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APARSEN

Alliance for Permanent Access to the Records of Science Network

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D33.1B REPORT ON PEER REVIEW OF DIGITAL REPOSITORIES

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Abstract:

This document reports on the work which has been undertaken in support of the European Framework for Audit and Certification of Digital Repositories which was initiated by the European Commission's unit which funds APARSEN. In negotiation this work was integrated into the APARSEN project and this document made part of the D33.1 deliverable.

The work undertaken for ISO 16363 and for DIN 31644 is reported separately under the various headings. The DSA (Data Seal of Approval) process took place separately, prior to and independently of, this project, and is not reported in detail here.

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EXECUTIVE SUMMARY

The European Framework for Audit and Certification of Digital Repositories provides three levels of evaluation for repositories, ranging from the DSA as an entry point which requires a few days' effort from the repositories to the much more detailed formal standards from DIN and ISO, which required between 1.5 to 3 person months to collect the evidence and take part in the audits. The focus of the DSA is on smaller organisations within the research data domain. The two more formal standards are more demanding but, in some cases, especially where there are higher stakes involved, will provide more of a guarantee of 'trustworthiness'.

This document reports on the work which has been undertaken in support of the European Framework for Audit and Certification of Digital Repositories which was initiated by the European Commission's unit which funds APARSEN. In negotiation this work was integrated into the APARSEN project and this document made part of the D33.1 deliverable.

The main part of this report provides details of the test audits which were carried out, the problems encountered and the lessons learned. The European repositories were the Deutsche Nationalbibliothek (DNB), Koninklijke Nederlandse Akademie van Wetenschappen Data Archiving and Networked Services (DANS), UK Data Archive (UKDA), Centre Informatique National de l'Enseignement Supérieur: Département Archivage et Diffusion (CINES-DAD) and in addition, in the USA, the Socioeconomic Data and Applications Center (SEDAC) at the Center for Earth Science Information, the National Space Science Data Center (NSSDC) and the Kentucky Department for Libraries and Archives (KDLA).

The work undertaken for ISO 16363 and for DIN 31644 is reported separately under the various headings. The DSA (Data Seal of Approval) process took place separately, prior to and independently of, this project, and is not reported in detail here.

Statements from the repositories involved illustrate the value of taking part in the framework:

> *For DNB, the main motivation for undergoing audit and certification was to have their own processes and documentation reviewed, scrutinized, and ideally approved by some external professionals. The preparation for the test audit and certification required a thorough analysis and documentation of the achieved status. Thereby, strengths as well as gaps were revealed, which is already a valuable result. Feedback from the auditors will influence the medium term development directions, especially in areas where the auditors suggested improvements. For the DNB, this knowledge gain is even more important than receiving a certificate to showcase.*
>
> *The advantage of the (test) audit for DANS was that it sheds a clear light on what the strengths and the weaknesses are in the archiving activities of our institute. It gave us confidence that we are well on our way to fulfil the requirements. As the procedure was not yet formal, and we do not yet pass all the requirements, we do not use our "marks" yet to promote the archive, although we certainly do mention to our (potential) users that we are determined to be among the first officially certified digital archives.*
>
> *UKDA stated that the comments have proven instructive.*
>
> *CINES-DAD said that certainly helped them to evaluate the progress made since the previous audits and the relevance of the actions taken over the past couple of years, and was a good experience as a contribution to a standardization process, as CINES [required] a predefined scale for the self-assessment of the different metrics of the audit.*
>
> *SEDAC stated that the ISO 16363 test audit provided an excellent opportunity for SEDAC to continue assessing its data management policies and procedures to identify opportunities for improvement.*

Very importantly the formal standard based audits identify priority areas in need of improvement in the repositories' preservation activities, and the impact may be seen in the following statements from them:

> The DNB said*: we will integrate the test audit results into its short and medium term digital preservation development strategy. Two concrete results were that the DNB will have to document more thoroughly its policy decisions and will have to reinforce its internal Quality Assurance.*

DANS said*: we have taken the recommendations from the test audit as a primary guideline in the further development of our procedures and technical adaptations of our archive. The test audit gave clear indications where we could improve the trustworthiness of our archive.*

UKDA said*: implementation of non-contentious recommendations have been undertaken*

CINES-DAD *said: the observations and report produced by the PTAB team following the audit certainly validated the procedures put in place and the willingness for transparency, although some requirements for clarification of the documentation were identified and have been fixed since then; additional action plans have also been worked out to address the few metrics which were not satisfied, and progress will be monitored regularly.*

SEDAC said: the recommendations received from the test audit are important inputs into SEDAC's efforts to improve its capabilities and practices for data preservation and stewardship in collaboration with the Columbia University Libraries.

The DSA has an existing process while the test audits helped in the refinement of the DIN 31644 and ISO 16363 processes, so that both will be able to offer certification in the coming year or so. Further information is available on the web site http://trusteddigitalrepository.eu.

1 INTRODUCTION

This document provides details of the work undertaken in support of setting up the European Framework for Audit and Certification of Digital Repositories. Section 2 describes the background to the signing of the MoU creating the Framework, and the actions agreed to follow in order to undertake the research in the methodologies for auditing and to demonstrate that use of this Framework could be beneficial for repositories. Section 3 provides the list of repositories involved and a high level description of the individual tests used to undertake this research. Feedback from the repositories on the way in which the test audits were conducted is provided in section 4, while the lessons learned the test audits may be found in section 5. The relevance of the work reported here to repositories and also to the audit processes themselves is described in section 6. Dissemination activities, through which information about the Framework is being spread are listed in section 7. The conclusions and recommendations are provided in section 8, including recommendations for consideration as possible updates for the MoU. A number of annexes contain reference material including a copy of the MoU, an example audit report from the ISO 16363 work and feedback reports from some of the repositories.

2 PRESENTATION OF COMMON APPROACH INITIATIVE

In this section we outline the background to the European Framework for Audit and Certification of Digital Repositories, discuss the three main methods used and explain the process of test audits for the APARSEN project.

2.1 OUTLINE

On 8th July 2010 the European Commission brought together Dr. Henk Harmsen, Dr. Christian Keitel and Dr. David Giaretta representing, respectively, the Data Seal of Approval (DSA), DIN 31644 and ISO 16363 - audit and certification initiatives. In addition Ms. Natascha Schumann, Mr. Olivier Rouchon and Dr Matthew Woollard representing the Deutsche Nationalbibliothek, CINES and the UK Data Archive respectively attended the meeting.

A Memorandum of Understanding was signed (Annex A) to define a European Framework for Audit and Certification of Digital Repositories. It was agreed to name the three certification levels of the common approach:

- Basic Certification (based on DSA)
- Extended Certification (self-assessment based on DSA plus self-audit based on ISO 16363 or DIN 31644)
- Formal Certification (self-assessment based on DSA plus full external audit of ISO 16363 or DIN 31644)

Actions from that meeting included:

- The participants will provide the EC with informal estimations regarding the costs and efforts for conducting the test audits. The European Commission will then look at ways how to provide funding to support the test-audits.
- The EC will provide the participants with a draft structure for the final test audit report and the related timeline that will then be finalised until the next (virtual) meeting.
- Confirmation of additional test repositories to contribute to the test audits.

The draft structure resulting from the second bullet provides the structure for this document. The outcome of the first bullet was that the funding was provided from APARSEN. As a result Task 3310 *Repository test audit and certification*, was added to the DoW. This was described as follows:

> *Building on the work of the ISO repository audit and certification working group of CCSDS [6], we will undertake a number of test audits of our data holding partners working with the ISO working group and using the metrics which they have set out. We expect coming out of such an audit not a simple yes/no answer but rather in view of the areas in which each repository need to improve. This is part of the standard ISO audit and certification approach, namely review, improvement plan, check.*
>
> *…..*
>
> *Under this task we will fund the test audits and related activities required to support the research required to set up of the European Framework and the ISO Digital Repository Audit and Certification processes.*
>
> *The three levels of the European Framework will allow us to*
>
> - *start with the DSA*
> - *perform a self audit in more detail using ISO 16363 and the corresponding DIN (draft) standards*
> - *validate the results of the self certification using 3rd party auditors associated with ISO 16363. This will produce an improvement plan for each repository and together these will contribute to a best practice analysis and recommendations report.*

The report should encourage other repositories to take part in this European audit and certification framework.

The European Framework for Audit and Certification of Digital Repositories (Annex A), which is supported by and coordinated with the help of the European Commission, is intended to support researchers, repositories and funding bodies in gaining appropriate certification and identifying suitably certified partners.

Note that the scope and level of detail of individual criteria of the DSA against the DIN and the ISO standards means they are not directly comparable (nor are they intended to be) though it is to be expected that as organisations progress through the European Framework it will become clear how evidence for specific DIN or ISO metrics maps to evidence for the 16 DSA guidelines. Providing guidance on these relationships in the future is expected to drive adoption of both the DIN and ISO through Extended and Formal certification.

The next sections provide information about the three initiatives.

2.1.1 Data Seal of Approval

The sixteen quality guidelines of the DSA (http://www.datasealofapproval.org/) are designed to support data producers, repositories and consumers in the reliable management of data for the future without requiring the implementation of new standards, regulations or high costs. Any organisation may perform an internal self-assessment against the published guidelines. Repositories choosing to complete the DSA self-assessment form may then seek peer review. Both the form and the peer review process are managed through an online application at http://assessment.datasealofapproval.org/apply/. Once a repository has been successfully peer reviewed and joined the DSA community approval is granted by the DSA board to display the Data Seal of Approval logo including a public link to the completed assessment (http://assessment.datasealofapproval.org/seals/). There is no audit process or site visit: just a review on the basis of trust resulting in a clear, public statement of the process undertaken.

While the board is confident that the Data Seal of Approval meets an important requirement for both repositories and researchers seeking a trustworthy place of deposit they are also clear that different environments require different levels of review, audit and certification.

While three DSA board member organisations took part in the test-audit against the draft of ISO 16363 that process did not involve any direct evaluation of or comparison with the DSA. This evaluation has taken place post-test audit.

2.1.2 ISO 16363

OAIS (ISO 14721) [5] contained a roadmap for follow-on standards; one of these was for accreditation of archives. To achieve this RLG and NARA led the first phase which produced the TRAC document [4]. This was then taken into the CCSDS Repository Audit and Certification Working Group (RAC-WG) to develop into a full standard, *Audit and Certification of Trustworthy Digital Repositories* [1]. This was then passed on to ISO and is being published as ISO 16363. Although there is significant overlap with TRAC, TRAC was somewhat skewed towards self-audits of digital libraries whereas ISO 16363 was designed from the start to form the basis for a full external audit process of all types of repositories, from cultural to science to commercial, and with international, trained, consistent, cohorts of auditors to supply whatever the scale of demand.

An important part of this strategy was the creation of a second standard, *Requirements for Bodies Providing Audit and Certification of Candidate Trustworthy Digital Repositories (ISO 16919)* [2], which defines the way in which the external audit and certification must be undertaken, following and specialising the ISO hierarchy of standards defining audit processes. ISO 16919 defines the way in which the process is boot-strapped via the Primary Trustworthy Digital Repository (TDR) Authorisation Body (PTAB) the membership of which is based on the membership of RAC-WG.

Another part of this strategy was to ensure that the external audit process would be practical. This was done before the two standards were finalised. To do this a number of test audits were performed by PTAB in order to ensure (1) that the metrics were understandable and usable by a variety of repositories and (2) that the

evaluation of the evidence could be done in a consistent manner by the PTAB members. The test audits described in this document were part of that process.

