# An ontological model for the representation of the Barranquilla Carnival as cultural heritage in a context-aware system*

## Un modelo ontológico para la representación del Carnaval de Barranquilla como patrimonio cultural en un sistema consciente al contexto

María Antonia Diaz – Mendoza **[1]
Jorge Eliecer – Gómez – Gómez ***
Emiro De La Hoz – Franco****

**Para citar este artículo / To cite this Article**
M. A. Diaz-Mendoza, J.E.G. Gómez, E De La Hoz-Franco, "An Ontological Model for the Representation of the Barranquilla Carnival as cultural heritage in a context-aware system", Revista de Ingenierías Interfaces, vol. 6, no.2, pp.1-21, 2023.

**Abstract**
The Barranquilla Carnival is the most important cultural expression of Colombia, declared as Oral and Intangible Cultural Heritage of Humanity by UNESCO in 2003. This paper proposes an ontological model for the management of the Carnival of Barranquilla as a measure of recognition worldwide in a context-aware system. The ontological model has 18 domains that relate the Barranquilla Carnival (Traditional Dances, Device, Environment, Dance Schools, Cultural Event, Cultural Managers, Interface, Location, Profile, People, Typical Characters, Typical Food, Preference, Network, Cultural Sites, Time and Clothing), evaluated by means of seven (7) situations that were described in natural language and SWRL (this language was used because it allows expressing concepts in OWL combined with RuleML). The proposed model can be used in other similar cultural expressions such as the Binche Carnival in Belgium, the Basel Carnival in Switzerland, the Oruro Carnival in Bolivia, the Recife Carnival in Brazil, the Podence Carnival in Portugal, among others that enjoy the recognition of cultural and intangible heritage of humanity.

*Artículo inédito: "An ontological model for the representation of the Barranquilla Carnival as cultural heritage in a context-aware system.".

** Universidad de la Costa CUC; mdiaz60@cuc.edu.co, ORCID: https://orcid.org/0000-0002-5742-0060, Barranquilla, Colombia.

*** Universidad de Córdoba; jeliecergomez@correo.unicordoba.edu.co, ORCID: https://orcid.org/0000-0001-8746-9386; Montería, Colombia.

**** Universidad de la Costa CUC; edelahoz@cuc.edu.co; ORCID: https://orcid.org/0000-0002-4926-7414; Barranquilla, Colombia

**Resumen**

El carnaval de Barranquilla es la expresión cultural más importante de Colombia, declarado como Patrimonio Cultural oral e Inmaterial de la Humanidad por la UNESCO en el año 2003. En este documento se propone un modelo ontológico para la gestión del Carnaval de Barranquilla como medida de reconocimiento a nivel mundial en un sistema consciente al contexto. El modelo ontológico cuenta con 18 dominios que relacionan el Carnaval de Barranquilla (Danzas Tradicionales, Dispositivo, Entorno, Escuelas de danzas, Evento Cultural, Gestores culturales, Interfaz, Localización, Perfil, Personas, Personajes típicos, Comidas típicas, Preferencia, Red, Sitios Culturales, Tiempo y Vestimenta), evaluado por medio de siete (7) situaciones que fueron descritas en lenguaje natural y SWRL (Se usó este lenguaje porque permite expresar conceptos en OWL combinado con RuleML). El modelo propuesto se puede usar en otras expresiones culturales similares como es el caso del Carnaval de Binche en Bélgica, el Carnaval de Basilea en Suiza, Carnaval de Oruro en Bolivia, Carnaval de Recife en Brasil, Carnaval de Podence en Portugal entre otros que gozan del reconocimiento de patrimonio cultural e inmaterial de la humanidad.

