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Recordkeeping metadata and archival description: a revisit

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Metadata go through an evolutionary process from creation to archival preservation. During this process, some metadata are re-used (inheritance), other metadata are eliminated (extinction) and still others are updated or newly generated (mutation). Unlike other literature that focuses on metadata inheritance and mutation, this evolutionary view highlights the extinction of metadata. As such, it might raise awareness about the appraisal and selection of metadata in digital curation practice.

Keywords: archival description; ISO 23081; ISAAR(CPF); ISAD(G); recordkeeping metadata

Introduction

The Records Continuum theory envisages integrated recordkeeping environments.[1] Based on this theory, the Monash University SPIRT project has created high-level conceptual models and a Recordkeeping Metadata Schema, that encompasses metadata for both the records management and the archives management environments.[2] In practice, this integrated view applies well in situations where records management and archives management are not seen as separate functions, such as within private organisations, some universities and several European countries. In many other situations there are separate records management and archives management functions, systems and metadata schemas, even in Australia, where the Records Continuum theory originated. For example, the National Archives of Australia created the Recordkeeping Metadata Standard for Commonwealth Agencies, which is used for managing current records in agency recordkeeping systems.[3] For archival materials, the National Archives of Australia uses the archival descriptive metadata *Commonwealth Record Series* (CRS) *Manual*.[4] According to Joanne Evans,[5] in most organisations, business, records management and archival control systems are configured as separate applications. Where separate records management and archives management systems exist, it is necessary to study the relationships between records management metadata and archival description and to decide to what extent archival description requirements can be incorporated into records management systems to facilitate metadata inheritance and re-use.

Since the 1990s, various mapping projects have been conducted between records management metadata standards and archival description standards, such as the mapping between the first version of ISAD(G) and the University of Pittsburgh metadata

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specification;[6] mapping between the metadata specifications of the University of Pittsburgh project, the University of British Columbia project and, the Australian records management standard;[7] and, the mapping between ISAD(G) and the metadata requirements of ISO 15489-1.[8] These mapping projects have shown that records management metadata overlap with archival description.

There have been debates, however, as to the degree of this overlap and whether metadata can eventually replace archival description. Bearman and Hedstrom argued that in an electronic records environment, archival description information can be fully captured while records are still active, so that we can just select from the metadata and eliminate the need for *post-hoc* description.[9] MacNeil, on the other hand, maintained that metadata cannot replace archival description and used an analogy to illustrate the differences between metadata and archival description. Metadata systems are like diaries that record the daily events that take place in the life of all records within a particular records system, while archival descriptions are like biographies that summarise the life of records across all the records systems of an organisation, but only those records that are selected as archives. Therefore, metadata tend to be detailed but narrower in scope and archival description is less detailed but can reveal the larger pattern of the life of records, and the broader contexts of documents.[10]

MacNeil's analogy is based on the assumption that archival description standards and practices will continue as in the past. Bearman[11] and Hedstrom[12] pointed out that existing archival description practices are inadequate and that automated systems can capture far more descriptive information than was possible with manual systems. They proposed to reform archival description from *post-hoc* creation to gathering and managing existing system metadata. Their arguments seem to suggest that, since diaries are available and have the potential to be more comprehensive than biographies, it is not necessary to write the biography. McKemmish et al. proposed to capture in the current records systems the broader contextual metadata traditionally found in archival systems, such as the wider organisational context of the records and the relationships to high-level functions.[13] These arguments lean toward the opinion that records management metadata might eventually replace archival description. However, Bearman[14] and supporters of the Records Continuum theory maintain that archival description grows continuously during the whole of the record's existence, including its administration by the archives and its use by primary and secondary users.[15] The Records Continuum approach entails augmentation of archival description by archivists and thus contradicts the idea that records management metadata will replace archival description.

In this paper, the author contributes to discussions about the relationships between records management metadata and archival description: first by presenting an evolutionary view of metadata from creation to archival description, then by analysing the entities in business systems, records systems and archival systems based on the SPIRT conceptual model; secondly, by comparing current international standards for record-keeping metadata and archival description, including ISO 23081 part 1[16] and part 2,[17] ISAD(G)[18] and ISAAR(CPF);[19] and, finally, the author extends the discussion of metadata evolution to a more general context: the Open Archival Information System (OAIS) reference model.