It is worth noting that as these standards were produced while the OAIS was being revised by the CCSDS Data Archive and Ingest Working Group (DAI-WG). There was a significant overlap between the membership of RAC-WG and DAI-WG and this ensured the consistency of the standards.

The next steps include establishing a commercially viable audit and certification organisation with a growing number of certified auditors and a number of national accreditation bodies.

One particular positive outcome has been that this process has allowed the test audit team to be formalised into the PTAB organisation has been set up formally which has a three year plan to develop into a full international audit system, working in a way which is consistent with the other ISO audit processes.

Assuming that there is sufficient demand for the commercial sector for audits, the plan is that by the end of 2014 there should be a number of national accreditation bodies, affiliated with the PTAB, supporting a growing number of auditors.

2.1.3 DIN 31644

The DIN 31644 goes back to the nestor Catalogue of Criteria that was developed within the BMBF (Federal Ministry of Education and Research) funded nestor project. In 2003, a working group “Trusted repositories – Certification” was set up in the nestor project in order to create a first catalogue of criteria for trustworthiness and to prepare for the certification of digital repositories in accordance with nationally and internationally coordinated procedures. The catalogue was developed in an open process, and involved institutions with practical experience in setting up digital repositories by means of surveys, workshops, requests for public comment. Both versions of the nestor-catalogue of criteria (v 1: 2006 and v 2: 2008) were also published in English in order to launch the nestor criteria catalogue into the international discussion. The working group cooperated with the OCLC/RLG-NARA Digital Repository Certification Task Force and the Centre for Research Libraries (CRL), and the Digital Curation Centre and the EU-Project Digital Preservation Europe. The international collaboration of the above initiatives led in January 2007 to the formulation of 10 core requirements for trusted repositories.

Based on this work, the DIN WG "Trustworthy digital archives” developed the DIN standard 31644 “Information and documentation- Criteria for trustworthy digital archives”. The scope of the standard was broadened from memory institutions to all institutions with the aim to preserve information in digital form. The normative character of the requirements was strengthened. The standard was published for public comment in spring 2011 in Germany and will be published in its final form in spring 2012.

The standard comprises an introduction addressing the challenges of digital preservation, the scope of the standard, and the definitions of relevant terms, which go back to the terms of the OAIS reference model. The main part of the standard consists of the list of 34 requirements structured in 3 parts: organization, management of intellectual entities and their representations, and infrastructure and security. Appendixes with examples of digital archives and best practices for each requirement as well as literature complete the standard.

The nestor catalogue and the DIN standard have mainly been compiled for application in Germany, however it is also being discussed and standardised within the international context, particularly within the European Framework for Audit and Certification of Digital Repositories. In an international context, it is crucial to identify generally valid criteria amongst the specifically national conditions. These lie e.g. in the legal framework, the provision of public institutions with adequate financial and human resources, in national organisational structures and the status of national development in the field of digital long-term preservation.

In order to establish and test the audit and certification process for German institutions based on DIN 31644 the nestor WG “Certification” was founded in 2010 (hereafter referred to as “nestor WG”).

3 METHODOLOGY OF TESTING THE COMMON APPROACH

The actions arising from the meeting in which the MoU was agreed laid out the plan for a set of test audits which would test the Framework and facilitate its move into operational status. The following is an extract of the minutes of that meeting.

> *At that meeting were three repositories present, which committed themselves to run test audits in the coming months: DNB, UK Data Archive and CINES. All three have already concluded or are soon to conclude their DSA audit.*
>
> *The test audits should run through all three stages of the common approach:*
>
> *The partners involved are to provide the European Commission with estimations of the costs and efforts involved.*
>
> *The report should address the following issues:*
>
> - *test of standard and practical conclusions from conducting the audits;*
> - *how much effort and time needs to be invested by the participants;*
> - *if the levels build up efficiently from each other, e.g. if work for the DSA audit facilitates the work for the ISO and DIN standards;*
> - *what aspects of the used methodologies should be improved and what tools are helpful;*
> - *if the requirements of the standards do sufficiently take into account the different types of repositories involved;*
>
> *In general, the final outcome of the test audits will provide a possibility for an in-depth examination of the involved repositories and the external reviewers and auditors. Furthermore, the final report will also be a valuable document for the feasibility of the chosen approach and its added value for repositories.*

This agreement formed the basis of the test audits and this report.

3.1 TEST REPOSITORIES INVOLVED

The European repositories involved were:

- ISO 16363 focus:
  - Data Archiving and Networked Services (DANS) in the Netherlands
  - Centre Informatique National de l'Enseignement Supérieur: Département Archivage et Diffusion (CINES-DAD)
  - UK Data Archive (UKDA)
- DIN 31644 focus
  - Deutsche Nationalbibliothek

All the above already have the Data Seal of Approval [3], and the effort involved with these test audits were predominantly funded through APARSEN.

In addition three repositories in the USA volunteered to be audited following ISO 16363. These repositories did not receive any EU funding. None of these repositories had carried out a self-audit against DSA (nor did they wish to); they found that a fuller audit was preferable for their circumstances. These repositories were:

- NASA's National Space Science Data Center (NSSDC)
- The Socioeconomic Data and Applications Center (SEDAC) at the Center for Earth Science Information (CIESIN)
- Kentucky Department for Libraries and Archives (KDLA)

Although the concept of an easy entry into an accreditation was attractive a fuller self-audit – essentially the "Extended certification" – was preferable.

An added purpose for the test audits for ISO 16363 was to verify the practicality of the audit process and understandability of the metrics, help to develop the process for the audits and to check the consistency of the judgements of the auditors. This last point required that, whereas a normal audit would involve two auditors, the test audits had to involve larger groups of auditors.

3.2 STRUCTURE OF THE INDIVIDUAL TESTS

The three European repositories had already carried out self-audits against the DSA which had subsequently been verified by the DSA Board, and the three US repositories had no interest in auditing against this method, hence no audits were carried out using this method as part of this piece of work. However, it is clear from the experience of the participants that as an entry-level method of evaluating the level of "trustworthiness" the DSA is an entirely applicable and useful method to use. However, it is clear that the DSA does not provide the level of detail which either DIN 31644 and ISO 16363 require, and as such the level of confidence in the 'trustworthiness' of a repository is likely to be lower. However, all participants agree that it is a starting point which will inculcate trust within stakeholders, and as it provides a public evidence of the criteria, external parties may elect to review the evidence.

For ISO 16363 the general structure of the audit was for the repository to undertake a self-audit, writing briefly about the evidence for each metric. This self-audit Checklist and Self-audit summary was returned to the audit team for review and initial evaluation. On the basis of these documents the audit team could request extra evidence or the availability of additional documentation. In addition the audit team was able use the self-audit to prioritise its questions and determine its approach to the site visit.

With hindsight it seemed that the activities required for what will be called Phase 1 of the full audit process (which is being developed) has a significant overlap with the Extended Certification. As pointed out by UKDA, they would have delivered a different style of document for Extended Certification (as Extended requires publicly available self-audit), but the information to be collected and the effort required would be very similar.

During the site visits, which lasted two days each, the audit team examined the evidence in detail, asked questions and were shown details of procedures and techniques. At the end of the visit the audit team gave a verbal feedback to the repository staff. Note that as many of the PTAB as possible attended each audit in order to test commonality and consistency of understanding of the metrics when confronted with real evidence. In addition it was important to ensure the consistency of judgements across repositories.

After the site visit the audit team discussed the evidence and their impressions. On the basis of their general experience and guided by the metrics of ISO 16363, a brief Audit Report was drafted which identified those areas which were in need of improvement. This was not an exhaustive list, rather those things which were considered by the audit team to be of the highest priority. In a 'live' audit this Audit Report would be prepared in a few weeks and would include feedback on the status of the repository with respect of many more of the metrics.

One challenge for the 16363 process was to ensure that there was consistency between the auditors and across repositories. This required that draft Audit Reports be prepared for all of the repositories and then an extended process of comparison was undertaken. The lessons learnt from the test audits helped to finalise the standards and also the plans for the conduct of real audits.

For DIN 31644, the test candidate, who already had the DSA (=Basic Certification), undertook an externally reviewed self-audit (=Extended Certification) and a full external audit (=Formal Certification). For the self-audit, an Excel form was filled in with evidence for each metric. The form was reviewed by external auditors, and questions were solved in writing.

The auditors prepared their on-site visit on basis of the reviewed self-audit. The on-site visit basically consisted of an in-depth discussion between the auditors and staff of the test audit candidate and questions that had only been touched upon during the self-audit could be discussed in detail.

3.3 TIMELINE OF TEST AUDITS

3.3.1 ISO 16363

March 2011	Repositories receive 'Expectations' Document [Annex F]
April-June 2011	Repositories complete Self-Audit Checklist and Self-Audit Summary completed
June-July 2011	Repositories host site audit visits for test audits
June-July	Repositories complete Post-Test Audit Report to feedback on process
August-December 2011	Auditors produce consistent Audit Reports.
Jan 2012	Audit Reports distributed to repositories

3.3.2 DNB / DIN 31644

April 2011	Preparations for Extended Audit
May/June	DNB fills in Audit form
May	Initial experiences fed back to nestor WG
June-September 2011	Extended Audit reviewed by auditors
July	Questions of auditors discussion in nestor WG
October 2011	Formal Audit takes part
November 2011	Lessons learned are fed back to nestor WG
December 2011	Documentation of the whole test audit experience in test audit report

4 REPORTS FROM THE TEST REPOSITORIES

This section provides the feedback from the repositories about their experience of the test audits; further details are included in annexes D and E. Although 'live' audits will be different from the test audits, this feedback provides a valuable 'warts and all' record of those test audits.

4.1 ISO 16363: 3 EUROPEAN REPOSITORIES

After receiving a document detailing the 'Expectations for Repositories and Audit Teams Volunteering to Conduct Test Audits of Draft ISO 16363' (Annex F), each of the European repositories, which had all previously self-assessed and been reviewed against the DSA, completed the Self-Audit Checklist (SAC). The process of the three repositories was similar in approach, with each of the controls in the (then) draft standard being provided by evidence for the level of conformance. Some slight differences of approach in this activity reflected the levels of familiarity with auditing against standards. CINES and DANS provided a single document with the controls and their evidence; the UKDA provided a spreadsheet which linked to a separate worksheet listing all the available evidence. These completed SACs were provided to the test auditors along with a Self-Audit Summary. DANS plan to publish their SAC online; the UKDA has not published theirs owing to some sensitive issues relating to the hosting of personally disclosive data. The UKDA's Self-Audit Summary is available online. [reference TDB] These SACs were distributed to the auditors around a month before their site visits. The test audit team found it unnecessary to share any of the questions for the repository audits which they prepared during their preparation phase, suggesting that the SACs were not only completed to the satisfaction of the test auditors, but they found that the repositories had provided an acceptable level of evidence for the controls. Site visits were made during June and July 2011 and the auditors provided informal feedback to each of the repositories based on the additional evidence which had been received during the site visit. Immediately after the site visit the repositories created Post-Test Audit Reports outlining their experience during the audit. DANS's Post-Test Audit Report is provided in full in Annex C. The UKDA's response is too long to reproduce in full, but the key recommendations are reproduced in Annex D. In general, the repositories found:

- Greater effort than expected was required to complete the SAC, due to the difficulty to evaluate the level of compliance of the repository to the different criteria of the SAC, as no measurement range was provided;
- Audit Team did not present an Audit Plan [ISO 17021:2011: 9.1.2.3]
- Size of Audit group would be much too unwieldy for a real audit;
- Hugely rewarding process for the test repositories.