**Palabras clave:** Modelo ontológico, Contexto, Carnaval de Barranquilla, Patrimonio cultural, Web semántica.

## 1. Introduction

The Carnival of Barranquilla is considered the most important festival of the Colombian Caribbean and was declared oral and intangible cultural heritage of humanity by UNESCO in 2003 [1] thanks to the fact that it is a cultural manifestation where traditions and oral expressions converge, due to the fact that customs and traditions are passed from one generation to another through orality, where language is the main vehicle for the preservation of intangible cultural heritage, as well as the performing arts, which take force in each of the activities that make up this majestic festival, such as the Battle of Flowers, the great parade of tradition, among others, the social use of rituals and festive acts, such as the burial of Joselito, the knowledge and uses of nature and the universe and different traditional craft techniques that adorn the most representative event of the North Coast of Colombia. [2]

This document presents a proposal for a contextual awareness system for the management of the Barranquilla Carnival as oral and intangible heritage of humanity. This contextual awareness system allows the interaction of the users and the elements of the context that compose the proposal, which are: Traditional Dances, Devices, Environment, Dance Schools, Cultural Event, Cultural Managers, Interface, Location, Profile, People, Typical Characters, Typical Dishes, Preference, Network, Cultural Sites, Time, Clothing.

To understand the proposed model, it is necessary to know that the context is modeled by means of the semantic representation of an ontology, where properties and relations and instances are defined that are subsequently consumed by the context-aware system, which are processed by a reasoner by means of previously defined rules. Through the automatic

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acquisition of the context modeled by an ontology and the definition of inference rules, an intelligent system is created, capable of interacting with the environment and offering a variety of options for the carnival of Barranquilla to the different users and their profiles that are an intrinsic part of the context. [3]

The proposed model can be adapted to other cultural manifestations worldwide, such as the Binche Carnival in Belgium, the Basel Carnival in Switzerland, the Oruro Carnival in Bolivia, the Recife Carnival in Brazil, and the Podence Carnival in Portugal, among others.

**Related work**

For this section, a systematic review of the literature on the design of ontologies for cultural heritage was conducted, where a search was performed in the databases Scopus, Web of Sience, IEE Xplore and Science Direct, the keywords used in the search were the following: "Cultural Heritage", "Ontology"; "Technology", "context-aware"; resulting in the following search strings: "Ontological model and Cultural Heritage"; "Cultural Heritage and context-sensitive"; " Ontology And Cultural Heritage", in addition, articles that were Open Access between the years 2018 and 2022 were selected. As a result, 259 articles were obtained, finding 54 duplicates, finally analyzing 204 articles in total. The same review was used in [3].

Likewise, in [4] a literature review on technologies used for the preservation and dissemination of the cultural and intangible heritage of humanity is carried out, resulting in the conclusion that technology currently has resources and elements that allow the inclusion of technology as a tool to contribute to the preservation of cultural elements and intangible heritage.

Similarly, in [5] the most well-known ontological model related to cultural heritage is shown, called CRM CIDOC[2], which is a widely developed ontology that provides a semantic framework for the integration, mediation and access to CH information, can handle different types of information such as GLAMs[3], This model was evaluated for quality by ISO 21127 of 2006. The ontology has 99 classes and 188 properties.

In [3] an ontological model for the management of Colombian vallenato as a cultural heritage of humanity from an educational environment is presented, entitled "Vallenatic", this ontology was modeled in Protégé and has 15 domains (Vallenato Songs, Artist, Devices, People, Environment, Cultural Managers, Interface, Location, MOOC, Learning Object, Profile, Preference, Network, Cultural Time, Event, Cultural Sites).

Also, in [6] an ontology is presented for heritage sites in Iran, specifically the Sa'dabad complex, where elements of CIDOC CRM and GeoSPARQL (standard ontology for the geospatial domain) are taken. The purpose of this ontology is that any user can explore the

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[2] https:// www. CIDOC- CRM. Org/.
[3] This is the name given to articles published by Galleries, Libraries, Archives and Museums.

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heritage site of their choice with geospatial information. The model was developed in Protégé, composed of 2 superclasses: Entity by CIDOC CRM, with 15 subclasses and Spatial Object by GeoSPARQL with 5 subclasses, has 25 domains, with a hierarchy of 5 levels deep.

## 2. Methodology

### 2.1.Selected Methodology

A comparison of different methodologies for modeling ontologies is presented in [3] among which Uschold and King (1995) [7], Grüninger and Fox (1995) – TOVE Methodology [8], Kactus (1997) [9]; [10], Fernández-López, Gómez-Pérez and Juristo (1997) – Methontology [11] - [12], On-To-Knowledge (2001) [13], ONTOLOGY DEVELOPMENT 101, Noy y McGuinness (2001) – Simple knowledge-engineering methodology, NeOn Methodology (2010), Stuart (2016).