Metadata evolution in archives and records management

In the author's opinion, metadata go through an evolutionary process from creation to archival description. During this process, some metadata are re-used (inheritance), other

metadata are eliminated (extinction) and still others are updated or newly generated (mutation). The aforementioned view of Bearman and Hedstrom,[20] that archival description information can be selected from metadata, recognises inheritance and extinction, but it does not give adequate attention to the mutation of metadata from creation to archival description. The Records Continuum theory acknowledges metadata inheritance and mutation but does not give sufficient attention to the extinction of some metadata information during the process. This evolutionary view, however, does not contradict the Records Continuum theory because it is about the whole universe of metadata from creation to archival description, whereas the Records Continuum theory is only about the accumulation of archival description information. The following paragraphs detail this evolutionary process based on the assumption that separate business systems, records systems and archival systems exist.

In Figure 1, business systems include the various applications that are used in conducting business activities, such as email and office applications, Web content management and human resource management systems. Record creators generate or receive information (often in the form of documents) when they use business systems to conduct business. Then, for each document, they manually add item-level metadata such as title or subject. These business systems can also automatically capture or extract some metadata such as the date and time the document was created. As documents pass from hand to hand in the work processes, additional metadata may be automatically captured and manually added, such as who read or annotated the document and at what time. Metadata within business systems are captured or created to support the general business activities of the organisation and are often not sufficient for records management purposes. Nevertheless, they do contain elements and values that are useful for records management purposes and thus those useful elements and values are captured into a records system together with their associated documents, which are selected as records. For example, when an email is registered as a record, the subject of the email can be captured as the title of the email record in the records system. An organisation may have multiple business applications (emails, Web content management systems and so on) but often has only one central records management system. Thus, the documents

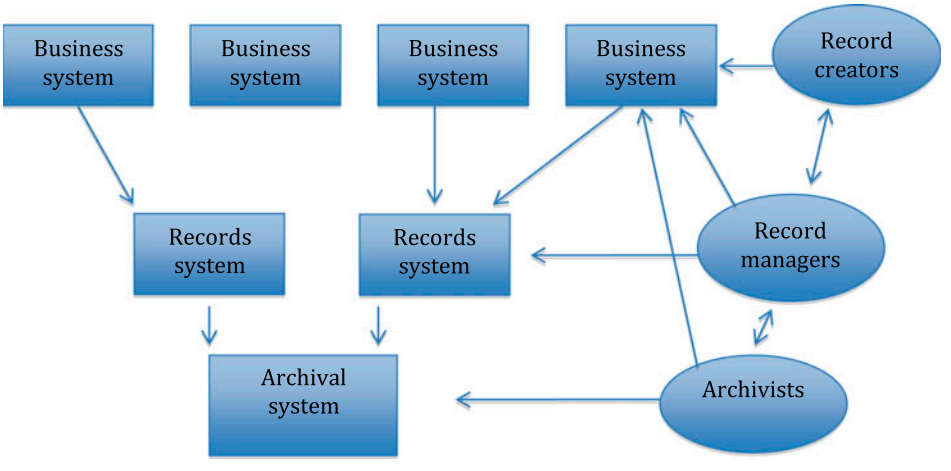

Figure 1. Metadata evolution in archives and records management.

and metadata from multiple business systems might be aggregated into one records system.

Since metadata inherited from business systems are often insufficient for records management purposes, record managers need to add some metadata that are necessary for recordkeeping purposes. For example, when they organise the records into a classification scheme, they are actually creating aggregate-level metadata for the records. They may also assign index terms from controlled vocabularies or create access restrictions and retention periods for records. Those records that have archival value will eventually be transferred to the archival system. Metadata associated with these archival records may be appraised, and only those useful for archival management purposes will be transferred together with the records. For example, according to the benchmark requirements created by the InterPARES project, access privileges information concerning creation, modification, annotation, and relocation, while destruction of records helps assess the authenticity of electronic records.[21] This type of information can be considered as metadata or documentation of associated archival records. In the frequently asked questions published by the National Archives and Records Administration (NARA) on using the *General Records Schedule 20: Electronic Records*, this kind of information, including 'log-in files, password files, audit trail files, system usage files, and cost-back files used to assess charges for system use', is scheduled as temporary and will not be transferred to NARA along with associated records for archival preservation.[22]

One archival system may receive records and associated metadata from multiple records systems. For example, a national archive receives records from multiple government agencies, each with its own recordkeeping system. In the archival system, archivists need to organise records from multiple provenances; thus, they need to add more metadata to control records on a large scale and also to help secondary users discover and interpret them.