Between August and December the test audit team produced Audit Reports for each of the repositories which were circulated to the repositories in January 2012. When these Audit Reports have been agreed by the repositories they may be able to be published. DANS has provided feedback on the process, reproduced in Annex C. UKDA also provided such feedback but this is provided as a separate document because it is rather detailed. Some of the major points are:

- The Audit Report makes no statement on the overall level of conformity to the standard. The yardstick to which the measurements are made is unclear. Should a repository fulfill all metrics to 100%? If one metric is met for 90%, does it mean the repository fails on that metric? And if it fails on one metric, does it fail the whole certification?
- The Audit Report does not explicitly mention whether the repository conforms to the metrics which are not explicitly discussed
- The Audit Report does not distinguish between major and minor nonconformities.
- The auditing methodology is not explicit in the Audit Report
- The Audit Report should provide a Corrective Action Plan
- "Recommendations" in audit terminology should refer to improvements

These points are being addressed as the full audit process is developed, and of course a full audit, as opposed to a "test audit" will be follow ISO audit requirements. The aim of each of the Test Audit Reports aimed to indicate the metrics which were not met and the improvements which were required. The structure is modelled on other ISO audit processes. An example of a Test Audit Report is provided in Annex B.

None of the European repositories were under the impression that this process would result in certification against what was then a draft-standard.

4.2 DIN 31644: DEUTSCHE NATIONALBIBLIOTHEK

The DNB conducted a Data Seal of Approval (DSA) Test Audit in 2010 already. To have done this before starting with the DIN process was helpful, given that we had already looked at our policies, our business practices, and our documentation from the perspective of an audit candidate. We could not, however, transfer any answer that we had given in the DSA Test Audit to the DIN process directly. A mapping between the criteria of the two standards did not exist at that time. Meanwhile, work on a mapping has begun and ist still ongoing.

The fact that the DIN Audit procedures were still under development when we started the Test Audit process in April of 2011 was challenging on the one hand, but on the other hand, it allowed the nestor WG to directly take into account real life issues, questions, and experiences. As a first step, we tested the self-audit process that would lead to Extended Certification. The nestor WG "Certification" had prepared a MS Excel form in which we could describe our implementation of the DIN criteria and in which we could link to available documentation. The WG had also defined a methodology for determining the degree of fulfillment (still open = 0 points; designed = 3 points; specified = 6 points; fully implemented = 10 points).). We had no difficulties with filling in the prepared form. A process for clarifying questions and handling objections between audit candidate and auditors, however, was initially defined when the need occurred during our Test Audit. It also turned out that the level of fulfillment that the nestor WG "Certification" originally wanted to see to issue a certificate (11 knockout criteria) was very (perhaps too) ambitious. When discussing specific DNB examples with the auditors, the auditors recognized that they had to get back to the WG to find a way to acknowledge the gap between theoretically thinkable, ideal implementations of certain criteria and the technological state of the art (e.g., criteria targeting preservation planning and preservation actions). The exchange between us and the auditors took part via email, which allowed for asynchronous communication and has the advantage that all questions and answers are documented, but only permits a certain level of detail in the interaction.

As regards content, we and the auditors found unisonous that it is important that the audit candidate specifies exactly its understanding of the object and scope of the certification: Which parts of the organization, and which processes are relevant to the long-term archive that is to be certified? Or, if the whole institution is to be certified, which of its parts and processes are relevant to the certification? When we filled in the Certification form, we considered the "whole DNB" as "the long term archive". The auditors, however, found it difficult that some of our answers referred to the general digital publications workflow and some to more preservation specific tasks and workflows. Another, related point is that different workflows can have varying levels of maturity, especially in large organizations. In our answers, we mixed a bit between our regular workflows and more advanced routines developed in projects with as yet a limited field of application within the library.

With approval of the self-audit by the reviewer, Extended Certification was achieved, and the full external audit and certification, which would lead to Formal Certification, could take part. In our test audit, we might not have separated clearly enough between these two, ideally separate, processes. Two auditors, both co-leads of the nestor WG "Certification" visited the DNB in October for one day. On this day, the auditors and several staff members of DNB (see 3.1.2 "Required Staff…" below) talked through all the issues that had not been completely clarified during the Extended Certification. After this was finished, we talked through all the criteria again. In doing so, we went into more detail than was possible in the email discussions we had during the Extended Certification in order to proceed from check of plausibility to scrutiny.
It was, for example, intensely discussed how standardized a workflow should be to be considered a "full implementation" of a criterion. For the criterion "Authenticity – The user must be able to check on the authenticity of the objects" the DNB does not have a standard workflow, but *if* a user had some doubts concerning a specific object, the user service would mediate between the user and the second level IT support that could share preservation related metadata with the user to check the authenticity.

Another topic was the use of temporary employees – may it, and if so, how does it influence the assessment of the stability of workflows and in the end, of the sustainability of services?
The greatest advantage of the on-site visit was that the auditors could immediately ask questions when needed. However, the auditors did not interview staff; test the systems, or inspect workstations or server rooms.
Altogether, the DNB considered it useful and helpful to have the own processes and documentation reviewed and scrutinized by some external professionals.

5 LESSON LEARNED

From test audits lessons were learned about how to conduct the audits within the framework structure and roughly how much effort is required from the repositories to undertake an audit.

5.1 PRACTICAL ISSUES FOR ORGANISING THE AUDITS

5.1.1 Basic Certification

The European repositories had already acquired the DSA and, apart from DNB, were part of the DSA board. Note however that nestor is part of the DSA board and the nestor office resides within the DNB

5.1.2 Extended Certification

5.1.2.1 ISO 16363

The processes surrounding Extended Certification as defined in the Framework was not performed using ISO 16363 because this was a test situation and there was no willingness amongst the repositories that self-assessments should be made public unless this were a "live" situation. The self-assessments (perhaps a less confusing term than self-audit, though the term Self-Audit was used during the process) which were conducted were probably a super-set of what would be revealed from the Extended Certification. This could be factored into discussions with repositories about the Framework i.e. to save effort the fuller self-assessment could be undertaken and an acceptable subset published for Extended Certification.

5.1.2.2 DIN 31644

During the certification process the necessity for tools that support such an enterprise evolved nearly automatically. Firstly, the audit candidate needs some tools to apply for and to undergo an externally reviewed self-audit, which will lead to Extended Certification: a website with information about the audit process, an online form or an email contact to apply for certification, and a form where they can fill in implementation and documentation for each criterion and guidelines for filling in the form. These tools were developed in parallel to the DNB test audit.
Secondly, the auditors need some guidelines how to assess the application of the candidate. A communication channel between auditors and audit candidate must be defined for queries of the auditors. It must be decided if the auditors are to be anonymous or known by the audit candidate.
In general, the whole audit process needs to be well defined, documented and transparent. It must be clear to the auditors and to the audit candidate how the auditors are appointed and according to which methodology the auditors assess the audit candidate. Terms and deadlines of the audit process must be communicated. As was said before, the procedures were partly shaped during the test audit process, and so could real life experiences immediately be taken into account.

5.1.3 Formal Certification

5.1.3.1 ISO 16363

The practical issues surrounding the ISO 16363 audits concerned scheduling to minimise travelling time and auditors being away from their home base.

The PTAB had taken into account the lessons learned by CRL staff (members of PTAB) who had undertaken audits in the USA using the TRAC [4] document. These had involved significant charges, paid by the repository being audited, and significant time – many months. The ISO 16363 process was designed to undertaken at a reasonable cost and the Phase 2 visit to be for 2 days involving 2 auditors. For the test audits we did not follow this plan, for reasons given previously, however we believe, on the basis of these test audits, that the full process is will be practical once the audit methodology has been refined and published.

5.1.3.2 DIN 31644

During the test process, DNB had some difficulties to separate clearly between the phases that would lead to Extended, respectively, Formal Certification. To avoid confusion, though, the relation of the Formal

Certification to the Extended Certification must be very clear (practical borderlines between the two processes, additional efforts as well as added value). This is not yet resolved completely, but questions to be considered are: Is an Extended Certification obliged before a repository can apply for a Formal Certification? If the repository achieved Extended Certification before the Formal Certification, is it sensible that the same auditors are involved in both audit processes? Which additional information is needed for the Formal Certification?

As in the phase that leads to Extended Certification, the auditors need tools and guidelines that help them conduct the Formal Certification. The tools and guidelines can to a large extent draw on what is defined for the self-audit, but additional questions to be considered are: How much time of the on-site-visit are to be spend with interviews, with reading documents, with examination of facilities? How to assess things the auditor sees, tests reads, and is told? How to deal with conflicts between what the auditors sees, tests, reads, and is told?

5.1.4 Tools used in the Audits

The tools used by the repositories and the auditors were

1) Excel spreadsheets, used in the DIN and ISO audits. For ISO 16363 an example of the table sent to the repositories is shown adjacent. It includes the metrics plus explanatory text and examples, and space for the repository to provide information about the evidence for each metric. The aim was to avoid demanding vast amounts of paper of documents to be collected and sent to the auditors; previous experience had shown that this could be costly in time, effort and material. Instead the spreadsheet was to collect enough information to enable the auditors to make a decision as to whether or not to either (a) ask to see the evidence for a specific metric before the visit or (b) state specifically that the auditors wish to see the evidence during the visit. The auditors could also make a preliminary judgment as to whether or not the evidence (assuming the description was correct), was likely to be acceptable and prepare questions for the on-site visit.

   Some repositories converted the spreadsheet into a Word document for their own convenience but re-integrated the information into the spreadsheet to return to the auditors. Also, for convenience, repositories prepared separate spreadsheets with descriptions of the evidence so that individual rows could be referred to in case the same evidence could be used for several metrics.

Metric	Supporting Text	Examples of Ways the Repository can use to Demonstrate It is Meeting this Requirement:	Brief description of evidence (add rows as needed, possibly more than one per metric)	Repository explanation of how it addresses this metric or why it is not applicable.	Only Paper (Y/N)	URL (if available)	Electronic document (Y/N) Web (Y/N)	Num pages (if applicable)	Size in (if electronic)
3. ORGANISATIONAL INFRASTRUCTURE									
3.1 GOVERNANCE & ORGANIZATIONAL VIABILITY									
3.1.1 THE REPOSITORY SHALL HAVE A MISSION STATEMENT THAT REFLECTS A COMMITMENT TO THE PRESERVATION OF, LONG TERM RETENTION OF, MANAGEMENT OF, AND ACCESS TO DIGITAL INFORMATION.	This is necessary in order to ensure commitment to preservation and access at the repository's highest administrative level.	Mission statement or charter of the repository or its parent organization that specifically addresses or implicitly calls for the preservation of information and/or other resources under its purview; a legal, statutory, or government regulatory mandate applicable to the repository that specifically addresses or implicitly requires the preservation of information and/or other resources under its purview.							
3.1.2 THE REPOSITORY SHALL HAVE A PRESERVATION STRATEGIC PLAN THAT DEFINES THE APPROACH THE REPOSITORY WILL TAKE IN THE LONG-TERM SUPPORT OF ITS MISSION.	This is necessary in order to help the repository make administrative decisions, shape policies, and allocate resources in order to successfully preserve its holdings.	Preservation Strategic Plan; meeting minutes; documentation of administrative decisions which have been made.							
3.1.2.1 *The repository shall have an appropriate, formal succession plan, contingency plans, and/or escrow arrangements in place in case the repository ceases to operate or the governing or funding institution substantially changes its scope.*	This is necessary in order to preserve the information content entrusted to the repository by handing it on to another custodian in the case that the repository ceases to operate.	Written and up-to-date succession and contingency plan(s); explicit and specific statement documenting the intent to ensure continuity of the repository, and the steps taken and to be taken to ensure continuity; escrow of critical code, software, and metadata sufficient to enable reconstitution of the repository and its content in the event of repository failure; escrow and/or reserve funds set aside for contingencies; explicit agreements with successor organizations which are sufficiently trustworthy, documenting the measures to be taken to ensure the complete and formal transfer of responsibility for the repository's digital content and related assets, and granting the requisite rights necessary to ensure continuity of the content and repository services.							

