

Traceability of Cultural Heritage Objects: The AICOA Model

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The implementation of a standard for tracing heritage objects is an tested tool for preserving cultural goods. This tracing standard will able to identify without a doubt the cultural object and create an individual profile document, giving the adequate guarantee documentation for commercial transactions and contributing to conserve the respective national cultural heritage of each country. The model facilitates the conveniently transfer of cultural objects, and the recovery of stolen or illegally transferred objects, prevent counterfeits and comply with the respective requirements of international institutions. To ensure traceability three basic criteria need to be addressed: correct identification of the cultural objects and their respective characteristics, inventory registration and information transmission /exchange.

Keywords: Traceability, Security, Radiofrequency, Standards, Documentation, Artwork

1. INTRODUCTION

Nowadays several conditions are affecting movable cultural heritage objects management. On the one hand there is a high mobility index affecting these objects (transportation, warehouses, exhibitions, etc.), on the other hand most cases have no accessible information concerning the cultural heritage object, and hence a growing non-security environment arises amongst museums, investors and artists.

This paper will introduce the AICOA Model and Radiofrequency Identification (RFID) as the most efficient technology to ensure traceability and security for any kind of heritage object. This goal will be achieved by outlining all the RFID benefits to the heritage object documentation process.

2. THE AICOA MODEL

AICOA is the first archive specialized in tracing heritage objects. One of the fundamental means of guaranteeing security, reliability, knowledge and location of any cultural object is through its traceability.

AICOA offers a Model to assure traceability. This Model is presently applied to contemporary artworks (pictures, photographs, sculptures, digital art, etc.).

AICOA promotes the cooperation within the art world, while scrutinizing the quality of its documentation and safeguarding the information in order to offer full security to authors, galleries, museums, private collectors and professionals. [1]

AICOA operates in Spain, Italy, France, Portugal and Andorra. In each of these countries there is a national rep-

resentative who gives all the services to the art sector professionals. Oncoming countries soon to be integrated in AICOA are: Colombia and Argentina.

The main processes of the AICOA operation model are:

- Reception of the artwork
- Systematic description and documentation of the artwork in the Description of Artwork (DOA)
- Registry, archiving and digital custody of the DOA including remaining documents related to the artwork (authorship certificates, reports, brochures, etc.)
- Issuing of a guide-passport that will help to track the artwork through its life cycle, adding information regarding exhibitions, registers and movements (transport, customs, etc.)
- On-line consultation (AICOA Intranet)
- Reporting and certification of the registered artworks

These processes can be summarized into three basic steps of traceability: identification, registration and archiving information, and transmission.

2.1 IDENTIFICATION OF THE ART OBJECT

In this step RFID tags are attached to the DOA document (Figure 1) together with the Guide Passport (Figure 2).

The DOA document includes the following information: artwork code (GS1 standard), authorship declaration, experts' certifications, technical features, various photographic views, public and confidential information.

The information registered on the tag is: serial unique number (ID unique), GS1 artwork code (Num. DOA), artistname and title of the artwork. The standard applied is ISO/IEC 15693:2004 (Information Technology –

Automatic Identification and Data Capture Techniques – RFID for item Management – Unique identification of RF tags), and the frequency used is HF 13,56 MHz.

Archivo Internacional Central de Objetos de Arte
AICOA
 DOA NO REGISTRADO
 Número de DOA
 (8004)84328720001304017248
 DESCRIPCIÓN DEL OBJETO DE ARTE PARA EL REGISTRO EN AICOA

Fotografía Principal Fotografía Secundaria

Datos del registro

Fecha del registro: 9/10/2006 – DOA NO REGISTRADO
 Hora del registro: 10:44:35
 Fecha de declaración:
 Tipo de registro: Unitario
 Tipo de objeto: Modelo 1 (Pintura, Artes gráficas)
 Subtipo: Pinturas

FICHA TÉCNICA DEL OBJETO

Tipo de objeto / Type of object:	Pinturas ()
Objeto de arte registrado en AICOA / Work of art registered in AICOA:	84328720001304017248
Título de la obra (Título alternativo) / Title (Alternative title):	BIOMBO ()
Autor / Author:	
Fecha realización / Date or period:	? ()
Escuela, corriente estilística / School, art movement:	
Datos de la serie / Serial Number:	/ – serie:
Técnica / Technique:	
Materiales-Suporte / Material-Support:	
Medidas / dimensions:	// @ //
Firmado / Signed	Si

Figure 1: Cover of DOA document

Guide-Passport with RFID tag ISO15693 enclosed, although adoption of e-passport technology (ISO/IEC 14443 - Identification cards – Contact less integrated circuit(s) cards - Proximity cards) is being studied, in order to share advantages when implemented in the very near future.

