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Research and Innovation Action

CESSDA Strengthening and Widening

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Heuristic Maturity Development Model

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Abstract:

The CESSDA SaW Capability Development Model (CESSDA-CDM) is a structured collection of elements that identify and describe the characteristics of effective preservation processes and activities. Building on established frameworks for trustworthy data preservation and the CESSDA community's prior experiences, the model provides both a starting point for emerging preservation initiatives and a reference tool for established archives that wants to strengthen their services. It is a model that can be used to appraise and/or improve the capability of a service provider to perform and to provide services.

The CESSDA-CDM aims to provide a structured view of processes across an organisation (service provider or research infrastructure); it can be used to set process improvement goals and priorities, provide guidance for quality processes and activities, and provide a benchmark for assessing and appraising current practices.

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1 INTRODUCTION

1.1 PURPOSE AND APPLICABILITY

The purpose of this document is to describe the background to the CESSDA SaW Capability Development Model (CESSDA-CDM); the model itself is available online on the CESSDA website. The model will be the basis upon which an assessment of Social Science service provision is made, and can aid in the improvement of the capabilities of existing and future CESSDA Service Providers. Although the main emphasis of the model is on social science research data, it is applicable for all organisations that has taken on the responsibility to preserve and keep data understandable for the long term, and make it available and accessible for a user community.

1.2 RATIONALE

The CESSDA-CDM is a structured collection of elements that identify and describe the characteristics of effective preservation processes and activities. Building on established frameworks for trustworthy data preservation and the CESSDA community's prior experiences, the model provides both a starting point for emerging preservation initiatives and a reference tool for established archives that wants to strengthen their services. It is a model that can be used to appraise and/or improve the capability of a service provider to perform and to provide services.

The model aims at providing a structured view of processes across an organisation (service provider or research infrastructure); it can be used to set process improvement goals and priorities, provide guidance for quality processes and activities, and provide a benchmark for assessing and appraising current practices.

The model focuses on three main subject areas that describe on a high-level, the main objectives and principles of an organisation providing research data preservation services. Parts 1-3 address these three main areas.

1.3 BACKGROUND OF CESSDA

CESSDA (Consortium of European Social Science Data Archives)[1] aims to facilitate and promote increased and wider use of 'high-quality' data in social, economic and political research. The objective of CESSDA is to provide a comprehensive, distributed and integrated

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[1] http://cessda.net

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 members. In order to strengthen and widen the existing research infrastructure and make it more comprehensive, efficient, effective, integrated and Pan-European, 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. This upgrade is done by means 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 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.

This version of the CESSDA-CDM (Deliverable 3.1 of the CESSDA Strengthening and Widening (SaW) project) will be used and applied for other tasks within the SaW-project. After this usage, the model can be adjusted if needed.

1.4 BACKGROUND OF THE MODEL

The CESSDA SaW Capability Development Model (CESSDA-CDM) focuses on the activities that are required or expected in organisations or services that has taken on the responsibility to preserve research data and make it available for a designated user community. This means that it is primarily aimed at repositories, archives, infrastructures or other preservation initiatives that are providing, or aim at providing, preservation services. The model is not aimed at individual researchers, research projects or other loosely organised research activities or initiatives. However, several of the issues raised in the model should be relevant for any persons or initiatives that deal with management or processing of research data, whether it is for a project's internal storage of data or for preparing data for publication and reuse.

The CESSDA-CDM takes its cue from the Reference Model for an Open Archival Information System (OAIS)[2] and the European Framework for Audit and Certification (also known as Trusted Digital Repository EU (TDR-EU)[3]. TDR-EU is a collaboration between Data Seal of Approval, the Repository Audit and Certification Working Group of the Consultative Committee for Space Data Systems (CCSDS) and the DIN Working Group "Trustworthy

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[2] http://www.iso.org/iso/home/store/catalogue_ics/catalogue_detail_ics.htm?csnumber=57284
[3] http://www.trusteddigitalrepository.eu/Trusted%20Digital%20Repository.html

Archives – Certification". The framework consists of three trust/certification models: the DSA (Data Seal of Approval), the DIN 31644 (the Nestor seal for trustworthy digital archives) and the ISO 16363 (audit and certification for trustworthy digital repositories).

