From relational metadata standards to CRM ontology: A case study in performing arts documentation

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1. Cataloguing the costume: our experience and derived methodologies

1.1 Introduction

The success of the RADAMES project[1], a project promoted by the Music section of the Department of Art, Music and Performing Arts (DAMS, University of Bologna), in defining a cataloguing model for the Opera has suggested the opportunity to test its results with a broader range of documenting materials. In particular, the Theatre section of the department has examined the opportunity of cataloguing different material outcomes of the performance in order to obtain an almost accurate documentation of the "conceptual object conveyed by a show" ([LBF]).

Because of the ampleness of these materials, during the experimental phase we have concentrated our efforts on the staging area and, in particular, on the theatrical costume. Therefore, we had the need to adopt a specific cataloguing schema for the costume as the basis for the data format, in order to build on it the software model for the theatrical costume. The choice of the BDM model (Beni Demoetnoantropologici Materiali [Demoethnoanthropological Material Goods]), and then the OA model (Oggetti Artistici [Artistic Objects]), was made for the will to employ an acknowledged cataloguing standard that would guarantee a wide rage of applicability. In consequence of the agreement made with the Italian Institute ICCD (Central Institute for Catalogue and Documentation), the VAC model (Vestimenti Antichi e Contemporanei – Contemporary and Ancient Clothes), even if it is still at the experimental stage, was adopted.
The VAC model takes shape as a specialization of the OA model and maintains a whole compatibility with the BDM model. The final aim is to elaborate an object oriented model, realized through a software library which allows the employment of different data models maintaining an interior coherence with already defined standards.

1.2 The working experience at Teatro Comunale (the Opera house of Bologna)

After the definition of a draft of our cataloguing model for the costume, the second step was to test in a real environment to validate the adherence description to the real object: the theatrical costume onstage. Hence, collaboration between the University and Teatro Comunale is born. Two different teams of students of laboratory courses, one employed in photography and the

[1] RADAMES (Repertoriazione e Archiviazione di Documenti Attinenti al Melodramma E allo Spettacolo) is an integrated research project launched at the University of Bologna in 2001.

other in cataloguing, both coordinated by Charlotte Ossicini and Professor Paola Bignami (Alma Mater Studiorum, University of Bologna), have been working since two years ago in the theatre itself. Here, in one of the rehearsal hall at the first balcony, a photographic set has been furnished, where the costumes are photographed on dressmaker's dummies. We have chosen to catalogue only the costumes of the operas of the theatrical season, immediately after the performance's first night, as the first aim was to fix not only the objects as remnants, but also as physical evidences of a performing event in a precise place and time. In fact, the theatrical costumes can undergo countless modifications during a tournée, because of transport and/or eventual substitutions. Only the costumes of Teatro Comunale's ownership have been catalogued, even in case of co-productions, due to copyright issues.

1.3 The methodological approach to the VAC model

From the iconographical point of view, the costume has been documented as it appears on the stage during the opera: for example, if between an act and the other the actor takes off one of the components of the costume (for example a jacket), both *variants* have been photographed. Do these variants have to be considered as two different costumes or only one? Thanks to theatrical costumes outlines, we have decided to apply a fine distinction: we have two costumes if the variant is documented in two different outlines, only one if variant is only a marginal note on the paper.

The VAC model, expressed for the ancient and modern clothes with a museological approach, catalogues "continuant" objects while the theatrical costume is an ephemeral object. As a consequence, the VAC model presents some limitations:
Since, in most cases, cataloguing ancient cloths doesn't provide the accessories - almost always lost - we have decided to eliminate all the accessories (*properties* in the theatrical slang).