2) DSA provided a custom web form into which the repository could directly write their evidence and then reviewed by members of the DSA board.

Other tools such as DRAMBORA were not used in any of the audits.

5.1.5 Interaction between the individual schemes

Though the test-audit process as presented to the European repositories did not explicitly or implicitly examine the Framework, the repositories' previous involvement with the Data Seal of Approval (as

applicants for the Seal, rather than as board members) was enormously beneficial to the self-assessment against ISO16363 as it meant we had already undergone a structured self-assessment.

For example, the DSA self-assessment was the first initiative they undertook to capture fully procedural evidence across all activities and functions of the UK Data Archive. Previous to the DSA while the UKDA had key policy documents in place and a handful of procedural documents, their business processes were not captured in an auditable way. For the UK Data Archive, the DSA self-assessment process, along with the introduction of more formal records management was invaluable during both out ISO27001 audits and with the ISO16363 self-assessment process.

The DSA process also allowed them to understand that much 'evidences of practice' (i.e. evidences that policies and procedures are being implemented) are addressed from the workflow point of view rather than being managed as potential 'evidence' for internal or external consumption. This means that while they could honestly claim that the evidence is present it is not necessarily in a form which is easily accessible and digestible by an external audit team..

Nevertheless it was recognised that the ISO 16363/DIN 31644 processes were considerably deeper and more extensive than the DSA, and had a closer focus on digital preservation activities as defined in the OAIS Reference Model , but narrower in focus in some specific operational issues, like the ethical and legal issues of holding sensitive data. It is also recognised that amongst the European participants that the costs of undertaking either the ISO 16363/DIN 31644 processes were more costly due to the additional rigor necessitated through the production of evidence, and potentially through changes required in internal processes to meet the requirements of these standards.

It is understood by all parties that interpretations of the Framework need to be aligned and further clarifications agreed.

Note that the pre-test audit self-assessments involved a brief response to each 'metric' directed at an audience of digital preservation experts acting as experienced auditors during a managed process which included evaluation and feedback on the self-assessment and a detailed site visit. We would expect the preparation of evidence for Extended Certification to require more detailed descriptions and context to support a public statement to be read by a far wider group of stakeholders with a more varied level of digital preservation knowledge and limited auditing experience.

It may be useful to note that while there is at present no public guidance on mapping evidence for the DSA to evidence for the DIN/ISO the evidence submitted for both significantly overlapped. The European repositories involved here would expect that as repositories apply for various levels of certification the relationship between DIN/ISO controls and the 16 DSA Guidelines will become more explicit; if this happens there is the expectation that the DSA will be an even more useful starting point in repositories drive for audit and certification, and it would appear that the Extended and Formal certification processes really can be linked so that the effort involved is minimised.

The relation between Extended and Formal certification remains to be reviewed. For ISO, it seems that the self-audit and Phase 1 of the full external audit required by the Extended and Formal certification processes respectively do significantly overlap and so effort could be saved by combining them, perhaps with a pause before going on to Formal Certification. For DIN, a clearer separation between the two processes the lead to Extended, respectively, Formal certification, is sought.

5.2 COST AND EFFORTS FOR REPOSITORIES

5.2.1 DSA

As noted above the European repositories had already acquired the DSA so this process was not carried out in this project. The UK Data Archive reports that it was rather difficult for them to answer this in a way that would be generally representative since they were involved in developing the DSA guidelines at the same time as they were updating their records management practices and associated procedures and preparing for a very rigorous ISO 27001 process. However, the final assessment submission took one member of staff about

five days with one additional day responding to the peer-review comments to clarify and extend their statements. On the other hand, a seperate Archaeology Data Service case study for the DCC [1] states that the initial submission "took approximately 4 days of staff time. A day was needed to work through the self-assessment form and record how we met each guideline (consulting with colleagues where necessary), and the rest of that time was spent updating existing documentation and making it available on-line...". For the follow up the Archaeology Data Service stated: "Once comments were received back from the reviewer it did not take very long to address them and make a few minor changes to the self-assessment in order to complete the DSA assessment process."

We expect that a well-organised repository should be able to complete the DSA in less than two weeks (assuming that some evidence needs to be formalised.)

5.2.2 ISO 16363

5.2.2.1 Required Staff and Staff time

We can see from the effort reports the following figures for taking part in WP 33:

- DANS 3 MM (500 working hours)
- CINES 3 MM
- UKDA 2 MM

However, it is worth noting that these timings cover the time expended on all activities related to the work package, rather than just the preparations for the audit. Participants in the European audits were not only establishing an evidence base but also contributing directly to the processes involving the development of the audit mechanisms, and communicated extensively internally about the standards with a view to making the test audit process as advantageous as possible to the APARSEN work package, the finalisation of the ISO standard and the European Framework.

There are many more items in the ISO than there are in the DIN so discussing and amassing appropriate evidence obviously took longer. For all three processes preparation time will drop as the community becomes familiar with the requirements and supporting resources become available online.

5.2.3 DIN 31644

5.2.3.1 Individual Costs for Repositories

DNB: Only staff time (see below). The auditors carried their travel cost for the Formal Certification on-site-visit themselves.

5.2.3.2 Required Staff and Staff time

Several staff members of the DNB were involved with varying intensity in the test audit. The DNB does not have a dedicated Digital Preservation unit, but staff that has to do with digital preservation is distributed over several units in the IT department.
Total Person Months: 1,51 (1 PM = 17,6 PD)

5.2.4 Remarks on cost and effort

Effort expended in these activities can be broken down into the following major areas:

- preparation of evidence
- assessing level of conformance to the standard
- creation of new evidence if it does not already exist;

[1] http://www.dcc.ac.uk/resources/case-studies/ads-dsa

- changing policy/procedures if the procedures do not meet the standard (pre-audit)
- implementing policy/procedures

The level of cost/effort to be expended on each of these activities will depend on a number of factors. Amongst them are

- the preparedness of the organization,
- the scope of the organization,
- previous formal certification undergone,
- the quality of the audited organisation's records management
- the level of applicability of each of the elements of the standard to the organization (e.g., different security requirements.

6 RELEVANCE

6.1 FOR REPOSITORIES

6.1.1 Repository motivation for audits and certification

For the ISO 16363 audits the DANS, UKDA and CINES repositories were, as part of the DSA board, keen on the overall audit process.

As the UK Data Archive is registered to ISO 27001 for Information Security and has a peer-reviewed self-audit against the Data Seal of Approval (DSA); this audit against the proposed ISO 16363 represented the next step in repository best practice. The Archive benefits directly from a formal ISO standard on trusted digital repositories as an adjunct to the OAIS standard. As well as learning from this process the Archive hoped to contribute to the success of the ISO standard and the associated auditing processes. The Archive is in the process of developing formal records management to support long-term certification and improvement against ISO27001 so the primary investment was the individual evaluation of ISO16363 metrics (with minimal guidance given the draft status) and of existing evidence for specific conformity. It is not clear at this stage that there is an immediate demand from the Archive's funders or users for ISO16363 Formal Certification, though if stakeholders require certification against the standard, it should be able to accommodate them, at a cost.

The audit against the future ISO 16363 standard turned out to be the fourth audit for the CINES Archive in as many years: the path to certification started in 2009 with an external audit based on ISO 14721 (OAIS), TRAC and DRAMBORA, with the objective to identify the strengths and weaknesses of the digital preservation repository and department which had been rolled out two years before, and validate the concepts that had been implemented. It was immediately followed in 2010 by an audit by the French National Archives that led to the publication of an enabling act in favour of CINES for the preservation of public data, and by the DSA which was granted the year after. It appeared relevant to move the process forward by testing a certification specific to the digital preservation world – one of which would likely have the biggest impact on the CINES user communities and funding bodies – in other words, the ISO 16363. It certainly helped the CINES to evaluate the progress made since the previous audits and the relevance of the actions taken over the past couple of years, and was a good experience as a contribution to a standardization process, as CINES claimed the need for a predefined scale for the self-assessment of the different metrics of the audit. The observations and report produced by the PTAB team following the audit certainly validated the procedures put in place and the willingness for transparency, although some requirements for clarification of the documentation were identified and have been fixed since then; additional action plans have also been worked out to address the few metrics which were not satisfied, and progress will be monitored regularly.

The US repositories which, although they had contacts with the US based RAC-WG members, did have other reasons for seeking some kind of accreditation including the desire to demonstrate to management and reviewers that they were willing to undertake external, independent, international (ISO) evaluations in order to reach the highest standards in digital preservation.

For DNB, the main motivation for undergoing audit and certification is to have their own processes and documentation reviewed, scrutinized, and ideally approved by some external professionals. The preparation for audit and certification require a thorough analysis and documentation of the achieved status. Thereby, strengths as well as gaps are revealed, which is already a valuable result. It helps defining the medium term development directions. Two concrete results were that DNB will have to document more thoroughly their policy decisions and will have to reinforce their internal Quality Assurance. For the DNB, this knowledge gain is more important than receiving a certificate to showcase.

6.1.2 Main difficulties for repositories

For the ISO 16363 repositories the main difficulties arose from the fact that PTAB had not yet evolved its procedures or made explicit the methodology by which conformance to the standard was to be measured. This caused a level of tension especially from UKDA which had already undertaken ISO based conformity assessment exercises, and were expecting an audit based directly on the standards-based documented processes, despite these being labelled as "test audits". These issues have subsequently been rectified and a

clearer Audit Plan will be delivered in advance of any further audit against ISO 16363 conforming to the principles of ISO audits.

As a sizeable team of auditors took part in the visits, the repositories were somewhat overwhelmed by numbers and the practicality of managing tours around the repository. Combined with a lack of a clear, finalised, Audit Plan, this was inconvenient to the audit process. This is an acknowledged problem in the test audit process, but one which was understood by both the PTAB and the repositories in advance. In future it is expected that the visiting team will consist of 2 people (with possibly an additional expert with domain specific knowledge) - a much more manageable number, and a formalised and published procedure, developed in the light of the test audits, will be used.

Separate handbooks are being prepared for repositories and for auditors. These will continue to evolve and will greatly assist the audit process to run smoothly.

The overall level of effort required to self-assess against ISO 16363 was considered to be high, and the costs of employing commercial auditors would be too expensive in the longer term. There is a expectation that charges for audits of public archives will be subsidised by charges for audits of commercial repositories. The charging algorithm is being developed separately. The audit and certification system must be able to be self-sustaining on an international basis.