The selection of the appropriate methodology is a determining factor in the correct modeling of ontologies. In this case, the NeOn methodology [14] applied in different works [3] - [15]. was selected. This methodology arises from the need to fill the gaps that could not be filled by the three most known models up to that moment. Such as the concept of ontology network and the dimension of collaboration, context, and dynamism. [15]

The NeOn methodology comprises scenarios for ontology construction, the authors propose scenarios that are flexible and combinable, thus adaptable to different requirements for specific users.
In this sense, based on[15] the scenarios are the following:

- Scenario 1. Ontology network development from specification to implementation.
- Scenario 2. Ontology network development through reuse and reengineering of non-ontology resources.
- Scenario 3. Development of ontology networks through reuse of ontology resources.
- Scenario 4. Development of ontology networks through reuse and reengineering of ontology resources.
- Scenario 5. Development of ontology networks through reuse and mixing of ontology resources.
- Scenario 6. Development of ontology networks through reuse, mixing and reengineering of ontology resources.
- Scenario 7. Development of ontology networks through the reuse of ontology design patterns.
- Scenario 8. Development of ontology networks by reengineering ontology resources.
- Scenario 9. Development of ontology networks by localization of ontology resources.

In this case, scenario 1 applied in [3] is taken as a reference, which comprises the following tasks:

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1. Identification of the purpose, scope, and implementation language of the ontology 2.

2. Identification of the intended end users.

3. Identification of the intended uses.

4. Identification of requirements.

5. Requirements are divided into two types:

6. Non-functional requirements that refer to general aspects not related to the knowledge to be represented by the ontology.

7. Functional requirements that are content requirements related to the knowledge that the ontology must represent. These requirements must be written in the form of competency questions with their respective answers.
8. Grouping of functional requirements.

### 2.2. Task development

**Task 1**

**Purpose:** To represent the domains and types of contexts that influence the domains to adapt the behavior to an application to promote the carnival of Barranquilla as oral and intangible cultural heritage of humanity.

**Scope:** The ontology designed comprises the following domains:

- Traditional Dances
- Devices
- Environment
- Dance Schools
- Cultural Event
- Cultural managers
- Interface
- Location
- Profile
- People
- Typical characters
- Typical dishes
- Preference
- Network
- Cultural Sites
- Weather
- Clothing

**Implementation language:** The ontology is modeled using the Protégé software in the OWL language.

**Task 2**

**Identification of the intended end users:** The following intended users shown in Table I are established.

**Table I. Expected Users**

| | |
|---|---|
| **General users** | Various users |
| | Tourists |
| | Cultural managers |
| **Cultural managers related to the Barranquilla Carnival** | Schools |
| | Dancers |
| | Directors of dance schools |
| | Event organizers |
| | Government entities |
| | Representatives of foundations related to the Barranquilla Carnival. |

**Source**: Authors

**Task 3**

**Uses of the ontology:** The intended uses of the ontology are the following:

- Store and edit information about the users (General users, tourists)
- Stores and edits information about the context of users.
- Store and edit information about dance schools.
- Store and edit information about the devices that users can access.
- Store and edit users' network information.
- Store and edit location information.
- Store and edit users' environment information (Cultural Managers, Dancers).
- Store and edit user interface information.
- Store and edit information about cultural events associated with the Barranquilla Carnival.
- Store and edit information about user preferences, user profiles and user roles.
- Store and edit information about typical foods related to the Barranquilla carnival.

**Task 4**

**Identification of requirements**

- **Non-functional requirements**

Based on the review of other ontologies designed for similar purposes, two non-functional requirements are established: The ontology must be modular, and it must be in English.

- **Functional Requirements**

To determine the functional requirements, applying the NeOn methodology, competency questions were asked, and three (3) experts were used to divide the subdomains of the ontology.

**Task 5**

**Grouping of functional requirements:** in this case, it was not necessary to group requirements, since they are established by domains and sub-domains.

**Task 6**

**Validation of the set of requirements:** The functional and non-functional requirements validation process was carried out by the ontology development team (This team is made up of the three authors of the document).
Task 7

**Prioritization of the set of requirements:** in this step both functional and non-functional requirements are prioritized, in this sense, the two non-functional requirements are given the same priority.