Every VAC file catalogues only one object, while the costume is an aggregate entity. We have decided to insert for every costume a series of sub-areas which contain the technical features and sizes of the single components, so to have a double function: on the one hand to document the object costume as it was in a definite theatrical event, on the other hand to offer detailed information prefiguring a possible reuse of the whole costume or of the single component.
The VAC model is subdivided in different thematic areas: OBJECT, CHRONOLOGY, AUTHOR, DRESSMAKING AMBIT, PURCHASERS, USER, METERIALS, SIZES, CONSERVATION, and DECORATIVE ELEMENTS. In CHRONOLOGY, the date of the

performance's first night and the specification of the act are comprised. For two of these, OBJECT and DECORATIVE ELEMENTS, it has been necessary to create a new glossary for this specific context. In the OBJECT data field, the theatrical costume is catalogued as an aggregate entity. In one of the items (MODEL TYPOLOGY), in case of daily clothes, were provided only the models belonging to the Fashion History, while in case of the theatrical costumes these models are not slavish followed and, besides, in theatre, the costume can convey abstract concepts. Thus, a new close glossary for this item has been introduced, including four different definitions: ETHNICAL (e.g.: dress in the Indian style), FANCY (when it is a pure creation without possible cross-references), HISTORICAL (e.g: dress in the medieval style), CONTEMPORARY (e.g.: an Armani's outfit). In the item KIND AND AGE, the definition UNISEX has been included. In the data field DECORATIVE ELEMENTS, in the item TYPOLOGY, new definitions have been inserting for the so called "tricks of the trade" (for example an "effect damask silk" obtained through painting).

The model underlying to the VAC data structure considers the context of use of the daily clothes as a mere attribute of the good, in case of the theatrical costume, instead, his own existence is strictly bound to the performing event. The costume lives for a lapse of time, more or less brief (from the scene, to the act, to the entire performance), while its single components are "morphologically perdurable objects". The theatrical costume, therefore, is not only an aggregate entity, but also, so to speak, a temporal aggregate. The resulting final version of our model had to take in account this methodological approach and resulted as a "hybrid": in part directly derived from the traditional approach of the VAC data structure, in part deeply influenced by the "time-based" nature of the performing arts collections.

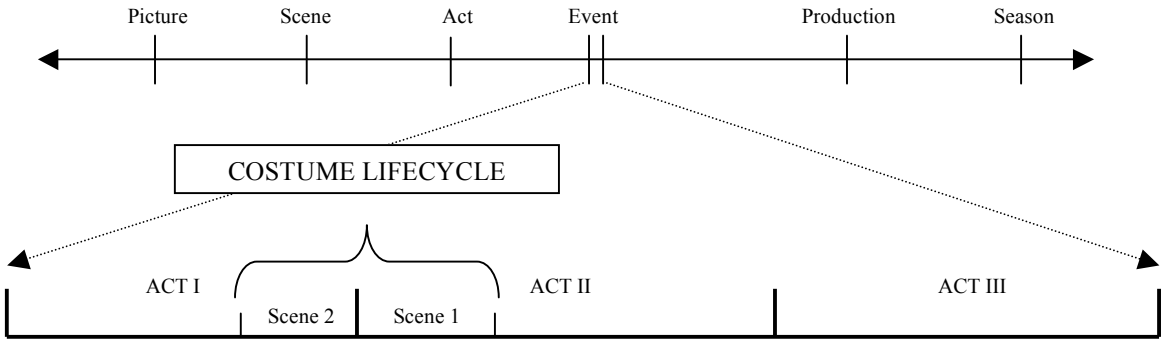

Fig. 1 – Performing Arts Timescale

2. From relational to object oriented: the RadamesLibrary

The idea that has driven the implementation of the Radames architecture was to move from a pure relational logic, the traditional approach in catalographic systems, to an object oriented approach [POM]. In this way, an O.O. (object oriented) class library defines types, methods and services, which become living instances when used, relying on the RDBMS (relational database management system) only for persistency. The guideline during the design of the class library (called RadamesLibrary) was to define an abstraction layer between physical data and the model describing the entity (e.g. a composition or a costume as in our case) in order to let the developer able to play directly with object types modeled in their morphology and capabilities (we could say physiology) instead of managing plain data over the RDBMS. This abstraction let the development major effort focusing on information workflow implementation and UI (user interface) design also enabling to build sharp vertical applications without dropping physical dataset compatibility required by standards or pre-existing systems. The migration process involves of course the definition of a model able to describe the object in its complexity. In the case of the costumes we started from the relational guidelines defined by the VAC dataset and designed the *Costume* class which entered in the more articulated namespace of the library *Scenotecnica* (stage materials which belongs to the top level namespace *Archivio* [archive]). The original entity-relation dataset (based upon the VAC model) is composed of many thematic areas each of them articulated in different fields. Its primary objective is to offer an exhaustive repository for a complete catalographic description of a clothe. Information about its context of use is considered as mere attribute (or static characteristic of the material good itself). Our approach in the O.O. migration has been adding to this basic morphological description information about modifications or variations caused by the use made of the object in the performing context onstage. In other words, we tried to take into account and describe, the value derived from the onstage usage of a single piece of clothe as if its characteristic could be directly influenced by its use. This means linking information about the described object to a specific context. In our case, describe a costume in a specific production (or even a single performance). How to do this? The first step has been a simple migration of the dataset fields into coherent complex properties of the class defined, in many cases, by complex types (the most important is *ComponeteIsolato* [single piece of clothe]) making a simple enumeration relation a more articulated relationship between types. Resulting classes hold in their properties their morphology, the relationships between them results from the modeled class hierarchy. The resulting O.O. model encapsulates in its morphology most of the semantics of the data (now characteristics of an object) of the source relational model. The problem is that these semantics are implicit and not immediately intelligible (although modern O.O. environments implements