The costs of implementing the DSA were considered to be small in comparison for these repositories, but this was partially a result of their being well advanced in conformity assessment already.

For DIN 31644, the DNB do not foresee any major difficulties unless the repositories are charged large amounts of money for the certification process. Therefore, the certification process that the nestor WG develops is intentionally free of charge. A small, content related, difficulty could be to make clear and express which part of the organisation undergoes certification and to identify all processes that are relevant to the certification.

6.1.3 Recommendations from the Audits

For the ISO 16363 test-audits participants were not expecting detailed recommendations but in a number of cases found that the Audit Reports received contained some inaccuracies and failed to explain the relationship between the evidence submitted and the non-conformities detected. However the comments have proven instructive, and implementation of non-contentious recommendations has been undertaken.

The whole process has been enormously useful in identifying the individual and communal gaps across the three methodologies and standards (in terms of implementation and support rather than in terms of content of the standards) and it is clear that the deliverable will drive forward some clearly directed actions both within APARSEN and for all Framework participants.

6.2 FOR THE AUDIT AND CERTIFICATION SCHEMES

6.2.1 Basic Certification

The DSA process took place separately, prior to and independently of, this project, and is not reported here.

6.2.2 Extended Certification

Two issues were extensively discussed during the test audit phase for DIN 31644 in the nestor WG that were not directly related to the test of the audit and certification scheme, but extremely relevant to the further audit and certification activities of nestor: A) the pros and cons of accreditation and B) potential liability claims. Altogether, however, the procedure for externally reviewed self-audits that lead to Extended Certification seems stable enough to be applied in productive audits from spring 2012 on.

For ISO 16363 the test audits led the auditors to the view that the effort demanded to prepare for Extended Certification can be significantly mitigated by undertaking Stage 1 of Formal Certification at the same time The evaluation tool (in spreadsheet form) for repositories containing the metrics with additional columns to

capture information about the evidence was beneficial and will be adapted in the future to streamline the process.

6.2.3 Formal Certification

The process for ISO Certification using ISO 16363 is still evolving but now has a firm basis thanks to the research undertaken during the test audits.

- The experience gained during these test audits helped to finalise the standard which has now been published as an international standard, available on the ISO website as ISO 16363:2012 at http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=56510.
- The audit process has been, and will continue to be, significantly improved.
- Confidence has been gained in the ability to interpret the ISO 16363 metrics consistently by the audit team and to train new cohorts of auditors.

For DIN 31644 the Formal Certification process needs to be refined some more by the nestor WG. Its demarcation from the process that leads to Extended Certification seems crucial and will be worked out in 2012.

7 DISSEMINATION ACTIVITIES

Event	Authors	EventDate
Society of American Archivists' Annual Meeting in Chicago, 22-28 August 2011	Mark Conrad	2011-08-26
Audit and Certification Process for Digital Repositories PV2011 http://www.pv2011.com	David Giaretta, Mark Conrad, John Garrett, Terry Longstreth, Simon Lambert, Barbara Sierman, Steve Hughes, Helen Tibbo	2011-11-15
Betrouwbara digitale archieven, hoe kom je er achter? In: Informatie Professional. Vakblad voor informatiemedewerkers. 2011, 09. p. 12-13	Barbara Sierman	
American Library Association Midwinter Meeting. Saturday, January 21st, at 4:00 in the afternoon Dallas	Marie Waltz	2012-01-21
NISO Discoverable, Available, Accessible: Preserving Digital Content Webinar	Marie Waltz	2011-09-15
"Establishing Trust in Digital Repositories," Chapter 18 in Usha Mujoo Munshi and Bidyut Baran Chaudhuri, Multimedia Information Extraction and Digital Heritage Preservation, Statistical Science and Interdisciplinary Research, volume 20, World Scientific Publishing Co. 2011.	Bruce Ambacher,	2011-09-01
"Audit and Certification of Digital Repositories: ISO and the European Framework" APA conference http://www.alliancepermanentaccess.org/index.php/event/apa-2011-conference-8-9-nov-london/	David Giaretta	2011-11-08
PTAB website launched http://www.iso16363.org		????
"The New ISO Standard for Digital Repositories: What Will It Mean for Libraries?" CNi Conference, date and time not yet established. http://www.cni.org/events/membership-meetings/upcoming-meeting/fall-2011/	Marie Waltz	2011-12-13
"ISO Audit and Certification of Trustworthy Digital Repositories, the Primary TDR Authorisation Body (PTAB)" PASIG workshop, Austin, Texas	David Giaretta	2012-01-11
CERTIFICATION AND QUALITY: A FRENCH EXPERIENCE IPRES 2011	Marion Massol, Olivier Rouchon and Lorène Bechard	2011-11-01

Trustworthiness beyond borders: Developing and Implementing the ISO TDR Standard Society of American Archivists, Ag 2012, San Diego	David Giaretta Helen Tibbo and Bruce Ambacher	2012=08-09
„Vom DIN-Standard 31644 zur praktischen Zertifizierung. Nationale und Europäische Ansätze und ihre Relevanz für Digitalisierungseinrichtungen.“ Workshop Langzeitarchivierung von Retrodigitalisaten: Handlungsfelder und Praxis München, BSB	Christian Keitel	20.1.2011
„From the standard DIN 31644 to functional Certification. National and European Approaches and their relevance for digitisation facilities“ Workshop on Long term preservation of digital reproductions. Bavarian State Library, München	Christian Keitel	20.1.2011
„DIN 31644 - Information und Dokumentation - Kriterien für vertrauenswürdige digitale Langzeitarchive“ 100. Deutscher Bibliothekartag, Berlin	Christian Keitel	9.6.2011
„DIN 31644 - Information and Documentation – Criteria for trustworthy digital long-term archives“ 100. Deutscher Bibliothekartag, Berlin	Christian Keitel	9.6.2011
„Vertrauenswürdige digitale Archive: DIN Norm 31644“ Archivierung sozial- und wirtschaftswissenschaftlicher Datenbestände, Deutsche Nationalbibliothek, Frankfurt/Main	Christian Keitel	15.9.2011
„Trustworthy digital long-term archives: DIN 31644“ Workshop on Archiving of social and economical research data holdings. Deutsche Nationalbibliothek, Frankfurt/Main	Christian Keitel	15.9.2011
„nestor-AG Zertifizierung“ nestor-Praktikertag, Mannheim	Astrid Schoger, Christian Keitel	14.11.2011
„nestor Working Group on Certification“ nestor practitioner day, Mannheim	Astrid Schoger, Christian Keitel	14.11.2011
Wie wird Langzeitarchivierung vertrauenswürdig?, in: DIN-Mitteilungen, 12. Dezember 2011	Astrid Schoger, Christian Keitel,	

	Kathrin Schroeder	
How can digital preservation become trustworthy?, in: DIN Communicatios, 12 Dezember 2011	Astrid Schoger, Christian Keitel, Kathrin Schroeder	
Audit of a Scientific Data Center for Certification as a Trustworthy Digital Repository: A Case Study[2]. IN52A-07, 2011 AGU Fall Meeting. San Francisco, CA, Dec. 9, 2011.	Downs RR, Chen RS	

2 http://earthdata.nasa.gov/sites/default/files/webform/agu/DownsChenAuditTrustworthyCaseStudy20111209.pdf

8 CONCLUSIONS AND RECOMMENDATIONS

There is a need and a demand for a number of levels for accreditation, for both cost and effort reasons.

The three levels of assessment established in the European Framework provide a clear and balanced response to the needs of the community and the stakeholders.

All three levels of assessment are appropriate to be used by organisations involved in digital preservation. whether in the public or the private sector or for SMEs as opposed to large knowledge institutions. The focus of the DSA is on smaller organisations within the research data domain. The two more formal standards are more demanding but, in some cases, especially where there are higher stakes involved, will provide more of a guarantee of 'trustworthiness'.

The test audits have proved extremely valuable in testing all the standards and the processes. They have shown strengths and weaknesses in the processes of conformity assessment, including in the construction of an explicit audit methodology. The vision is that there will be:

- continued improvements in digital preservation capabilities for repositories which are public funded, as well as private/commercial
- Certified conformance to recognised standards will be required by repositories if they are to be eligible to supply trusted preservation services
- trained, consistent set of auditors, consultants across the globe
- national accreditation bodies
- a common framework for different levels of entry

This should help to build the market for vendors, systems builders and service providers

Overall, society should benefit from its digitally encoded capital.

8.1 RECOMMENDATIONS

To achieve a broad application of the audit and certification schemes subsumed under the umbrella of the European Framework, we must not only have the process and plans but we must also ensure that it is known about and is appreciated. To this end a number of talks and presentations have been given – see section 7.

Further promotion should be undertaken by the EU in Europe, as well as by colleagues in the USA and Asia.

Some other issues remain about terminology which may affect the Framework document (Annex A). This occurs because of the inconsistent use of certain terminology across domains and within the specific language relating to conformity assessment. We propose that the three level (not stage) framework should consist of

a) LEVEL 1 ASSESSMENT

b) LEVEL 2 ASSESSMENT

c) LEVEL 3 ASSESSMENT

At present there is a requirement for any organisation *within the Framework* to reach LEVEL 1 ASSESSMENT in order to reach LEVEL 3 ASSESSMENT, but there is no requirement that an organisation should reach LEVEL 1 *before* LEVEL 3, though this would be unusual. This will to some extent depend on the maturity of the organisation. It will also depend on the resources available to any organisation to undertake the necessary corrective actions evidenced in any level assessment. It is important to note that the costs of audit and the costs of meeting the requirements of any standard are entirely unrelated.

Outside of the Framework this requirement should not be necessary and will of course not be mandatory.

One benefit of retaining DSA status at all levels of the Framework is that it ensures a consistent public statement of evidence is available which supports best practice and helps guide repositories seeking trust status. As presently written the MoU is explicit that any repository which moves to DIN / ISO directly (i.e. without a current DSA status) cannot be considered to be working within the Framework. This restriction

should be reconsidered by all the signatories to the MoU when it can be clearly demonstrated that Levels 1 (DSA) and 2 (DSA and ISO/DIN peer-reviewed self-assessment) cannot be effectively scaled to meet the demand from repositories directly seeking level 3 status. This recommendation needs to be discussed by the signatories to the MoU.

The European Framework certainly has advantages, especially for publicly funded repositories. However separate discussions indicate that it is the "Formal Certification" which is of most interest to the commercial world.

Note that this is not an inconsistency or a problem. In fact it opens the way for multiple entry points into a certification framework and also allows a cross-subsidy between the audits of commercial and public repositories. It further provides a bridge between the European Framework and the global audit and certification activities at which ISO 16363 is aimed.

REFERENCES

[1] *Audit and Certification of Trustworthy Digital Repositories*, available from http://public.ccsds.org/publications/archive/652x0m1.pdf and will also be available from www.iso.ch as ISO 16363.

[2] *Requirements for Bodies Providing Audit and Certification of Candidate Trustworthy Digital Repositories*, available from http://public.ccsds.org/publications/archive/652x1m1.pdf, and will also be available from ISO as ISO 16919.