The evolution of metadata from creation to archival description is guided by their fitness for archival description purposes. Traditionally, the selection of metadata happens at the end of each stage of the life cycle of records. Record managers select records and metadata when they capture records into the records system. Archivists select records and metadata when the records are no longer needed by the records creators. With early intervention, this guiding force of fitness has been made explicit and evident. Increasingly, archivists have started to provide policy guidance to record managers about what records and metadata to capture into the records system. For example, the national archives of the United States (US), Canada, United Kingdom (UK) and Australia have all issued records management guidelines for government agencies.[23] Records managers have started to train record creators about recordkeeping and archival requirements. For example, upon generating or receiving a record, records creators need to name and describe the records according to recordkeeping requirements and file the record into a pre-defined classification scheme.

In practice, not all of these systems exist or if they do, they exist separately. A records system may not exist, or it may be incorporated into a business system or fully integrated with an archival system. In these scenarios, metadata evolve directly from various business systems to an archival system. This evolutionary view provides a context for understanding the relationships between records management metadata and archival description. In the following section, the relationships between records management metadata and archival description will be analysed based on the SPIRT conceptual model.

The SPIRT conceptual model

The Monash University SPIRT project developed a high-level conceptual model for recordkeeping metadata.[24] This model defines three primary entities (agents, records and business, including recordkeeping business) and two additional entities (mandates and relations) in the archives and records management environments. If we generalise the records entity as information resources, the SPIRT model can be used to analyse the entities and relations in all three systems mentioned earlier in this paper.

In the business system, agents are people who create or use documents during business activities that are mandated by policies, regulations or laws. The business here is the general and often unique activities of an organisation. For example, the business of the US Department of Defense is different from that of an insurance company.

In the records system, agents usually include record managers and primary users. Records are the portions of documents in business systems that are brought under the control of a records system. Records management business is a subset of all the business activities of an organisation and usually include the inventory, classification, scheduling, description, access and disposition of records. These records management activities are mandated by policies, regulations and laws different from those governing the general business of the organisation.

In the archival system, agents usually include archivists and secondary users. Archival records are aggregations of records from multiple records systems but represent only a very small portion of those records from each records system. Archives management business usually includes acquisition, accessioning, arrangement, description, access and preservation. The mandates for archives management activities are different from those in business systems and records systems.

As records and their metadata travel from a business system to a records system and then to an archival system, descriptions of some entities need to be carried over, whereas other entities and their attributes may not need to be included in archival description. For example, some descriptions of records, records creators, records creating and management activities need to be transferred to an archival system for users to understand and use records, whereas the description of archivists and the mandates that authorise archival management functions may not need to be included in archival description.

This analysis tells us the following: first, the same conceptual model and types of entities (agents, records, businesses and mandates) apply to both records management and archives management environments. This shows the potential for records management metadata and archives management metadata to be designed consistently. Second, since the descriptions of some entities need to be carried over, metadata inheritance is very likely to happen, even though the inheritance may not always be automatic. Third, although the five types of entities exist in both the archives management and records management environments, the actual records, business, agents and mandates are different. Thus, it is inevitable that records management metadata and archives management metadata will not be identical. Even if the same metadata elements can be defined, the values of those elements could be different.

Comparing records metadata standards with archival description standards

This section will analyse the relationship between records management metadata and archival description by comparing ISO 23081, ISAD(G) and ISAAR(CPF). ISO 23081

claims to encompass operational records management along with archival perspectives. However, this appears to conflict with the fact that ISO 23081 is the metadata requirement in support of ISO 15489, which does not cover archives management. Evans has confirmed that the archival perspective has not been taken into account in 23081-1. Therefore, ISO 23081 is mostly a metadata standard for records management. ISO 23081 does not prescribe a specific set of metadata elements. Rather, it identifies only generic types of metadata that are record format neutral and implementation neutral. ISAD(G) and ISAAR(CPF) are the current international standards for archival description. They are meant to be used in conjunction with existing national standards or as the bases for the development of national standards. They offer general guidance and do not provide all elements that are required in a particular implementation or for a particular record type. The fact that all three standards are high-level abstract standards and subject to adaptation in real implementations makes them comparable standards.

The Encoded Archival Description (EAD) and Encoded Archival Context (EAC) are more recent archival description standards based on ISAD(G) and ISAAR(CPF), respectively. As XML-based metadata schemas, they not only use and expand the elements from ISAD(G) and ISAAR(CPF), but also include some elements and attributes from the XML schema for linking, structuring hierarchical XML documents and displaying archival description. These two detailed standards are not directly comparable with the high-level standard ISO 23081. However, they allow identifiers (IDs) for all entities and enrich the relation description in ISAAR(CPF) and ISAD (G). These two features are used as supplements to ISAAR(CPF) and ISAD(G) in this analysis.