methodology for publishing internal structures). The migration process gives to the original data-structure a different shape and functionalities which reflect the specific point of view (approach plus a specific scale of value) of the community knowledge and its approach to the specific matter. Unfortunately this brings the model to be "proprietary". The traditional approach to interoperability has always been the definition of common standard or at least interoperable data formats. The adoption to an O.O. model offers the opportunity to address interoperability at the semantic level. As this level is implicit in the class model, it has to be explicated in the same way of each single property content. We have two different levels: basic property semantics (as types: colors, materials, etc.) and a class (or namespace) semantics (complex entities level). In our case study the most interesting example is the difference between the costume and its components. The standard relational model simply defines the hierarchy between each element and at most reduces the granularity of data at higher levels taking into account primarily the morphology of the objects and relates them from this specific point o view. But the costume, as part of a performance, gets from the complex relation established with it far more information. A costume might be existed for a single performance of few minutes and immediately be divided in its components forever. How to describe this? How to tell this substantial difference: the costume is a "variable" entity while its components are "stable" in relation to the performance time. The object model through the relation with time-related properties indicates this, but implicitly [the *Costume* class has a property *Eventi* (events) the *ComponenteIsolato* inherits this relation through its belongings to the costume]. The challenge is to explicitate this level of information formally in order to let different system understand the underlying semantic of the model.

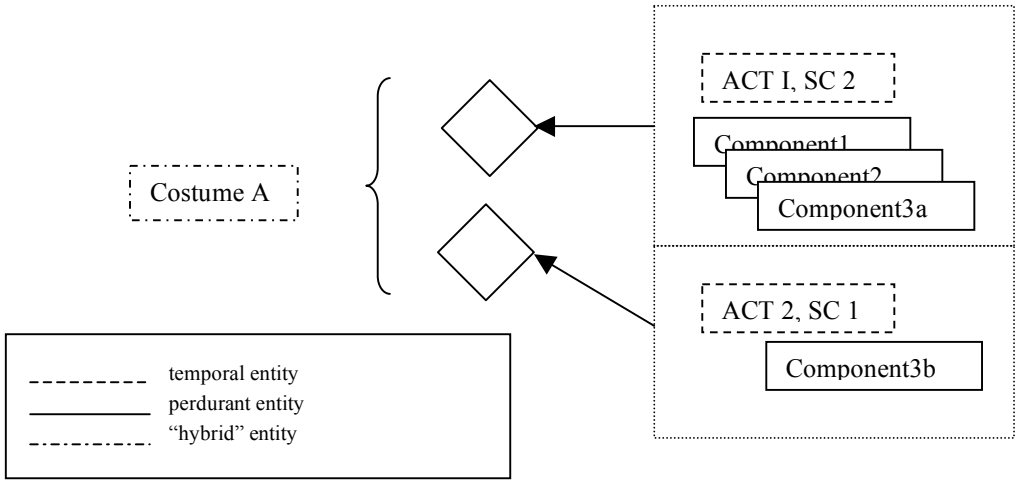

Fig. 2 – Radames Library O.O. model

3. CRM conceptualization towards interoperability

As described in sections above, the transformation from a relational model to an object oriented one has been implemented during the *Radames* project. Afterwards, the final aim is to try to define an interface to let our model (internally defined and not being a common accepted standard) interoperable with similar archives and studies worldwide in the field of performing arts. In this respect, the choice of CIDOC CRM as semantic reference model has been investigated.