[3] List of repositories with the Data Seal of Approval – see website http://assessment.datasealofapproval.org/seals/

[4] TRAC (2007), Trustworthy Repositories Audit & Certification: Criteria and Checklist. Available from http://www.crl.edu/PDF/trac.pdf

[5] Reference Model for an Open Archival System (ISO 14721:2002), http://public.ccsds.org/publications/archive/650x0b1.pdf or later version. At the time of writing the revised version is available at http://public.ccsds.org/sites/cwe/rids/Lists/CCSDS%206500P11/Attachments/650x0p11.pdf or elsewhere on the CCSDS web site http://www.ccsds.org

[6] ISO Working Group on Audit and Certification of Candidate Trusted Repository http://wiki.digitalrepositoryauditandcertification.org

ANNEX A MOU FOR EUROPEAN FRAMEWORK

MEMORANDUM OF UNDERSTANDING

TO CREATE A

EUROPEAN FRAMEWORK FOR AUDIT AND CERTIFICATION OF DIGITAL REPOSITORIES

THIS AGREEMENT is made between:

- David Giaretta in his capacity as chair of the CCSDS/ISO Repository Audit and Certification Working Group (RAC),
- Henk Harmsen in his capacity as Chair of the Data Seal of Approval (DSA) Board and
- Christian Keitel in his capacity as Chair of the DIN Working Group "Trustworthy Archives – Certification"

WHEREAS the parties to this Memorandum of Understanding all lead separate groups aiming at certifying digital repositories, they wish to put in place mechanisms to ensure that the groups can collaborate in setting up an integrated framework for auditing and certifying digital repositories.

The framework will consist of a sequence of three levels, in increasing trustworthiness:

- **BASIC CERTIFICATION** is granted to repositories which obtain DSA certification;
- **EXTENDED CERTIFICATION** is granted to Basic Certification repositories which in addition perform a structured, externally reviewed and publicly available self-audit based on ISO 16363 or DIN 31644;
- **FORMAL CERTIFICATION** is granted to repositories which in addition to Basic Certification obtain full external audit and certification based on ISO 16363 or equivalent DIN 31644.

GRANTING OF THESE CERTIFICATES WILL ALLOW REPOSITORIES TO SHOW ONE OF THREE SYMBOLS (TO BE AGREED) ON THEIR WEB PAGES AND OTHER DOCUMENTATION, IN ADDITION TO ANY OTHER DSA, DIN OR ISO CERTIFICATION MARKS.

THE FOLLOWING SPECIFIC ACTIONS WILL BE CARRIED OUT BY THE PARTIES:

(A) ensure that there is overlap in membership between the groups' governing committees;

(B) undertake common promotion of the need for standards to repositories and funding agencies;

(C) make clear that there might be different needs among repositories, but that repositories should aim at Extended or Formal Certification;

(D) carry out related test cases of repositories (in the second half of 2010).

This process is supported by and coordinated with the help of the European Commission.

DURATION OF THIS AGREEMENT:

This agreement shall commence upon the signing of this agreement by all the parties and will end on mutual agreement of the parties.

SIGNED on behalf of the parties by:

1.

date:

David Giaretta

2.

date:

Henk Harmsen

3.

date:

Christian Keitel

ANNEX B: EXAMPLE AUDIT REPORT

PTAB Test Audit Report for <Site>

Prepared by

Primary Trusted Digital Repository Authorisation Body (PTAB)

18 January 2011

(This Annex has a selection of merged comments from all the repository audits)

Introduction

In the first half of 2011, while in the last stages of preparation of the ISO/DIS 16363 *Space data and information transfer systems – Requirements for Audit and Certification of Trustworthy Digital Repositories* (also known as *CCSDS 652.0-M-1*) and ISO/DIS 16919 *Space data and information transfer systems - Requirements for bodies providing audit and certification of candidate trustworthy digital repositories* (also known as *CCSDS 652.1-M-1*), the Primary Trusted Digital Repository Authorisation Body (PTAB) conducted test audits for six repository sites.

At the culmination of this activity in June/July 2011, PTAB representatives constituting Test Audit Teams visited three sites in Europe and three sites in the USA. Seven reports were written: one for each of the visited repositories, and a general background document.

The test audits were designed to help refine the audit process and not to produce actual certification of the repositories. Although the aim was to follow proper audit procedures this was not always possible due to time and resource constraints for the test audits.

Correspondence about any of these reports should be addressed to the PTAB Secretariat ptab-secretariat@iso16363.org).

<Site> Summary

This Audit Report describes the results of the initial PTAB study and the PTAB Test Audit Team visit to <Site>, located at XXX on XXX.

Site history and Background

Types of data and data storage media

Specific areas to be audited

All departments of the <Site> Organization participated in the PTAB review, but most of the time was spent reviewing current digital processes.

Exclusions

There are a significant number of analog legacy data holdings within <Site>.

Designated Communities

Generally each data collection is managed as a data resource for scientists or upper level college students concerned with the scientific domain covered by that collection. In most cases the data are also available to the general public, although that public is not seen by <Site> as the target audience for most collections. Documentation is intended to be adequate for the target scientist, but may not be so for the general public.

<Site> Self Audit Review

In advance of the site visit, the PTAB, operating as a committee of the whole, reviewed the self-audit spreadsheet submitted by <Site>. That review resulted in a list of topics which are summarized below as candidate subjects for the discussions during the ensuing site visit.

Organizational Infrastructure

1) While we were provided some documents in advance, we had no opportunity to follow the document tree because we were not able to access the primary documentation repository..
2) There is no permanent endowment to ensure continuous funding of the archives and the intention is to hand over to XXXX. In the event funding for the program is permanently discontinued, <SITE> may intend to transfer the collections to XXXX.
3) Currently, <SITE> does not formally document all changes to its operations, procedures, software and hardware.

Digital Object Management

1) <SITE> frequently referred to maintaining usability of the archived contents, but we were unable to identify where usability was defined.
2) The process for converting SIPs to AIPs and the corollary mapping history between them was unclear. To clarify the ingestion process, the PTAB Test Audit Team felt that they needed to see what actions are recorded and what are not.
3) The components of archive objects (particularly, SIPs and AIPs) seem to be scattered among several storage subsystems, and it was not clear that all of the information relevant to an AIP could be easily or accurately brought together if the need arose to hand on responsibility.

Infrastructure and Security Risk Management

1) There was a need to understand how organizational, technological, preservation and financial risks are identified and characterized, and how they are managed or mitigated.
2) The <SITE> policy of moving AIPs to media independent format might risk loss of representation information. It was unclear that this activity improved or enhanced preservation of the AIP. Such risks should be documented and acknowledged in the migration histories together with the mitigation options available.
3) There were several documents that we felt might significantly ease the evidentiary burden required of <SITE> for an actual audit. These included but were not limited to the <SITE> Operations SOP, the Disaster Recovery Plan, Strategic Plan, and one or more Technology reports.
4) <SITE> has no technology watch.
5) <SITE> has no risk register.
6) Currently <SITE> has no overall change management process in place.

Site Visit Results

The <SITE> Test Audit was completed in mid-June, 2011. At the end of the two-day visit to <SITE>, the PTAB Test Audit Team met with <SITE> leadership and staff and presented the PTAB Test Audit Team's findings and initial conclusions about the readiness of <SITE> to be audited and certified as a Trusted Digital Repository. Those findings, with some augmenting comments are reproduced here.

The PTAB Test Audit Team reviewed the documentary evidence submitted by <SITE>, and coupled with the information gained from our interviews with <SITE> employees and contractors, reached the following broad conclusions. With minor revisions, these are as presented at the end of the Site Visit.

General observations

- <SITE> has a dedicated, knowledgeable staff
- Application of these standards at <SITE> is somewhat uneven, but that situation is understandable, given the youth of the standards.
- <SITE> Staff displays a strong desire and a commitment to improving and automating operating procedures
- The overall architecture and procedures of the <SITE> are well thought out and competently executed.

PTAB Audit Team Findings

The <SITE> Test Audit revealed that the repository was well-positioned to undergo an actual ISO 16363 Audit at such time as that document has itself become a full international standard, and when the requisite audit machinery is in place to perform full inspections and award certificates of ISO 16363 compliance.

Findings shown below are the results of post-visit analysis of the full body of data collected. These findings were not presented in this form at that final meeting. They directly relate specific metrics of ISO 16363 to information collected during the <SITE> Test Audit.

Issues from ISO 16363 Metrics

Metric 3.3.1 THE REPOSITORY SHALL HAVE DEFINED ITS DESIGNATED COMMUNITY AND ASSOCIATED KNOWLEDGE BASE(S) AND SHALL HAVE THESE DEFINITIONS APPROPRIATELY ACCESSIBLE.

- The PTAB Test Audit Team interpretation of this metric during the <SITE> Test Audit was that it required evidence that there was a defined Designated Community for each AIP.
- The metric was not satisfied. There were no records or documentary evidence presented to describe any Designated Community, nor any AIP associations with any Designated Community.

METRIC 3.1.2 THE REPOSITORY SHALL HAVE A PRESERVATION STRATEGIC PLAN THAT DEFINES THE APPROACH THE REPOSITORY WILL TAKE IN THE LONG-TERM SUPPORT OF ITS MISSION

- Currently there is no preservation strategic plan separate from the overall strategic plan of the organization. However, within the new strategic plan 2011-2015 attention is given to preservation aspects. This Strategic Plan will be published in June. The metric was not satisfied.

Metric 3.3.2 THE REPOSITORY SHALL HAVE PRESERVATION POLICIES IN PLACE TO ENSURE ITS PRESERVATION STRATEGIC PLAN WILL BE MET.

- The metric was not satisfied. Documentation of Preservation Policy, associated workflows and operating procedures was incomplete and out of date.

METRIC 3.3.3 THE REPOSITORY SHALL HAVE A DOCUMENTED HISTORY OF THE CHANGES TO ITS OPERATIONS, PROCEDURES, SOFTWARE, AND HARDWARE.

- Currently, <SITE> does not formally document all changes to its operations, procedures, software and hardware. There is no procedure in place for documenting. The metric was not met.

METRIC 4.1.4 THE REPOSITORY SHALL HAVE MECHANISMS TO APPROPRIATELY VERIFY THE DEPOSITOR OF ALL MATERIALS.

- The system does not yet properly check such changes with the depositor's (old) e-mail address or notify the data-manager or administrator. The metric was not met.

Metric 4.1.6 THE REPOSITORY SHALL OBTAIN SUFFICIENT CONTROL OVER THE DIGITAL OBJECTS TO PRESERVE THEM.

- This metric was not met. Particularly as regards XXX holdings, there was no clearly documented policy or agreement to show that <SITE> was managing the holdings with a view toward long term preservation and usage. It is quite possible that the XXX holdings were not intended to be managed in accordance with ISO 16363. If that is so, then their separate status should be clearly delineated and their fonds excluded from formal ISO 16363 audits.

Metric 4.1.7 THE REPOSITORY SHALL PROVIDE THE PRODUCER/DEPOSITOR WITH APPROPRIATE RESPONSES AT AGREED POINTS DURING THE INGEST PROCESSES.

- This metric was not met. The ingest process as described did not clearly show at what point a submitter was told : "<SITE> has completed the ingest and has assumed full stewardship of the data submitted. "

METRIC 4.2.3 THE REPOSITORY SHALL DOCUMENT THE FINAL DISPOSITION OF ALL SIPS.