Regarding the functional requirements, the following priority scheme is established:

**Priority 1:** Comprises the following domains: Traditional Dances, Environment, Dance Schools, Cultural Event, Cultural Managers, Location, Profile, People, Typical Characters, Typical Foods, Preference, Cultural Sites, Clothing.
**Priority 2:** Comprises the domain Time.
**Priority 3:** Comprises the domain Device.
**Priority 4:** Comprises the domain Interface and network.
**Task 8**

Extraction of terminology and its frequency: For this task a syntactic annotator was used, where words were extracted to be organized in a Word document and arranged in tables.

## 3. Results

### Ontology in Protégé

For ontology modeling we used the Protégé application[4], an open – source platform developed at Stanford University, which provides a set of tools for building domain models and knowledge-based applications with ontologies. This application has been used in different ontology modeling projects. [3] – [6] – [16] – [17] [18] – [19].

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[4] https://protege.stanford.edu/

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For this ontology, the version of Protégé used is 5.6.1. downloaded directly from the site https://protege.stanford.edu/products.php.

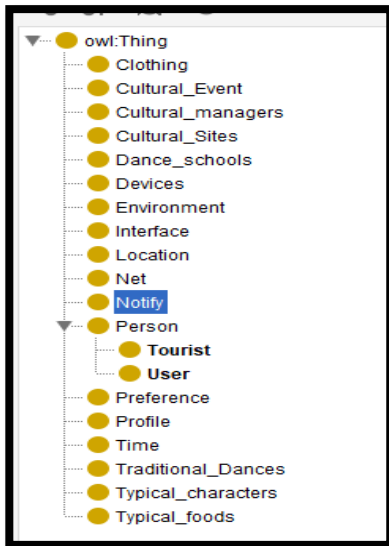Each of the domains constitute the classes in Protégé, as shown in Figure 1.



**Figure 1. Class**
**Source:** Obtained from the Protégé software.

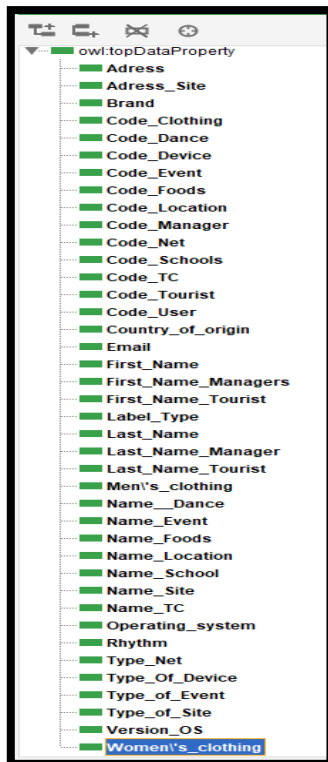In the same way, the data properties are configured as shown in Figure 2.



**Figure 2. Data property**
**Sourse:** Obtained from the Protégé software.

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The object properties show each of the relationships between the classes and subclasses of the model, the data properties correspond to the instances of the Ontology. The object properties are shown in Figure 3 and the relationships are shown in Table II.
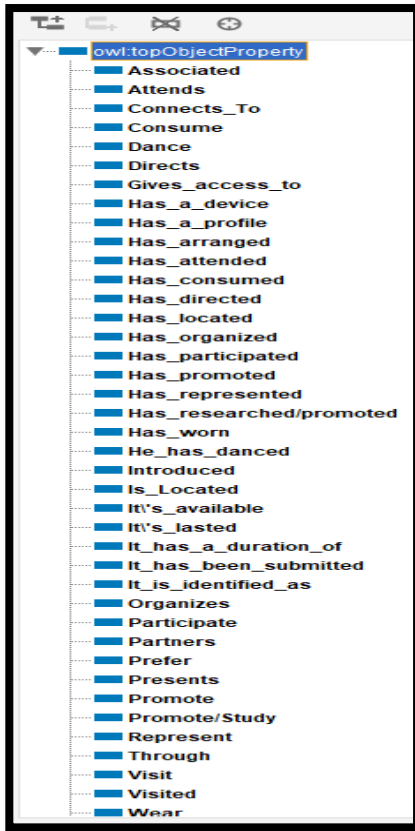