According to Le Bœuf [LBF], "*the development of a conceptual model is a complex process […], time-consuming, and can be validated only by agreement of a group of participants who actually need such a model*".

As a consequence, in this case study the CIDOC CRM model has been used only to semantically interpret our internal model, rather than model the entire dataset in CIDOC CRM natively. In other words, we have tried to maintain our model for internal use, but exposing a CIDOC CRM compliant model for data exchange. The diagram below depicts the *Radames* conceptual approach from a CRM-oriented point of view:

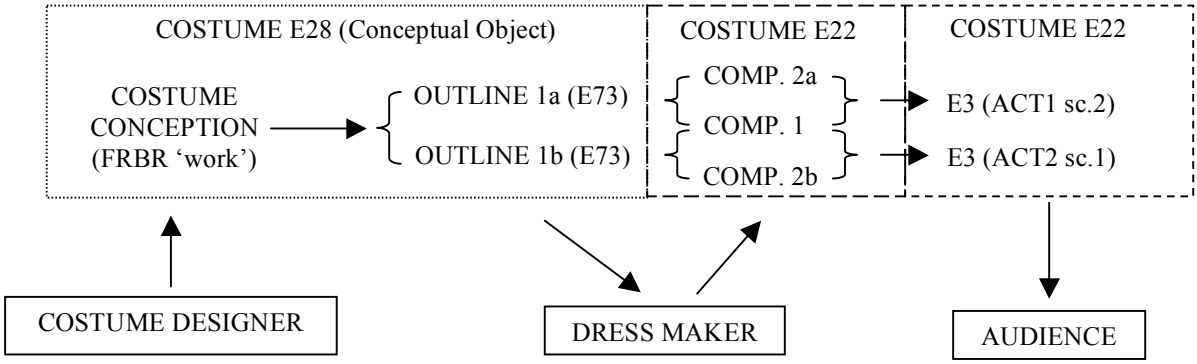

Fig. 3 – The costume from the different points of view

As shown in the example above, the Designer defines a *costume* as a unity with changes in its morphology (*significant*) that in turns determinates changes in its symbolism (*significance*). The costume is depicted in one or more outlines: E84 Information Carrier considered as physical object, while E73 Information Object from the point of view of the conception of the costume. Afterwards, the Dressmaker turns it into its three components. Onstage, the costume changes during the acts, while the audience still sees it as a unique entity changing its morphology and, consequently, its semantics (iconology). The same modifications bring iconological meanings.

In this paragraph, two mappings are described, as meaningful issues that came out during this process:

Author(s) of the costume and his(their) peculiar responsibility;
A costume is constituted by a (temporary) aggregation of *perdurant* components; this aggregation could change over the performance duration time.

First of all, a mapping between the main components identified above shall be described in terms of CIDOC CRM:
Costume: According to the discussion above, the costume can be identified as an entity belonging to class E22 Man-Made Object and as E28 Conceptual Object at conceptual level (same as work in FRBR model which is the base of the RADAMES approach);
Component: every component can be identified as "Physical Object" E19, "Man-Made Object" E22 or "Physical Man-Made Thing" E24, according to the actual nature of the component;
Author: every person that has a peculiar responsibility in the *costume "*life cycle": "person" entity E39 Actor is the most appropriate entity to be applied;
Every *scene, act, picture* should be identified as Period E4, with "falls within" (P9) and "consists of"(P10) properties for correct interpretation. E.g.: "Scene 1, Act 1" "falls within" "Scene 1".