ISO 23081-2 defines six types of records management metadata: identity, description, use, event plan, event history and relation. It claims that these apply to all types of entities (agents, records, businesses, mandates and relations). However, a close examination of the metadata types finds that this is not the case. For example, the *classification, abstract,* and *technical environment* elements in the description type and all elements in the use type do not apply to the agent entity. The *technical environment* element does not apply to the mandates and business entities either. ISO 23081 defines a relation metadata type while *relation* is also defined as an element in the event plan and event history metadata types. This seems redundant. In addition, ISO 23081 claims that it provides general metadata types instead of specific elements. However, it defines three different identifiers: *registration identifier, external identifier* and *event identifier*.

For the purpose of this paper, this author presents a way to organise the metadata elements based on the conceptual model defined in SPIRT. See the elements from ISO 23081 in Table 1. In the table, the *date/time* and *trigger* elements in the event plan and event history metadata types are redefined as attributes of the business entity because events are essentially business activities. The *abstract* element in the description type is changed to a *description* element for the agent, business and relation entities because it is inappropriate to write abstracts for agents, business and relations. The *event type* and *event description* elements are removed because they are covered by the *entity type* and *description* elements for the business entity. The three identifiers are collapsed into one and the event relation element is also removed because it can be covered by the attributes of the relation entity.

ISAD(G) is a flattened record-centric metadata schema. All of its metadata elements are modelled as attributes of records even though some of them are describing other entities. ISAD(G) does not contain elements for mandates. ISAAR(CPF) is a flattened

agent-centric element set. It defines richer elements for agents, but does not contain elements for records because agent description will be linked to records description. For the purpose of this paper, elements from ISAAR(CPF) and ISAD(G) are combined with overlaps removed and then organised based on the five entities defined in SPIRT. See the elements from ISAAR(CPF) and ISAD(G) in Table 1.

Metadata that could be inherited

Table 1 reveals identical or similar elements between records metadata and archival description. For example, the *title, language* and *aggregation* elements for records in ISO 23081 map to the *title, language/scripts* and *level of description* elements in ISAD (G), respectively; the *name* and *place* element for agents in ISO 23081 map to the several elements for names (*authorised form(s) of name, parallel forms of name, standardised forms of name according to other rules, other forms of name*) and the *place* elements in ISAAR(CPF). Values of these equivalent elements could be inherited. Some elements in the archival description standards do not have equivalent elements in ISO 23081, such as the *appraisal, destruction* and *scheduling information* element for the business entity, the *history, dates of existence, general context* and *the internal structures/genealogy* elements for agents. However, these elements have the potential to be inherited from the records system because the activities of appraisal, destruction and scheduling happen during the records management stage, and records managers, as employees of the organisations producing these records, tend to be very knowledgeable about the records creators. Since ISO 23081 is a high-level metadata standard that only defines types of metadata, in practical implementations, more metadata elements can be added to record information needed by the archival repository. Even those elements already defined in ISO 23081 can be renamed consistently with archival description standards. For example, the *aggregation* element can be renamed as *level of description* and thus make metadata inheritance easier.

In addition to those elements listed in the table, the archival description standards also define elements for meta-metadata in their control areas. These elements treat the description of records and agents as the object of description. ISO 23081-2 also defines the concept of meta-metadata. According to ISO 23081-2, the generic records management metadata elements defined in ISO 23081-2 apply to the description of metadata as well. Comparing the ISO 23081 elements with the elements defined in the control areas of the two archival description standards, we can find the following elements are similar and potentially can be inherited: the ISO 23081 elements *record identifier, agent identifier* and *language/scripts used* map to the *authority record identifier, institution identifiers* and *languages and scripts* elements in ISAAR(CPF), respectively.

ISO 23081 allows for the description of multiple aggregate levels of agents, records, business and mandates, and for the relations among these entities on each aggregate level. For example, it defines six levels of aggregation for records: item, transaction sequence, file, series, archive and archives. This correlates with the multi-level description rule for archives defined in ISAD(G). ISAAR(CPF) also allows for the multilevel description of agents. One ISAAR(CPF) description can be created for each agent, and then these descriptions can be linked through the *names/identifiers* element of the related agent. These linked agent descriptions show hierarchical relationships when the value of the *category of relationship* element is hierarchical. Due to this consistency, the multi-level description created in the records system can be inherited by the archival system.

