Preservation of Trust and Security in Long-Term Record Management

Jianqiang Ma[1], Habtamu Abie[2], Torbjørn Skramstad[1]

[1]*Norwegian University of Science and Technology (NTNU), Trondheim, Norway*
Email: {majian, torbjorn}@idi.ntnu.no
[2]*Norwegian Computing Center, Oslo, Norway*
Email: habtamu.abie@nr.no

Abstract

The trust and security issues in record management have been researched for many years, with the main focus on the nature and meaning of the record itself. However, less attention has been paid to the potential use of the record as evidence of the originator's origins, functions, and activities. This PhD work will be devoted to researching the evidential value, and its long-term preservation. The evidential value will be used as an index for the degree of trust in the organizational and procedural practice in connection with the preservation of trust and security in documents over time.

Keywords: Evidential Value, Trust, Security, Long-Term Preservation.

1. Introduction

Preserved records have two types of value, categorized as primary and secondary in accordance with Schellenberg's Appraisal Taxonomy [1, 2]. The primary value of a record is the value the record has for the creator, who will use the record for legal, fiscal and administrative purposes, and as necessary for the continuation of business. The secondary value of a record is the value the record has for persons or entities other than the creator, including both public and private users. In the context of record storage the secondary value is more important since the record is preserved for the benefit of users other than the creator. A record's secondary value can be of two types: 1) evidential value, i.e. the evidence a record contains, whose value will vary with the nature and significance of that which is evidenced, and 2) information value, i.e. the information that a record contains about persons, things, and phenomena. Bartlett [1] defines evidential value as: "the value of what makes a process, decision, and set of relationships apparent beyond the information content which forms the purpose of the communication". As the evidential value may be the main value of a record, Schellenberg recommends that the criteria for evidential value should be more rigorous than those for information value [1, 2, 3].

To summarize the various definitions of evidential value [3, 8, 9], evidential value is the quality of the record that provides a legal proof, historical proof, authentic evidence, and adequate evidence about a) the creator of the record, b) the creation of the record from different perspectives, and c) the history of events and topics (activities, functions, policies, operations etc.) associated with the record. It is therefore essential that the history of the record is documented in a way that can be inspected, validated and reasoned about by authorized users so that it is possible to check and ensure that records have not been modified, abused or tampered with.

The aim of this research is to develop theory and methods to preserve evidential value over time, and to express, measure, and verify evidential value. This may be used for trust management, forensics or other purposes. Our research does not include legal or privacy issues[1].

2. Methodology

2.1. Research Model

There is a need for adequate methods of keeping records' evidential value intact while they are still being used together with associated records within a complex contextual structure constituted by business and record keeping processes. This research work will use the evidential value representation model proposed by Abie [4] as shown in Fig.1. This model consists of evidence of structure, evidence of provenance/source, evidence of context, the operation used to combine the evidence, and strategies for preservation of the value of the evidence.

In this model, each evidence node is composed of several attributes. These attributes are used to illustrate the factors related to the evidence node, e.g. the provenance or source of this node, the context of this node. Due to the differences of the origin and function of these attributes, a number of different linguistic evidential values are assigned to each attribute. The linguistic evidential values are typically described as high, medium, or low trustworthiness, and are used to express the degree of support of a certain "trustworthiness hypothesis". These linguistic evidential values will then be converted to numerical evidential values from 0 to 1 at the corresponding nodes. The numerical evidential values are assigned as the mass function of the nodes, as defined by the Dempster-Shafer Theory [5]. The combination approach of the Dempster-Shafer Theory and the MADM method [6, 7, 10] will be used to combine the numeric evidential values of the attributes into a composition node. The computed results are the degree of trust of the composition nodes. The composition nodes will in turn be used as attributes of higher level nodes with numerical evidential values either used directly or converted to

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linguistic evidential values. The combination process then continues to the highest level evidence node.
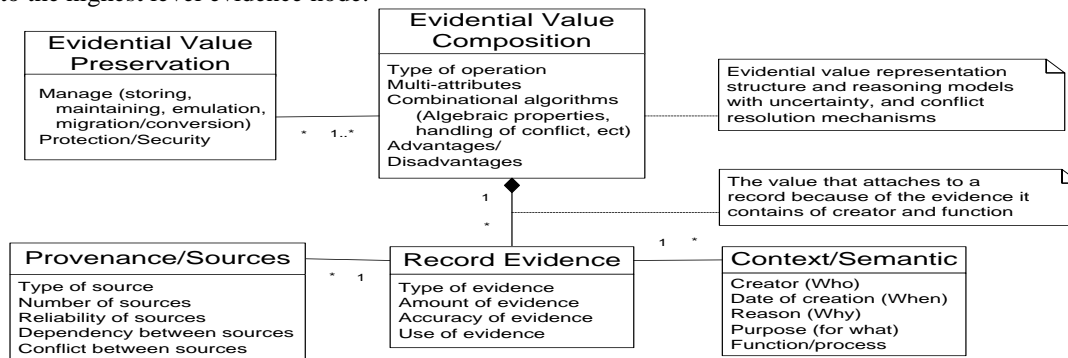

Figure 1. The evidential value research model

2.2. Research Questions

This research work will be conducted in two phases. The first phase will concentrate on expressing, measuring and verifying the evidential value, and will attempt to answer the following questions:

- What are the requirements for evidential value of the records? Example sources of requirements are compliance (law, business practices), corporate polices, and requirements from risk management
- How are these requirements met at the time of creation, and how do they change over time? E.g. requirements for confidentiality and availability can typically be relaxed over time.
- Which attributes/parameters must be collected in the process of creation of records? E.g. information about the origins, functions, and activities of the creators.
- How can evidential value be verified when required? E.g. requirements for trust in the verification process and related software, and requirements for use of independent actors to perform the verification.

The second phase of this research will expand evidential value, and also consider how to preserve evidential value over time. The second phase will try to answer the following questions:

- How can evidential value best be preserved over time according to the (partly changing) requirements of the record?
- How can digital signatures be removed without too much loss of evidential value?
- How does long-term use of cryptographic algorithms and keys effect evidential value preservation?

3. Expected Results

This research work is expected to provide the following contributions:

- Develop theory and methods to preserve evidential value over time.
- Propose an approach to express, measure and verify evidential value.

- Analyze degree of trust in records correctness.

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