Regarding example (1), what came out is that even if the act of creation is obviously time-dependant, the relation between the costume and the author tends to be constant if related to the performance timescale. Hence, a possible approach for the definition of the creational (at conceptual level: costume considered as E28 Conceptual Object) event is: E65 Creation P94 has created: E28 Conceptual Object where E65 Creation (E11) P14 carried out by E39 Actor P14.1 in the role of: costume designer (E55) Regarding the outlines as E73 Information Object: E65 Creation P94 has created: E73 Information Object where E65 Creation (E11) P14 carried out by E39 Actor P14.1 in the role of: costume designer (E55) The role of the costume designer in the outlines definition is: E84 Information carrier was produced by E11 Modification P14 carried out by E39 Actor P14.1 in the role of: costume designer (E55) The role of the dressmaker could be defined as follows: E22 was produced by E11 Modification P14 carried out by E39 Actor P14.1 in the role of: dressmaker (E55)

Example (2) is somehow more complex, since it involves a relation that can change over time. For example, at the beginning of the first act, the actor wears a costume with a white scarf, while some time later (e.g.: the beginning of act 2, picture 1) the scarf is red. According to section 1.3, if the outline is the same, then we have only one costume with two "variants". How can we describe such variation from the audience point of view? The solution adopted into the O.O. library was to define a type *VarianteCostume* (costume's variant) which relates a collection of

ComponenteIsolato to a period of the event. This approach allows to have two properties of the *Costume* class, each of them exposing the collection of the costume components, one of those (*ComponentiIsolati()* defined as an array of type *ComponenteIsolato*) which enumerates each components, the second (*VariantiCostumi()* defined as an array of type *VarianteCostume*) which enumerates components related with their actual "existence" onstage.
The scheme below tries to depict the O.O. library model in CRM terms:

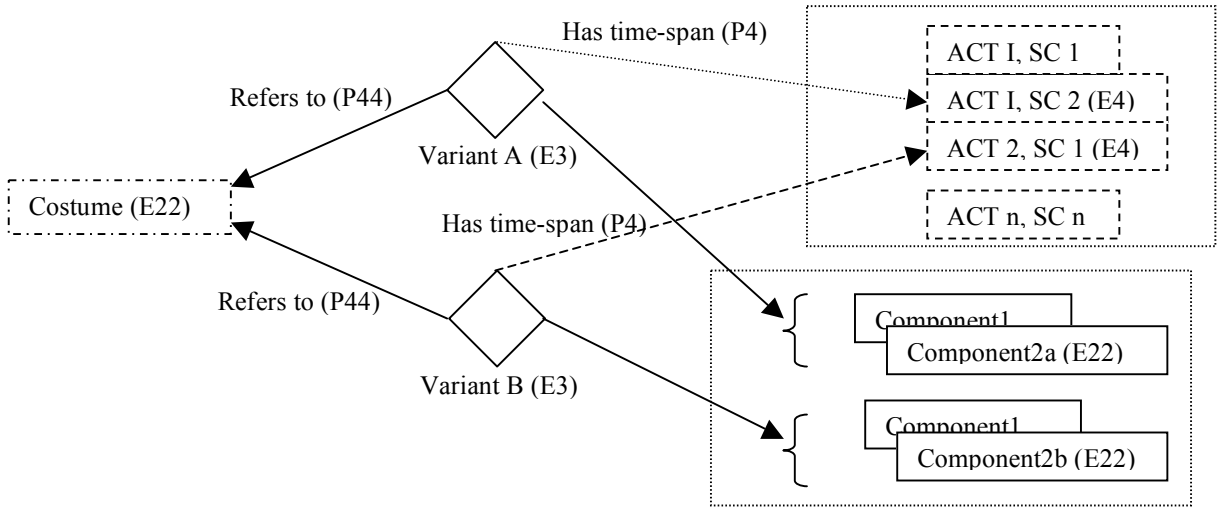

Fig. 4 – The O.O. library model with CRM terminology

The formalization in CRM class of the relations described above in terms of object type seems not to be so straightforward. A feasible solution seems to be switching from a collection of time related *perdurant* entities (defined in the RadamesLibrary as type *VarianteCostume*) to the definition of a *sequence of modification events* occurring to the costume during the time of the performance. Hence, the variation of the costume between the two acts could be properly described in CRM terms as follows:

