the following:

- ICPSR as a long-operating, established and resourceful organisation has reached a higher maturity level of organisational infrastructure compared to median (and mean as well) level within CESSDA ERIC, among CESSDA members; however, long-operating, larger (FTE) and certified (DSA) CESSDA members are characterised by higher maturity levels as well;
- Among Digital object management activities:
 - there are gaps in maturity levels prevailing irrespective of size (FTE) or certification status (DSA) regarding citations, completeness and corrections, persistent identifiers, and authentication and authorisation;
 - maturity level of preservation strategies is close or similar for ICPSR, larger (FTE) CESSDA members, and certified CESSDA members,
 - maturity level of conditions placed on content is about the same for ICPSR and larger (FTE) CESSDA members,
 - Legal transfer of custody, agreements on rights/responsibilities is on the same maturity level for ICPSR and median value for CESSDA members;
- ICPSR and larger CESSDA members (in terms of FTE, mean value) do not differ much with regard to maturity of technical infrastructure, but differences are larger compared to all CESSDA members (median) and certified (DSA, mean value) CESSDA members.

7. FURTHER STEPS

There are several issues that emerged during the comparison of CESSDA ERIC and ICPSR. One of the issues that seems to be very clear is the difference between the more and the less 'resourceful' (in terms of employees, but these reflect the resources in general as well) CESSDA ERIC members; namely it would seem that one of the priorities would be to identify key objectives and activities that should be on the same level (i.e. *defined or managed*), and that should be applied to all CESSDA member data archives.

Another issue for CESSDA could be focussing on the elements of *not identified and/or initial* level of activities and services in various data archives, especially those not yet covered by certification requirements that are precondition for CESSDA membership, as stated in the Annex II of the CESSDA ERIC Statutes.

ICPSR is clearly more mature and defined organisation in terms of organisational structure and governance, data object management and technical infrastructure, but it seems reasonable to review the elements where the gaps between ICPSR and most resourceful CESSDA members are the largest. Identifying the reasons behind the gaps, in terms of possible different assessment, different policy framework, cultural differences, or any other issue related to broader DAS ecosystem, could give CESSDA the answers and clear strategy and direction for future developments.

It would also be of interest to repeat this exercise in a certain period (3-5 years) and try to see the future levels of comparison between two organisations.

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