**Figure 3. Object Properties**
**Source:** Obtained from the Protégé software.

**Table II. Ontology Relationships.**

| Relation | Description | Domain | Rank |
|---|---|---|---|
| Access | Every device connects to a network | Device | Net |
| Attends | Everyone attends cultural events | People | Cultural Event |
| Dance | All the people dance the traditional dances | People | Traditional Dances |
| Consume | Typical Foods Are Eaten by People | Typical Foods | People |
| Directs | Cultural Managers Run Traditional Dance Schools | Cultural Managers | Traditional Dances |

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| Localized Device | All devices have a location | Device | Localization |
|---|---|---|---|
| Teach | Traditional dances are taught in dance schools | School of Dance | Traditional Dances |
| It's available | Every Network has an environment | Net | Environment |
| Localized Cultural Manager | All Cultural Managers have a location | Artist | Localization |
| Has Lasted Event | Every cultural event has a duration | Cultural Event | Time |
| Dance Has Lasted | Every traditional dance has a duration | Traditional dance | Time |
| Organizes | Every Cultural Manager organizes Cultural Events | Cultural Managers | Cultural Event |
| Participate | All dance schools participate in cultural events | School of Dance | Cultural Event |
| Person Located | Every person has a location | People | Localization |
| By means of | Any cultural event can be followed by means of a device | Device | Cultural Event |
| Prefer | Every person, dance school, cultural manager has preferences | People Dance School Cultural Managers | Preference |
| Promote | All cultural managers promote typical foods | Typical Foods | Cultural Managers |
| Promote/Study | All cultural managers promote and/or study traditional dances | Cultural Managers | Traditional Dances |
| Represent | All the typical characters represent the traditional dances. | Typical characters | Traditional Dances |
| Partners | Every device is associated with an Interface. | Interface | Device |
| Introducing themselves | Every dance school performs at a cultural event | School of Dance | Cultural Event |

| | | | |
|---|---|---|---|
| Has device | Every person, cultural manager, has a device that allows them to interact with the context. | Cultural Managers | Device |
| Has a profile | Every person, cultural manager, dance school has an identification | Cultural Managers | Profile |
| Use | Every traditional dancer and typical character wears traditional dress | Traditional Dance Typical Character | Dress |
| Visit | Everyone visits the cultural sites | People | Cultural Sites |

Fuente: Authors

Using the Ontograf tab of the Protégé application, the ontology graph showing the classes and their relationships is obtained.
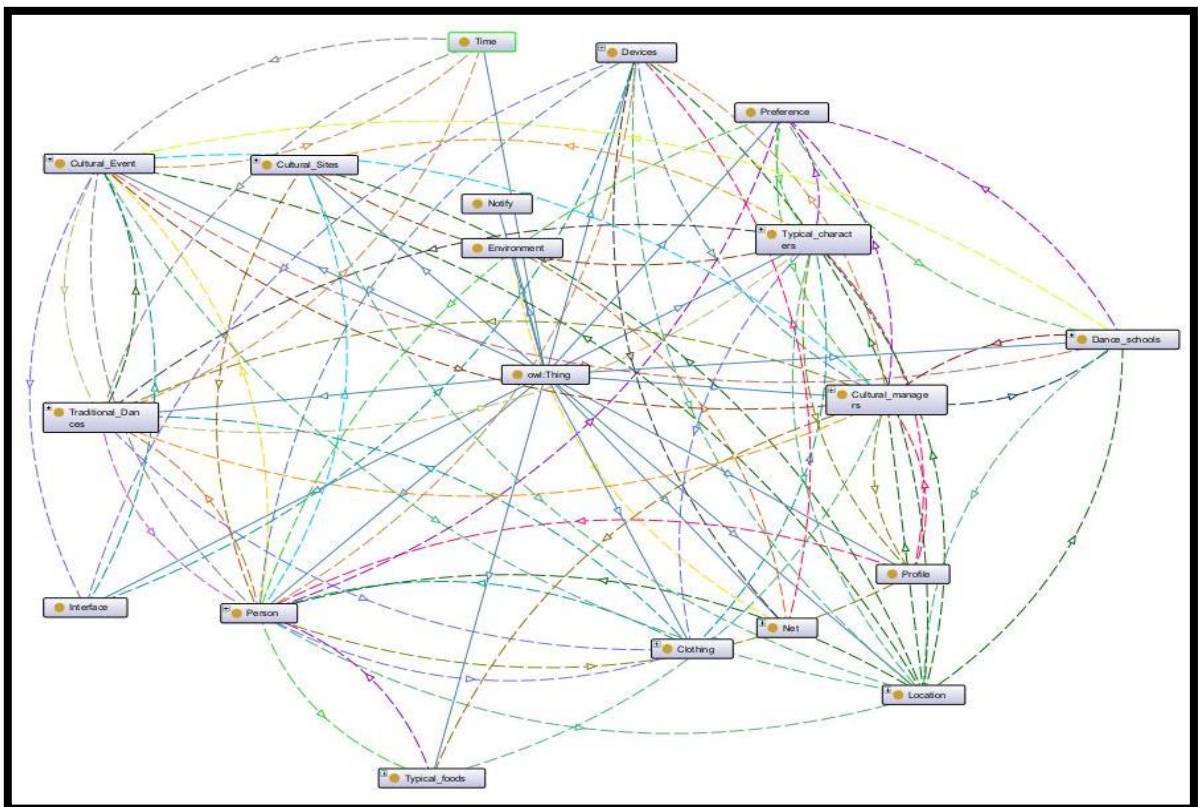