2.2 REGISTRATION AND ARCHIVING

All the above mentioned documentation must be kept in a high-security environment, in order to maintain its privacy. For this reason, AICOA’s archive is adopting a RFID-based security system, with access control through a RFID arc and smart shelves with embedded antennas and RFID readers connected to the corporate application (ERP). Services soon to be offered will include:

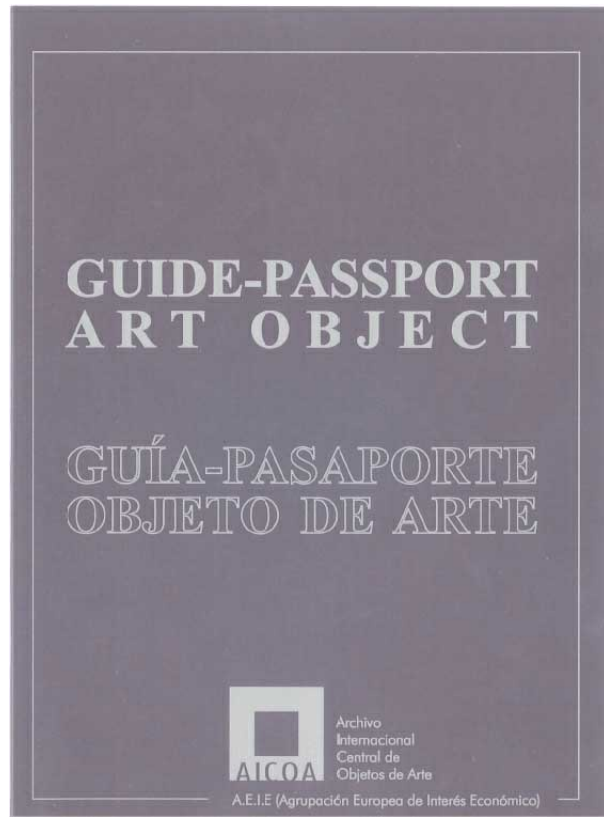


Figure 2: Cover of Passport document

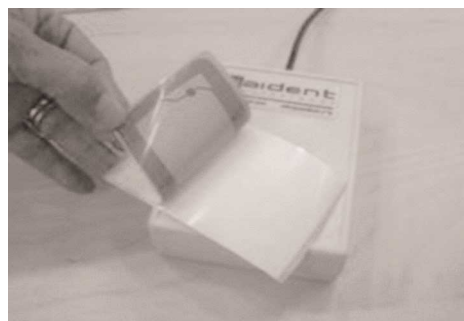


Figure 3: Tag and reader/writer

Localization: as you type the number of the desired folder in the computer, the solution gives you the position of that folder

Permanent inventory: a continuous reading mode, giving on-line information of all of the documents archived in the shelves

Alarms: the solution is able to generate an alarm if one of the permanent inventories detects the missing of a folder

2.3 INFORMATION TRANSMISSION

The third step of the AICOA traceability process is covered by the AICOA central server and transactional website (Figure 4). Through the AICOA information data base, the users have remote access to the information of the artworks and the possibility (if registered) to update it

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on-line with additional data regarding participation in exhibitions, awards, restoration activities, artwork lending, incidents. All this data is checked by AICOA before approval. Reports and certifications can be issued on-line as well (useful for transport or insurance companies).

In the near future, and with the objective of improving and widening international accessibility to all this information, the adoption of EPCglobal standards and its worldwide network is being studied. The aim of EPCglobal is to boost the adoption of the Electronic Product Code™ (EPC) as the next generation of product identification, We will have to wait until EPC creates a standard for HF (the only frequency adopted so far is UHF) See how EPC Network works in [2].

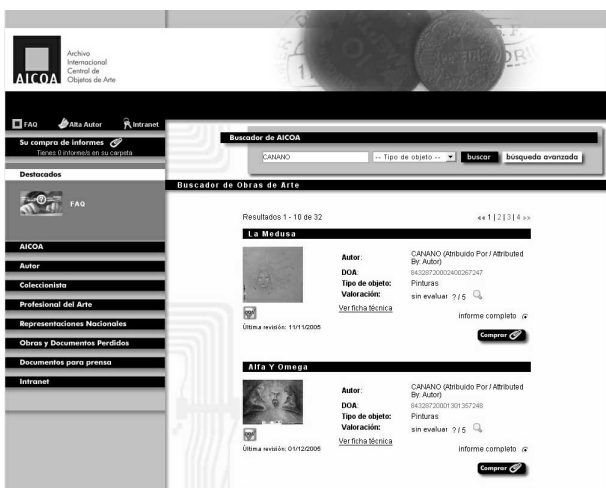


Figure 4: Search results screen of the AICOA Intranet

3. RFID TECHNOLOGY

Radiofrequency Identification is an automatic data collection technology (ADC) which exchanges data wirelessly. Its basic elements are:

The tag (or smart label): a kind of label that is applied to an object or document that contains a chip and an antenna, allowing both storage and transmission of information, respectively.

The readers: devices that use RF signals to extract the information of the tags that are within its read and frequency range. Data recovery is done automatically. After receiving the processed information, the reader transmits it to the corporate information systems (Figure 5).