The OAIS and the TDR-EU are used as the platform for the CESSDA-CDM. However, not all elements of the frameworks are being mapped one-to-one. They have primarily been used for identifying subject areas, processes and activities.

In addition to the OAIS and the TDR-EU, we have applied selected elements from the Social Science and Humanities Reference Model (RM-SSH)[4] developed during the DASISH project. Where possible we have implement elements from the CESSDA statutes[5] and the Annex 2 to the CESSDA statutes.

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[4] https://sites.google.com/a/dans.knaw.nl/reference-model-for-ssh-data-infrastructure/home
[5] http://cessda.net/About-us/Documents

2 MODEL COMPONENTS

2.1 THREE LEVELS: CAPABILITY REQUIREMENT AREAS, CAPABILITY PROCESS AREAS AND ACTIVITIES

The CESSDA-CDM is a structured collection of elements that identify and describe the characteristics of effective preservation processes and activities. The model is hierarchical. On the highest level, the model focuses on three main subject areas, so called Capability Requirement Areas (CRA), which describe on a high-level, the main objectives and principles of a service provider. Each CRA is divided in various Capability Process Areas (CPA), which each has it own purpose. Within each CPA there are several activities defined to achieve the objective(s) of that CPA.

Each of the levels in the model is dependent on the configuration of the lower level elements; lower level elements work as indicators for the evaluation of the higher level processes and capabilities. The model has three levels:

Level 1: Capability Requirement Areas

    Level 2: Capability Process Areas

        Level 3: Objectives and associated Required or Expected Activities

2.1.1 LEVEL 1 - CAPABILITY REQUIREMENT AREA

The model identifies a set of subject areas - The Capability Requirement Areas (CRA) - that fulfil a high-level objective or principle of a service provider. The CRAs that are identified in the model are the major factors contributing to the development and maturity of a service provider, an organisation or an infrastructure. A CRA may be undertaken by a part of an organisation, the whole of the organisation, or a group of organisations working together, to meet the high-level goals and to support the effective delivery of services to a designated community.

The CESSDA-CDM identifies three Capability Requirement Areas, which are described in more detail in part 1-3

1. Organisational Infrastructure

2. Digital Object Management

3. Technical Infrastructure

2.1.2 LEVEL 2 - CAPABILITY PROCESS AREA

Each CRA has several Capability Process Areas (CPA). Each CPA has a purpose, which can be subdivided into a set of objectives. Each objective consists of series of related activities that satisfy the objective of the process. An objective may be generic to many CPAs or specific to one Process Area.

The CESSDA-CDM identifies the following CPA's:

CRA1 - Organisational Infrastructure consists of the following CPAs:

1. Mission and Scope

2. Contracts, Licenses and Liabilities

3. Funding, Staff, Resources

4. Outreach and Communication

5. Confidentiality, Ethics and Disclosure risk

6. Documentation

7. Management Oversight

CRA2 - Digital Object Management consists of the following CPAs:

1. Data Acquisition and Ingest

2. Data Preservation: storage, curation and planning

3. Access / Provision

CRA3 - Technical Infrastructure consists of the following CPAs:

1. Risk Assessment

2. Technical Planning and Management

3. Technical Resilience - Infrastructure

4. Technical Resilience - Security

5. Technical Resilience - Disaster planning

2.1.3 LEVEL 3 - REQUIRED OR EXPECTED ACTIVITIES

To achieve an objective within a CPA, there need to be one or more activities present to reach that objective. Within the CESSDA-CDM, these activities are defined as Required or Expected. To measure the maturity of an activity, each activity has to be scored on a 6-point

scale based upon the Capability Maturity Model Integration[6]. For each activity specific descriptions for the different levels of maturity are defined, but there are some general/ generic properties that characterise each level:

(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) *Repeatable/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 review process. The review and update processes are institutionalised.

Note: In some instances, levels 4 and 5 are not described. This is because the activity is considered complete if at level 3.