**Figure 4. Ontology in Protégé**
**Source:** Obtained from the Protégé software.

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**Situations or behaviors for a management environment of the Barranquilla Carnival supported by contextual awareness.**

The following are the situations described by the ontology:

1. A tourist visits a cultural site associated with the Barranquilla carnival.
2. A dance group from school X performs at a cultural event CB.
3. A tourist attends a cultural event where a dance group from school X performs.
4. Several traditional dance schools perform at a cultural event.
5. A cultural manager organizes a cultural event where different traditional dance schools perform.
6. People research information about the carnival of Barranquilla from their devices by reading NFC tags, QR codes located in different cultural sites.
7. Tourists research about traditional dances from their devices.
8. People located in a U location check the location of cultural events related to Barranquilla carnival.
9. The system assists the tourist on information about cultural events related to the Barranquilla Carnival of their preference.
10. The system helps people to find the location of the cultural sites of their preference.
11. The system helps people to locate the traditional dance schools of their preference.
12. The cultural manager organizes a cultural event related to the Carnival of Barranquilla, which can be a folkloric event, parade of floats, popular parade.
13. The traditional characters show their costumes from their devices.
14. The cultural managers direct the dance schools that perform in the cultural events of the Barranquilla Carnival.
15. A cultural site has a location.
16. A cultural event has a location.

**Ontology evaluation by means of SWRL rules.**

To evaluate the correct functioning of the modeled ontology, rules are established and expressed in natural language and SWRL. In this section, 7 (seven) situations established in the previous section are shown and evaluated using Protégé's Pellet reasoner. The SWRL language was used because it allows expressing OWL concepts in combination with RuleML. [20]

**Situation 1:** A tourist visits a cultural site associated with the Barranquilla carnival.

**Rule 1:** Any tourist visits a cultural site associated with the Barranquilla carnival.

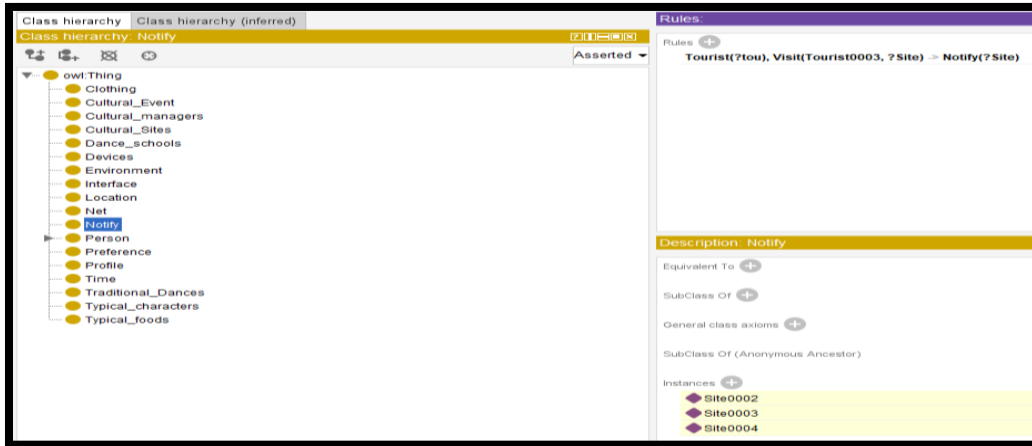*Tourist(?tou), Visit(Tourist0003, ?Site) -> Notify(?Site)*