Table 1. Elements from the three international standards organised based on the SPIRT conceptual model.

		Identity type	Description type	Use type
Records	**ISO 23081**	identifier, entity type, aggregation	title, classification, abstract, place	technical environment, rights, access, audience, language, integrity, documentary form
	ISAD(G) and ISAAR (CPF)	reference code (s), level of description	title, date(s), scope and content, system of arrangement, extent and medium	physical characteristics and technical requirements, language/scripts of material, finding aids, conditions governing access, conditions governing reproduction
Agents	**ISO 23081**	identifier, entity type, aggregation	name, description, place, jurisdiction	rights, access
	ISAD(G) and ISAAR (CPF)	type of entity, identifier	authorised form(s) of name, parallel forms of name, standardised forms of name according to other rules, other forms of name, history, dates of existence, general context, legal status, places, internal structures/genealogy	
Business	**ISO 23081**	identifier, entity type, aggregation	name, classification, description, place, jurisdiction, date/time, trigger	
	ISAD(G) and ISAAR (CPF)	identifiers	appraisal, destruction and scheduling information, accruals, archival history, dates of creation, immediate source of acquisition or transfer, function, occupations and activities	

(*Continued*)

Table 1. (*Continued*).

		Identity type	Description type	Use type
Mandates	**ISO 23081**	identifier, entity type, aggregation	title, classification, abstract, place, jurisdiction	
	ISAD(G) and ISAAR (CPF)	identifiers	mandates/sources of authority	
Relation	**ISO 23081**	identifier, entity type	relationship type, relation description, relationship date	
	ISAD(G) and ISAAR (CPF)	identifiers	names/identifiers of related resource, functions and agents, category of relationship, description of relationship dates of the relationship	

Note: the identifiers for the business, mandates, and relation entities in ISAD(G) and ISAAR(CPF) are from EAC. ISAD(G) only describes relations with allied materials. ISAAR (CPF) only describes relations with other agents. EAC allows richer description of relations. In the table above, the relation element of ISAAR(CPF) is enriched based on elements from EAC.

Metadata that need to be replaced or augmented

Equivalent elements do not mean that the values of those elements can be inherited without change. For some metadata information, although the same metadata elements can be used in both records systems and archival systems, the values of the elements need to be augmented or updated by archivists. For example, the *rights* and *access* elements in ISO 23081 map to the *conditions governing access* element in ISAD(G). The values of these elements need to be replaced because the rights and access information in a records system is mainly for primary users, whereas rights and access information in an archival information system is primarily for secondary users. Also, the value of the *physical characteristics and technical requirements* element in ISAD (G) may need to be periodically updated as digital materials are migrated to newer technology environments.

Although both records metadata and archival description allow descriptions of various relationships, these relationships may need to be updated by archivists. For example, archivists may need to add relationships with publications that are based on secondary use of the archival materials, as well as relationships with related records that did not exist in a particular records system. For meta-metadata, the dates of the creation of records metadata can be inherited, but archivists need to add further modification information after the metadata are accessioned and incorporated into an archival information system. From the records system to the archival system, the records enter into a larger context. Their identifiers, which were unique in the records system, may no longer be unique in the archival system. The identifiers may need to be replaced or modified to make them unique in the larger context.

For some elements, even though the content of values does not need to be updated, the form in which the content is recorded may need to be modified according to certain archival description rules or encoding schemes. As an example, archivists use functional thesauri and subject headings to describe archival records, whereas records managers and records creators may use keywords or natural languages. Archivists also follow various archival description standards, such as the *Rules for Archival Description 2* and *Describing Archives: A Content Standard*. One rule from ISAD(G) about the creation of title says: 'For supplied titles, at the higher level, include the name of the creator of the records. At lower levels one may include, for example, the name of the author of the document and a term indicating the form of the material comprising the unit of description and, where appropriate, a phrase reflecting function, activity, subject, location, or theme.' These archival description rules, however, may not be applied in business systems or records systems.