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[6] CMMI® for Services (CMMI-SVC), Version 1.3 http://cmmiinstitute.com/cmmi-models

2.2 OBJECTIVES, ACTIVITIES AND CAPABILITY COMPLETENESS

The three Capability Requirement Areas (level 1) have each a general, high-level goal connected to them. Each Capability Process Areas (level 2) has a purpose, which can be subdivided into a set of objectives. An objective may be generic to many CPAs or specific to one CPA. To achieve an objective within a CPA, there need to be one or more activities present to reach that objective. An activity may be: *required* to meet the capability objective, normally *expected* to be present but is optional, or *generic*, if its associated capability objective is generic.

The maturity of each activity has to be scored on a 6-points scale. The combined level of maturity for activities defines the Capability Completeness of a Capability Process Area. In other words, the maturity defines whether the purpose or the (sub)objective of the Capability Process Area has been reached. How the combination of activity maturity levels defines the Capability Completeness is open for definition for each CPA. An institution itself or CESSDA as an infrastructure can define that some activities should be very mature, while others can be on a lower maturity. This is depending on the high level goals of the institute or the infrastructure. The Capability Completeness descriptions in the model are indicative only.

Figure 1: illustration of the CESSDA-model, exemplified with the Capability Requirement Area (CRA) of Organisational Infrastructure. Each CRA consist of several CPAs. Each CPA is subdivided into a set of Objectives. Each Objective consists of a set of Activities.
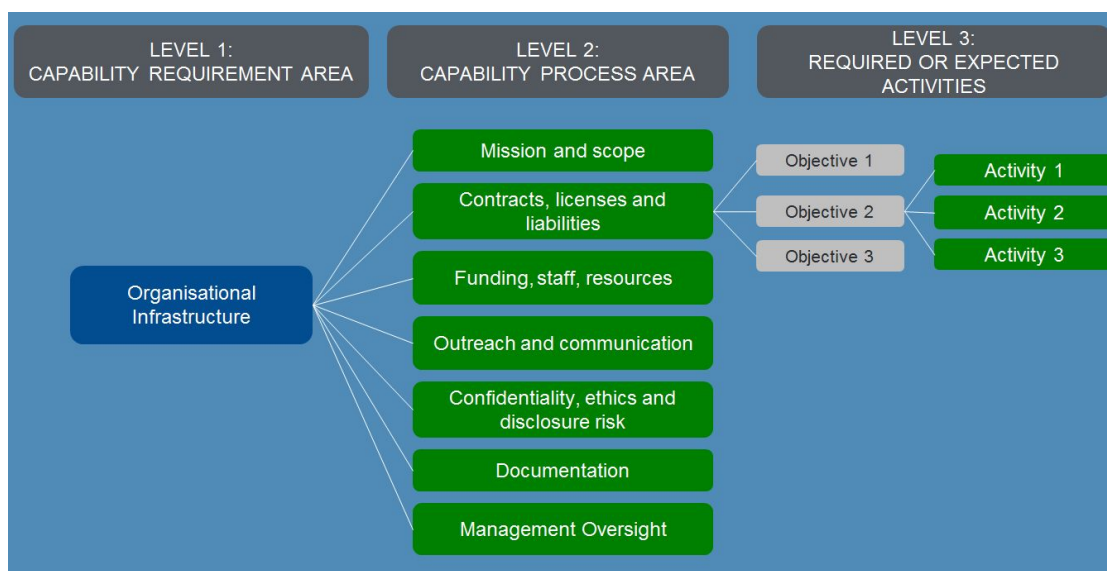
3 THE MODEL

To ensure that the CESSDA SaW Capability Development Model is maintained, managed and available for use beyond the end of this project & by other interested parties, it is available as a website here:

http://cessda.net/CESSDA-Services/Projects/CESSDA-SaW/WorkPackages/WP3/CESSDA-CDM

By publishing the model on the CESSDA website it will have high availability and it is hoped by placing it online it will foster long-term usage. Feed-back and comments will be encouraged to aid future development of the model.

LIST OF FIGURES