**Figure 5.** Result Rule 1.
**Source:** Obtained from the Protégé software.

Figure 5 shows the results obtained from the situation presented, where the tourist (*Tou0003*) visits three tourist sites related to the Barranquilla Carnival (*Site0002, Site0003, Site0004*).

**Situation 2:** Several schools attend a cultural event related to the Carnival of Barranquilla.

**Rule 2:** Several schools are participating in the Event (*Event0001*).

*Dance_schools (?sch), Cultural_Event(?event), Participate (?sch, Event0001) -> Notify(?sch)*
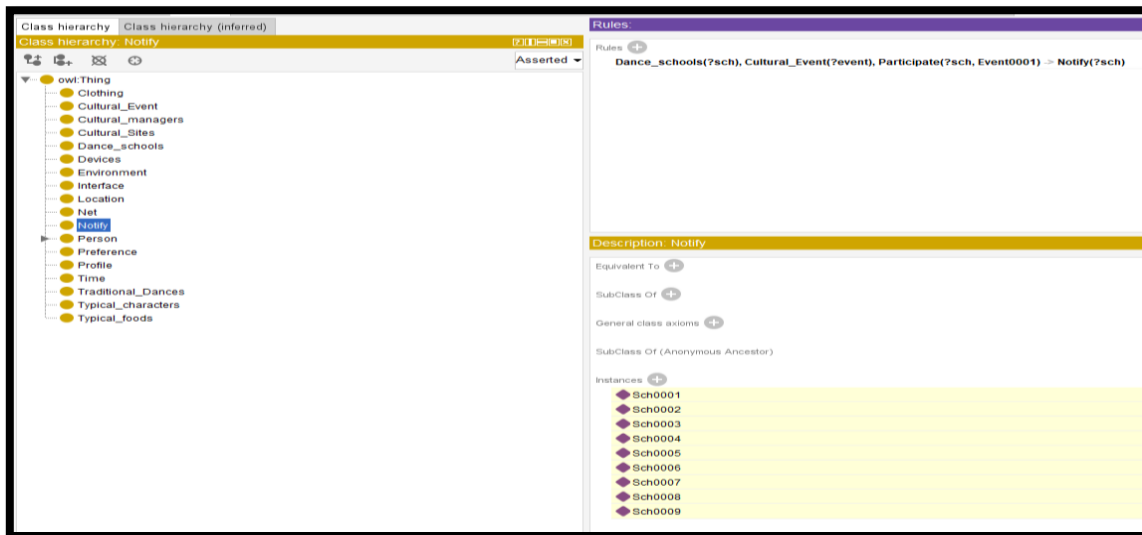


**Figure 6.** Result Rule 2.
**Source: Obtained from the Protégé software.**

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Figure 6 shows the result obtained from the presented situation, where it is visualized that to the Event (*Event0001*) the dance schools (*Sch0001, Sch0002, Sch0003, Sch0004, Sch0005, Sch0006, Sch0007, Sch0008, Sch0009*) are presented.

**Situation 3:** A tourist attends a cultural event where a dance group from X school performs.

**Rule 3:** A tourist attends an Event0003 cultural event related to the Carnival of Barranquilla where some traditional dance schools are performing.