Metadata that need to be created by archivists

Although records management metadata also have a multi-level structure, they may not contain fonds-level description because all records in a records system belong to the same fonds by default. This information may need to be added when records are accessioned into archives and are managed together with records from various other provenances. The elements *archival history, immediate source of acquisition, accruals* and *publication notes* are unique to archival materials and need to be created by archivists. *Date range, extent and medium of the unit of description, administrative/biographical history, scope and content* are all summary information elements that describe accumulated archival materials. Records management is about the ongoing and dynamic process of current records. Records managers may record the creation date and time of a

particular record or write an abstract for lower level aggregations of records, but they are unlikely to record the date range or the scope and content for large aggregations of records that accumulate through multiple accessions. Even if records managers do record this information, the date range or scope and content may need to be updated by archivists because archival collections aggregate selected records over a longer period of time.

Some of the summary elements in archival description, such as the *administrative/biographical history, the appraisal, destruction and scheduling information* in ISAD(G) and the *functions, occupations and activities* in ISAAR(CPF), are like the biographies mentioned by MacNeil. These elements summarise significant events which happened in time periods measured by years, decades or even centuries. The event history and event plan metadata in ISO 23081 intend to capture all events that ever happened to the records. They are essentially audit trails, which are like diaries. Although the audit trails are important to ensure the authenticity and integrity of records in the context of a record's creation and management, not all of them are worthy of archival preservation. Is it possible to appraise these audit trails periodically, delete those that are no longer necessary, select only those events that are significant and use these selected events as the values of the archival description elements such as *administrative/biographical history* and *appraisal, destruction and scheduling information*? Will these selected audit trails serve the same functions as the current summary information in archival description? Would appraising and selecting audit trails be less costly than creating summary information? These questions require empirical studies to be answered properly.

Metadata evolution in digital preservation

The comparison of the three international standards helps analyse metadata evolution in one particular scenario: metadata flow from a records system to an archival system where the records system uses a metadata schema based on ISO 23081 and the archival system uses a metadata schema based on ISAD(G) and ISAAR(CPF). In today's digital archiving practice, records management systems often do not exist and metadata flow directly from business systems to archival systems. The business systems use various kinds of metadata schemas and the archival system may not use ISAD(G) or ISAAR (CPF) at all. To broaden the view of metadata evolution, in this section, the types of metadata information defined in the OAIS reference model will be discussed, because OAIS encompasses all kinds of archival information systems.

The OAIS reference model reveals several causes for the evolution of metadata. The first is to augment metadata received from resource producers. Some submissions to an OAIS have insufficient representation information or preservation and description information to meet preservation requirements. Thus, the OAIS needs to extract additional metadata from the archival information packages and gather metadata from other sources. The second cause is digital preservation strategies. In order to keep digital resources alive, the OAIS may need to migrate digital resources to different storage media, file systems or files formats periodically. These migration procedures will change the packaging information, representation information and fixity information of the digital resources. Third, changes in the designated community may also require adaptation of metadata information. For example, when the designated community changes from a particular scientific community to the general public, additional metadata may need to be added to the representation information and the preservation description information

to enable the general public to understand these resources. Even if the designated community remains the same, the evolution of the knowledge base of the community may also require the enhancement of metadata to keep the preserved resources understandable. One kind of metadata evolution not mentioned in OAIS is user-added metadata. Web 2.0 has made it possible for users to tag and annotate archival materials and thus enrich existing descriptive metadata.

The OAIS reference model focuses on metadata augmentation and accumulation and does not pay sufficient attention to the appraisal and selection (extinction) of metadata. It assumes that metadata received from the producers will always be preserved. For example, it states: 'Evidence for Authenticity is provided by the Producer as part of the PDI in the submission, and this evidence is maintained, updated, and/or incremented by the Archive over time.'[25] About provenance metadata, it states: 'The Archive is responsible for creating and preserving Provenance Information from the point of Ingest; however, earlier Provenance Information should be provided by the Producer.'[26] In practice, metadata appraisal and selection happens not only before acquisition, as mentioned previously, but also after. In the NARA records schedule number DAA-0064-2009-002,[27] review status metadata of records already under the custody of NARA are scheduled as temporary and will be retained for a minimum of six years and then deleted when no longer needed. Review status metadata means electronic information relating to reviews of records that are conducted in response to Freedom of Information Act requests or various other reasons. It is a kind of metadata accumulated during archival preservation.

Conclusion

Metadata go through an evolutionary process from creation to archival preservation. During this process, some metadata are re-used (inheritance), other metadata are eliminated (extinction) and still others are updated or newly generated (mutation). Unlike the Records Continuum theory, that focuses on metadata inheritance and mutation, the evolutionary view presented in this paper highlights the extinction of metadata. As such, it might raise awareness about the appraisal and selection of metadata in digital curation practice.

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