- In the <SITE> workflow one SIP always results in one AIP. Technically the SIPs and AIPS are the same entities. It is not clear that there is a complete understanding of the essential elements that should be in the AIP. For example, provenance information might not be delivered as part of the SIP or collected as part of migration before ingestion. In fact a DIP does not indicate if the data had been migrated. The metric was not satisfied

Metric 4.2.5.2 THE REPOSITORY SHALL HAVE TOOLS OR METHODS TO DETERMINE WHAT REPRESENTATION INFORMATION IS NECESSARY TO MAKE EACH DATA OBJECT UNDERSTANDABLE TO THE DESIGNATED COMMUNITY.

- This metric was not satisfied. In our discussions, we perceived that <SITE>s view of their designated communities was ambiguous. Consequently, there were few indications that representation information was being organized to support the long term use and understanding of the AIPs. While a great deal of representation information, and indeed, metadata in general is being collected, there appear to be few opportunities within <SITE> for explicit review of those ancillary data in light of changes in long-term preservation needs of one or more Designated Communities.

METRIC 4.3.2 THE REPOSITORY SHALL HAVE MECHANISMS IN PLACE FOR MONITORING ITS PRESERVATION ENVIRONMENT.

METRIC 4.3.2.1 THE REPOSITORY SHALL HAVE MECHANISMS IN PLACE FOR MONITORING AND NOTIFICATION WHEN REPRESENTATION INFORMATION IS INADEQUATE FOR THE DESIGNATED COMMUNITY TO UNDERSTAND THE DATA HOLDINGS.

- This metric was not satisfied. The <SITE> has a great deal of data that is dependent on obsolete technology to access that data.

METRIC 5.1.1 THE REPOSITORY SHALL IDENTIFY AND MANAGE THE RISKS TO ITS PRESERVATION OPERATIONS AND GOALS ASSOCIATED WITH SYSTEM INFRASTRUCTURE.

- <SITE> accepts all file formats but promotes the use of preferred file formats. The vigor with which <SITE> promote or even push preferred files formats is dependent on the situation (budget, knowledge, usability requirements, etc.). The metric was not met.

METRIC 5.1.2 THE REPOSITORY SHALL MANAGE THE NUMBER AND LOCATION OF COPIES OF ALL DIGITAL OBJECTS.

- At this moment there is only the daily backup procedure which maintains an extra copy of digital objects. The metric was not satisfied.

Metric 5.2.4 THE REPOSITORY SHALL HAVE SUITABLE WRITTEN DISASTER PREPAREDNESS AND RECOVERY PLAN(S), INCLUDING AT LEAST ONE OFF-SITE BACKUP OF ALL PRESERVED INFORMATION TOGETHER WITH AN OFFSITE COPY OF THE RECOVERY PLAN(S).

- In the judgment of the PTAB Test Audit Team, this metric was not met. While there was clear evidence of an implemented backup procedure for the computer systems and their data content, we were not presented evidence that a recovery plan was in place or tested. Moreover, we found no evidence that there were any practical measures available to recover any complete AIP, including all relevant provenance, representation and usability data, as a single conceptual entity. Without such a capability, the actual validity of a recovered archival object (which includes all relevant metadata) would be clouded in the uncertainty introduced by an ad hoc procedure.

Miscellaneous Additional Observations

In keeping with the spirit and intent of ISO 17021 and ISO 16919, this Audit Report makes no recommendations as to how <SITE> might address the enumerated findings in the preceding section. However, in advance of an 'official' Audit, the PTAB offers the following suggestions to help <SITE> better prepare for a full formal audit.

- Although some <SITE> staff were very familiar with OAIS, nevertheless other <SITE> staff should become more familiar with the terminology of ISO 16363 and underlying ISO 14721 (OAIS) standards.
- <SITE> should improve on and cultivate mutual awareness of their Designated Communities. Aspects of this might include providing a process to ensure that the Representation Information is adequate for the Designated Communities, and instituting regular reviews of the Data Description Packages (DDPs) and the Representation Info Networks to ensure that they continue to be adequate for the Designated Communit(y/ies)
- <SITE> should create and explicitly codify their preservation policy, and complete a fully documented Preservation Plan including, for example, details of migration, verification of Representation Information, and strategy for Technology Watch and related impact analyses.
- <SITE> should ensure that there is adequate documentation to allow the transfer of the complete AIPs e.g. the tar files plus the referenced Representation Information and PDI as part of the Disaster Recovery procedures. The <SITE> should complete the Disaster Recovery Plan in a form adequate for an outside agency to perform a recovery without the assistance of <SITE> incumbent personnel. The Disaster Recovery Plan must itself be readily available to any person or organization authorized to perform the recovery.
- The <SITE> should consider instituting an Organizational policy governing risk management, including a Risk management plan and an Organizational Risk Register with mitigation schedules and tracking.

Feedback from <SITE> Staff

Additionally, we received some feedback from <SITE> about the conduct of the Test Audit and the comportment of the PTAB Test Audit Team itself.

- The process was of value to <SITE> in that it helped to identify focus areas for improvements in current procedures.
- The initial findings and conclusions from Day 2 of the site visit were accepted for immediate follow up at <SITE>.
- The <SITE> expressed concern that some of the members of the visiting team were not completely neutral, insofar as they themselves were closely associated with or affiliated with other archiving and space science related organizations, including some which had cooperating arrangements with <SITE> itself. <SITE> was aware of those conflicts and did agree to their participation since this was only a test audit and provided training for the audit team. Of course in a real audit the selection of the audit team would take these factors into account.

ANNEX C: FEEDBACK FROM DANS TO THE RAC AUDITORS

Feedback process

1- DANS had enough time to fill in the metrics. It was a greater effort than expected: over 500 person hours. A lack of documented information did not help…
2- We would have liked to better prepare the site visit for the auditors to achieve maximum effectiveness and efficiency during the visit. A protocol for site visits, what to expect and what not to expect, would be much appreciated. It would give more clarity in advance.
3- We foresaw that contributions from people from inside and outside DANS would be needed during the visit, but the overall uncertainty made it impossible to ask commitments from these people.
4- The number of auditors was a bit overwhelming … With so many visitors our attention is divided and contacts tend to remain rather superficial.
5- Suggestion: for the future our idea is that a full swing audit could take place once every 5 years. An intermediate lighter version could take place half way. A full audit would cost us 10,000 to 25,000 euro's, a midterm review 5,000 to 10,000 euro's. Every year such an effort would be not feasible and too costly for DANS

Feedback organizational strategy

1. It would help a great deal if the audit would follow a fixed protocol. The KNAW uses a Standard Evaluation Protocol (SEP) for the scientific evaluation of its institutes (see: http://www.knaw.nl/content/Internet_KNAW/publicaties/pdf/20091052.pdf). It describes the objectives, criteria, planning, self-audit (including a SWOT, which might be useful for the RAC as well), the site visit procedures, the evaluation report, and follow-up. It also has a checklist for the auditing committee. For the RAC something like this could be considered.
2. It became clear during the audit that DANS is very much focused on (permanent) access to data. This is the reason of existence of DANS (and possibly of preservation in general). Access hardly seems to play a role in the audit, however. We consider access as vital for the activities of the archive. More attention to this in the audit seems justified. In a way, the fact that data of 50 years old can still be accessed is a proof that the archive works, even though not all procedures prior to the present organization have been kept. Archival procedures, systems and archival institutions are susceptible to change. A current organization cannot be responsible for the work of its predecessors. How to take that into consideration in the audit?
3. One of the central lessons learned is that the documentation of the archival activities and procedures need to be improved.

Feedback RAC metrics

1- The formulation of the metrics is a bit idealistic ("down to the bit level"). The archive needs to know everything, have everything under its own control, etc. Since no archive is perfect, what will be the 'less than perfect' level (or levels for the different metrics), which is still acceptable and deserves a certification?
2- Suggestion: add a section to the evaluation form with room for administrative data: for what system is the evaluation done? What is the scope of that system? What is the goal of the system? Who is filling in the evaluation? Etc.
3- Suggestion: add a section to the introduction text of the RAC with the underlying principles. For instance "every action should be performed according to written specifications for that action", "every action should be recorded with all the details (software, parameters, …)".
4- Suggestion: give room for a separate list of evidence artifacts, with URL, yes/no only paper, etc. In the metric then can be referred to items in this list.
5- The complete distinction between Ingest (4.1) and Archiving (4.2) is not relevant to DANS, because the Ingest in EASY results almost completely in an AIP. We have solved this by

pointing in 4.2 to the corresponding 4.1 metric.
HK, 24-6-2011: I checked this out in 4.2…It appears to be more a feeling than a fact. Only 4.2.7 and 4.2.8 refer to 4.1 (4.1.5).

6- We had some problems with the text of the RAC metric, but these were not so severe that the text needs to be changed. We found a way to deal with them:
   a. Sometimes we felt duplication between two RAC metrics
      HK, 24-6-2011: this was said to quickly???
   b. Sometimes we felt the metric is too detailed.
      HK, 24-6-2011, examples: 4.2.4.1.1 and 4.2.4.1.2 which we answered in 4.2.4.1, and 5.1.1.1.6, 5.1.1.1.7 and 5.1.1.1.8 which we have combined in 5.1.1.1.6.
   c. Sometimes hard to see the difference between two metrics
      HK, 24-6-2011: again 5.1.1.1.6, 5.1.1.1.7 and 5.1.1.1.8 which you have to read several times to see the difference
   d. Sometimes the discussion is not relevant to our situation
      HK, 24-6-2011: example: metric 4.1.2

After June 10th…

1- It felt a bit strange that the commission did not work from the filled in evaluation form. We have spent so much time on preparing the evaluation form. The evaluation form has a balanced attention for all relevant aspects.
2- We especially liked the interaction on the second day of the visit, in the morning with the demos of the archivists and in the afternoon the discussion about IT technical matters. This made it livelier.
3- The term "preservation" seems to have two meanings: keeping it (guarantee existence and bit integrity), and, keeping it in a usable form (perform migrations, add representation information).

ANNEX D: POST-AUDIT RECOMMENDATIONS FROM UK DATA ARCHIVE

Our overall conclusion based on the trial audit is that the draft standard is fit for purpose, but owing to the lack of preparation time for the trial auditors, we can not be certain, at this stage, that each of the controls within the draft standard provide the ability to be measured. As other trial audits progress this will become clearer.

- Any guidance on the implementation of the EC framework should explicitly note that this publicly available self-audit can be redacted;
- A 'template' non-disclosure agreement should be included within guidance for the standard to support organisations with no previous experience of preparing such document;
- Provide a clear statement on which ISO 16363 controls are fully met by ISO 27001 compliance within the guidance;
- Replace the term metric in the standard with the term control;
- Provide clearer definitions of the term Succession Planning within the standard
- Reformat the Self Audit Checklist to ensure it is suitable for use and collaboration during all stages of the audit process;
- Rename the Self Audit Checklist to Self-Audit Template;
- Include with the Self-Audit Template space for the organisation to indicate their belief in the level of compliance to each control;
- Provide explicit guidance for repositories on how best to measure the level of compliance to each control;
- Provide guidance on the acceptable levels of variation in delivery format of the Self-Audit Template to auditors;
- Provide explicit guidance on the structure of evidence. Evidence offered should always point to something 'written' but there is a further delineation between procedural evidence and evidence of implementation;
- Provide repositories with guidance in generating results for controls with specific metrics through a clear Risk Assessment process;
- Formalise the inclusion of a self-audit summary document in the auditing process to provide an opportunity for a repository to respond to issues which cannot be easily recorded in statements of evidence;
- Consider whether this self-audit summary document should be a formal adjunct to the self-audit when repositories are seeking Extended Certification against the framework;
- Make the submission of a completed Self-Audit Template and associated Self-Audit Summary the repositories submission for an explicit Stage 1 of the audit. Include within this submission an organisation profile
- Include 'perceived areas of non-compliance' within the self-audit template and expand it to act as a general 'statement of applicability';
- Explicitly provide guidance on the process of a two stage audit;
- Auditors should offer queries, Corrective Actions, and a detailed and timed, audit plan for the (Stage 2) visit;
- Provide explicit guidance on whether sub-metrics are either a) to be treated as in addition to the parent metric or b) fully comprise the requirements for meeting the parent metric.