One of the most important issues in RFID today is the adoption of standards. ISO/IEC and EPCglobal are the two main standardization organisms for RFID regulations.

ISO/IEC is a joint venture formed by the International Organization for Standardization (the world's largest developer of international standards, worldwide accepted and used) [3] and the International Electrotechnical Commission, which is the leading global organization that prepares and publishes international standards for all electrical, electronic and related technologies [4]. ISO/IEC

provides technical regulations for both people and objects traceability EPCglobal is a joint venture between European Article Number EAN and the Uniform Code Council (UCC) entrusted by industry to establish and support the Electronic Product Code Network™ as the global standard for immediate, automatic, and accurate identification of any item in the supply chain of any company, in any industry, anywhere in the world. [5]. The aim of EPCglobal is to boost the adoption of the Electronic Product Code™ (EPC) as the next generation of product identification, given that, unlike current barcode systems, the EPC – among other advantages - has been created with a data structure of 96 bits capable of uniquely identifying all the elements of the objects (items, cases, pallets, locations, etc.) in the supply chain.



Figure 5: A RFID reader (left) and its antenna

Another relevant matter is the selection of the frequency band that may determine aspects such as the read distance (the distance from the reader to the tag), the speed reading or the tag size. The frequencies most often used are:

High frequency (13.56 MHz), read distance up to 3 metres, medium speed reading and small size of tags

UHF (between 859 and 960 MHz, depending on the zone), with read distances up to 20 metres, higher speed reading and bigger size of tags.

The adoption of RFID technology (although it has more than 50 years of history) is currently growing fast due to the implementation of the above mentioned standards. Recent improvements to equipment have also led to falling implementation costs.

3.1 TRACEABILITY AND RFID FOR HERITAGE OBJECTS

We understand traceability as the ability to track an artwork through its complete life cycle, in other words, the capability to identify, register and transmit the art information anytime and anywhere.

The tracking solutions, based on RFID, provide this features throughout the complete art chain. The contribu-

tions of this technology to the traceability of heritage objects are directly related to the label (TAG) which includes the following features:

- A unique serial number which allows individual and unrepeatable identification of the art object throughout the world.
- Additional data storage space which drastically enhances the capabilities of current marking systems, such as barcodes, which become able to register all the processes affecting the heritage object life cycle.

Due to the used radio frequencies the tag does not have to be visible for the reader. Therefore, it can be embedded and the system is able to work in harsh environments (high temperatures, contact with chemical elements, etc.).

Intrinsic security elements and encryption possibilities make the tags very difficult to counterfeit.

3.2 AVAILABILITY OF SENSOR DEVICES

A specific kind of smart labels, called active tags, comprise temperature or humidity sensors that will record data and allow the complete, automatic monitoring of these parameters wherever the art object is located. This guarantees the complete tracking of transportation and warehousing.

Information availability anywhere, anytime: RFID offers us the possibility to interact with the tags through the most common devices currently on the market, like mobile phones or PDA's. These strengths of the technology lead us to the conclusion that RFID is a useful and secure tracking technology for the management of cultural heritage objects.

However certain problems may arise with the direct attachment of the tag to an art object: difficulties in object manipulation, preservation requirements or even the existence of protected rights that impede any modification on the object.

For this reason, and in order to develop a standard applicable to all types of art objects, our proposal – at this stage – is instead of marking the object itself (although we continue investigating different possibilities of embedded tags, Figure 6) to mark the documentation related to it. The procedure comprises two steps: first a documentation process suitable for any existing work of art will be created, and secondly, once the various documents have been assembled the RFID benefits are attached to each of them.

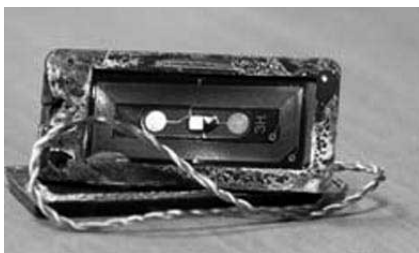


Figure 6: RFID tag embedded

CONCLUSIONS

Traceability is synonymous with security in the management of cultural objects and its related documentation. Radiofrequency Identification Technology (RFID) is the best way to assure it.

The optimum traceability will be achieved first if it is possible to mark each heritage object with a RFID label (tag) and secondly if the RFID tag is able to record environmental conditions (lux, temperature, humidity) or movement. In view of the difficult selection of the best way (if possible) to attach a tag on each heritage object, this paper presents an alternative approach: RFID tags (and so RFID processes) could be attached not to the cultural heritage object itself but to the specific descriptive documentation (paper, CD-Rom or DVD) accompanying the object for its identification.

Nowadays, there exists a considerable demand to develop a procedure that makes available all possible documentation, concerning cultural heritage objects. National and international agencies should promote traceability: a procedure that assures complete and appropriate documentation standardization under guaranteed security. This job could begin with contemporary artworks. In 100 years we should have all of the answers for the cultural heritage objects that are presently being created. This is the main goal of the AICOA Model.

AICOA offers its' model to the international community for the testing of traceability.

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