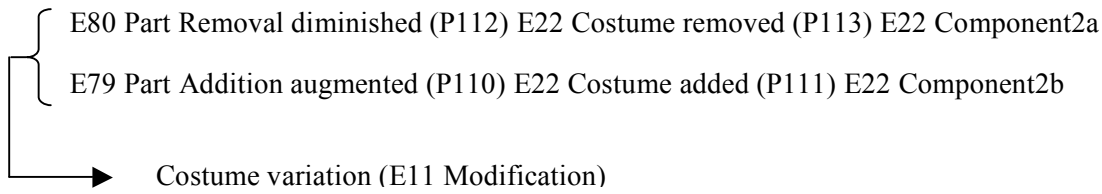

Fig. 5 – Costume variation definition in CRM terms

The different appearance of the E22 Costume from the dressmaker point of view vs. the audience point of view could be modeled as follows:

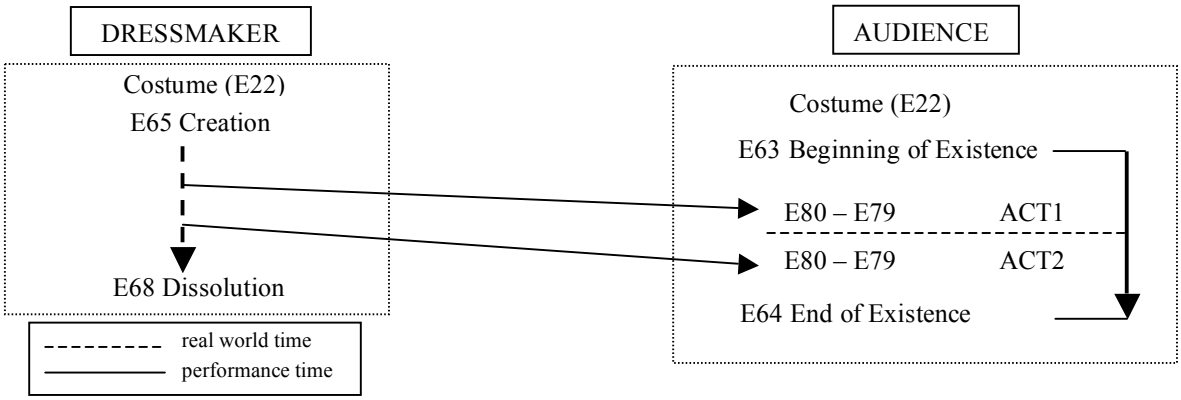

Fig. 6 – The costume from the different points of view in CRM terms

The implementation of a semantic interface for interoperability should then be able to declare the different approach of the two points of view when queried. If a remote user is interested in the material consistence of the costume, then the future Radames CRM Interface should adopt the dressmaker's point of view and reply with the entire collection of the components. Otherwise, if the user is interested in the costume in its existence onstage, then the system should adopt the "audience perspective", and reply with the costume described in its variations.

These simple examples show the difficulty of the conceptualization of performing arts evidences and aim to lead to further discussion among the research community to find a common way to face the evanescence in this field.

Beyond the conceptualization in CIDOC CRM of our O.O. model, a practical implementation of such a model is still to be defined. Current effort of CIDOC community in standardizing CIDOC format in RDFS [RDFS] seems to be a viable approach. Also, the undergoing harmonization between FRBR model, which is the base of the Radames model, and CRM, is expected to give useful indications for a first real implementation of the interoperability interface described in this paper.

4. Conclusions, future works and open issues

The theatrical costume, contrary to the modern and ancient cloths, is a material good that lives in a specific and peculiar context of use, which is the performing event. A costume description must attempt to settle, as much as possible, informative fragments pertinent to its existence onstage during a specific event, in which, the variations assume, in first place, an iconological result. A good cataloguing system, pertaining to the performing arts, should be able to formalize the dynamics of the good on the stage: this is one of the aims of the Radames project. This level of descriptive complexity introduces a considerable gap from the catalogue standards not based on the temporal coordinate (i.e. the VAC model), with important consequences in terms of

interoperability. Hence, the hypothesis of defining CIDOC CRM compliant interface for our model. This activity is expected to give two major results: a better formalization of our model in a standardized language and the capability of our system to exchange data with the outer world at a semantic level. As final result of this roadmap, there could be the creation of a documental system able to describe, even partially, some of the elements of the original context of use of the costume and then suitable to support a reconstruction of its existence onstage, even in a completely different environment, such as a museum.

5. References

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