ANNEX E: POST-AUDIT RECOMMENDATIONS FROM DANS

General comments and observations

- The yardstick to which the measurements are made is unclear. Should a repository fulfill all metrics to 100%? If one metric is met for 90%, does it mean the repository fails on that metric? And if it fails on one metric, does it fail the whole certification? Is it possible to amend or make corrections on certain metrics, or does the whole certification process have to be redone if a repository does not pass on one, two or ten metrics? We recommend the auditors to define certain degrees of fulfillment that can be attached to the different metrics to be met. This will also permit a more balanced outcome. We recommend to indicate the severity of provisions that are lacking in a manner that is understandable for all involved.
- Already in advance of the site visit by the audit commission DANS urged to receive information on the procedures that the commission wanted to follow. DANS experienced this lack of procedural clarity as a serious shortcoming in our preparation for the site visit. Had the procedure been more clear, the audit would have been more efficient, and we think we could have passed more metrics. Without clear audit procedures in place DANS does not see the use of applying for a formal certification.
- The lack of clarity extends to the status and publicity of the results of the test audit. We even do not know what will be done with this reply of DANS. We do (an did) not object to making results from the test audit public, but would appreciate it if this is done in consultation with us. For instance, the message: "DANS fails on 9 RAC metrics" sounds rather different from "DANS passes over 90% of the metrics of the RAC test audit".
- DANS regrets it that the report of the test audit took so long (seven months) to be produced and that certain elements from the report have already been incorporated in the overall APARSEN report before the audit report was even sent to us.

Specific comments

- In chapter 2 there is mentioned several times "DANS accepts all deposits from the research community". This needs additional clarification to avoid possible misunderstandings. We indeed accept research data from all scientific disciplines, but we do not accept all deposits without checks. We check for instance the credibility of the depositor, we check the completeness and understandability of the provided metadata, we check for possible privacy issues in the deposited data, etc.
- In paragraph 2.4. it is stated that the auditors had no access to the storage facilities and were not able to inspect the service level agreements. These issues were caused by the lack of procedures mentioned above, which hampered the preparation of the site visit. We proposed to invite representatives of our IT support department and could have arranged a site visit to the storage facilities, had we known the committee wanted this. And even without preparation in advance a visit to the storage facilities would have been possible, had the auditors requested it (which they did not). The service level agreements were and are available for the auditors, during and after the visit, but the auditors did not ask for them. This comment of ours pertains also to 4.2.2 of the PTAB report.
- Chapter 3 sums up the shortcomings DANS reported in a self-audit with regard to certain ISO 16363 metrics. There is no mentioning of the 'self-confessed' fulfilling of ISO 16363 metrics. The report is one-sidedly focused on shortcomings. In chapter 2 there is a general description of how DANS operates, but this is insufficient for outsiders to grasp how DANS performs adequately with regards to about 90% of the ISO 16363 metrics.

- In 3.3 is stated that DANS does not have a technology watch. This is not correct. DANS has an informal technology watch. We just do not have a regular official technology-watch report on this.
- In 3.3 is stated that DANS does not have a risk register. This is not correct. We performed a risk analysis workshop in advance of the visit of the auditors and this was reported to the auditors.
- Chapter 4 sums up the metrics that are not fulfilled by DANS. The rigid choice between 'does' or 'does not' fulfill is unsatisfactory. For some of these metric DANS performs quite well and this is not expressed in this way of evaluating (see also our general remarks above).
- The relationship of chapter 4 to chapter 3 is not clear to us. Are the points of chapter 3 recognized by the auditors and incorporated in chapter 4? If chapter 3 is only descriptive without consequences for the certification, it can be omitted, just like the rest of the self-audit compiled by DANS.
- On page 10 in METRIC 4.1.6 is stated that DANS runs the risk of having to return datasets to the depositors and stop archiving and distributing them. This is not correct. In our deposit agreement is settled that DANS has and keeps the right to keep and migrate the deposited data.
- On page 10 in METRIC 4.5.1. is stated that DANS should introduce collections. This is not correct. We have various collection mechanisms in our digital archive to enable Designated Communities to find data that are relevant to them. Each dataset is e.g. member of a collection of datasets pertaining to a scientific discipline. The online browse facility enables users to filter the datasets shown. Relationships between datasets are recorded in the metadata and visible to the users. In the future we want to introduce even more collection mechanisms.

METRIC 5.1.2 is about backups. This metric poses a clear example of the shortcomings of the binary pass/fail evaluation. We have a very good first class backup facility and this is not expressed. But we agree with the recommendation that more periodic checks should be performed on the backup.

- To illustrate the need for a more balanced evaluation:
    a. ISO 16363 has 109 metrics. In chapter 4 there are 10 metrics mentioned that are not (entirely?) fulfilled by DANS. This means we fulfilled 91% of the metrics. But how to interpret this score?
    b. Alternatively: have the auditors decided to evaluate only on metrics with three level numbers? For example, does the evaluation of 5.1.1 include all the evaluations of (sub)(sub)clauses of 5.1.1? There are 49 level three metrics in ISO 16363.

ANNEX F: EXPECTATIONS FOR REPOSITORIES AND AUDIT TEAMS VOLUNTEERING TO CONDUCT TEST AUDITS OF DRAFT ISO 16363

February 28, 2011

I. General Description:

Operating under authority of International Standards Organization Steering Committee 20, Technical Committee 13, a Working Group has developed the draft ISO 16363, Audit and Certification of Trustworthy Digital Repositories, and a companion draft International Standard16919, Requirements for Bodies Providing Audit and Certification of Candidate Trustworthy Digital Repositories. The latter draft standard was developed by the Primary Trustworthy Digital Repository Audit and Certification Accreditation Board (PTAB).

This document establishes the purposes of these test audits and defines the expectations, general criteria, and working procedures for the test audits; identifies aspects of draft ISO 16363 and draft ISO 16919 that can be improved prior to becoming standards; and establishes working protocols for future audits using the metrics of a final ISO 16363.

NOTE: The Test Audit will *not* result in the volunteer repository becoming a certified repository under the criteria of draft ISO 16363. That can occur only after the draft standard becomes an approved international standard and the companion auditor's handbook becomes an international standard and auditors' boards and teams are established and authorized audits are conducted.

II. Activities of the Volunteer Repositories:

1. Determine the scope of the test audit by establishing which parts of the repository, types of data, or collections will be audited.
2. Conduct a self assessment using the RAC Checklist Audit Template which contains an extract of the metrics and criteria of draft ISO 16363.
3. Collect the information, statistics, and documentation necessary to demonstrate adherence to each metric in draft ISO 16363. This may be accomplished by assembling textual (analog and digital) documents, policy and guidance, operating procedures manuals, and/or providing citations to URLs that contain the relevant information.
4. Prepare a summary of the self assessment including the motivations of the repository for wanting the audit and main items they wish to focus on during the audit. The summary also should include information on all aspects of the self assessment where the repository believes they did not meet the draft ISO 16363 criteria, where documentation was not available, and/or where pertinent information could only be created with great time, effort or expense.
5. Provide a copy of the completed RAC Checklist Audit Template and the self assessment summary to the audit team at least one month prior to the scheduled start of the test audit.
6. Address all site logistics issues related to scheduled test audit.
7. Each repository and its audit team will mutually agree on the specific site dates of the audit.
8. During the Audit Team's site visit:
    a. Provide the audit team access to information, systems, documentation, and standard operating procedures as necessary to conduct the audit.
    b. Inform the audit team which supplied information should be treated as "business confidential" and should not be included in any written audit report.
    c. Negotiate a Non Disclosure Agreement with the Test Audit Team if desired or required by policy or regulation.

d. Address the questions the audit teams raised after reviewing the repository's RAC Checklist Audit Template and the self assessment summary. [see III, 1f]

9. After the Site Visit:
    a. Assist the audit team in preparing its report on the test audit by supplying requested information on the process, the experience, and the benefits or detriments of a self assessment and external audit. [See III, 3j]
    b. Read the audit team report in draft and provide feedback and suggestions for factual revisions.[See III, 3k]

III. Activities of the Volunteer Audit Team:

1. Pre Site Visit Preparatory Work
    a. Send repository a copy of "Expectations for Repositories and Audit Teams Volunteering to Conduct Test Audits of Draft ISO 16363."
    b. Familiarize each team member with those parts of draft ISO 16363 that are especially applicable to the volunteer test repository's site, mission and scope of audit.
    c. Review the scope of the test audit established by the repository in terms of which parts of the repository, types of data, or collections will be included in the audit.
    d. Review completed RAC Checklist Audit Template, the self assessment summary, and self identified shortcomings raised by the repository provided by volunteer test repository.
    e. Prepare questions for the repository audit based on a review of the RAC Checklist Audit Template, the self assessment summary, and self identified shortcomings raised by the repository during its self assessment and submitted to the audit team.
    f. Share the questions with the volunteer test repository so its management and staff can address them prior to or during the test audit.
    g. Assemble all materials required to conduct the test audit.
    h. Make all travel arrangements.

2. Test Audit Site Visit

    a. Conduct test audit using draft ISO 16363 metrics, RAC Checklist Audit Template, the self assessment summary, self identified shortcomings, repository documentation, and questions noted during review of materials supplied by repository.

    b. Complete appropriate portions of the RAC Checklist Audit Template,

    c. Discuss preliminary findings with relevant repository personnel and provide opportunity for explanations.

3. Post Test Audit Report Produce a short (<10,000 words) report that contains:

    a. Introduction including the repository name and discipline focus, repository support team, audit team lead and composition, motivations of the repository for wanting the audit and main issues they wished to focus on during the audit.

    b. Methodology including how the test audit was devised and conducted, and the time frame for planning, conducting, and reporting the test audit.

    c. Number of staff and staff time required for the volunteer repository to prepare for and participate in the test audit and to review the preliminary findings.

    d. Number of auditors and auditor time required for the audit team to prepare for and participate in the test audit and to prepare the audit report..

    e. A narrative on conducting the test audit.

f. Results of the test audit.

g. Lessons learned from the activities carried out.

h. Suggested Corrective Actions the volunteer repository could take to remove non-conformities, if any. This list could assist the volunteer repository either to obtain the necessary resources or to create a timetable for its corrective actions.

j. Repository comments on the process, the experience, and the benefits or detriments of a self assessment and external audit.[See II, 9a]

k. Obtain repository feedback and suggestions for factual revisions to the final report.[See II, 9b]

l. Conclusions and recommendations

IV. Use of information

The Auditor's Report on the Volunteer Test Repository will be considered confidential. The results, however, will be used as part of the international effort to revise the draft ISO 16363. The results also may be used in an anonymous form and/or in a collective manner with the results of other test audits.