*Tourist(?tou), Cultural_Event(?event), Attends(?tou, Event0003), Dance_schools(?sch), Participate(?sch, Event0003) -> Notify(?tou), Notify(?sch)*
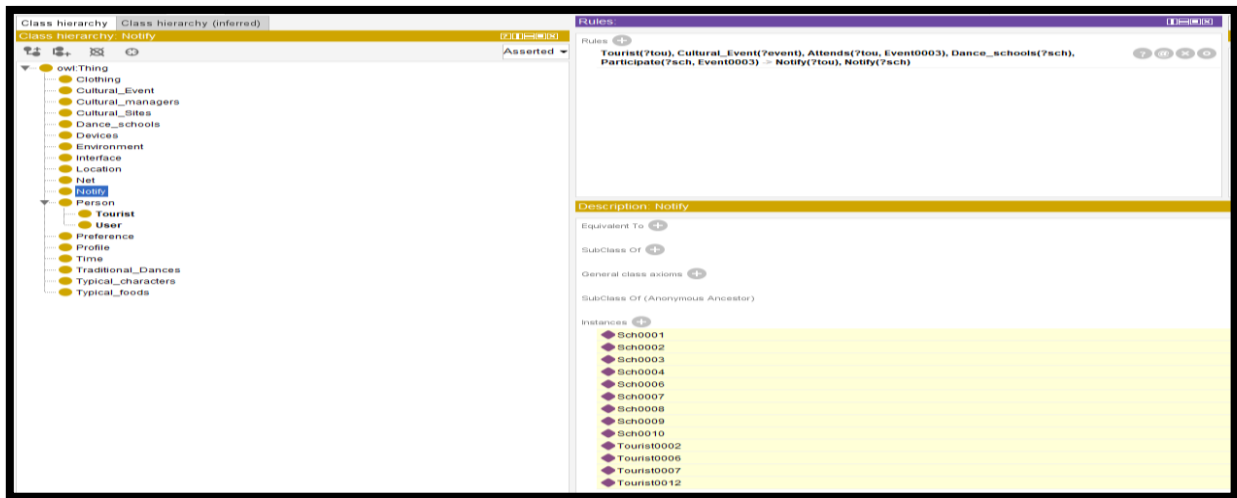


**Figure 7. Result Rule 3.**
**Source:** Obtained from the Protégé software.

Figure 7 shows the result obtained from the situation presented in rule 3, where it is visualized that at the Event (*Event0003*) the dance schools (*Sch0001, Sch0002, Sch0003, Sch0004, Sch0005, Sch0006, Sch0007, Sch0008, Sch0009* and *Sch0010*) where the Tourists (*Tourist0002, Tourist0006, Tourist0007, Tourist0012*) were present.

**Situation 4:** A dance group from school X performs at a CB cultural event.

**Rule 4:** A *Sch0001* dance school is presented at a cultural event related to the carnival of Barranquilla.

*Dance_schools (?sch), Cultural_Event (?event), Has_participated (?event, Sch0001) -> Notify (?event)*
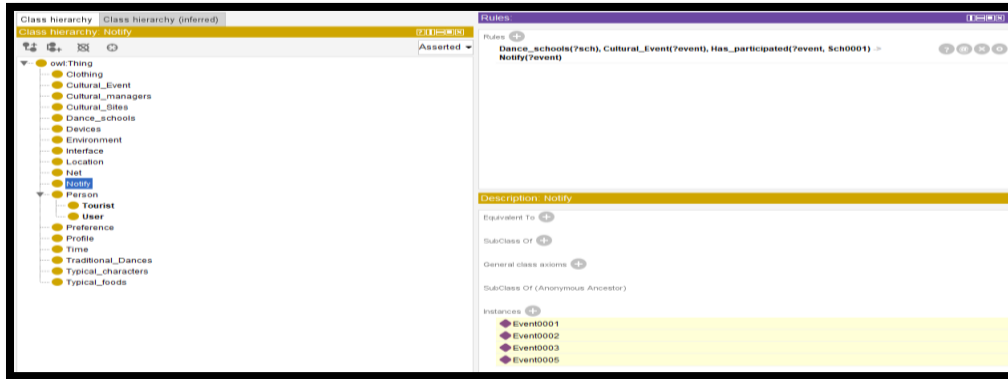
**Figure 8. Result Rule 4.**
**Source:** Obtained from the Protégé software.

As shown in Figure 8 the dance school *Sch0001* is presented in events *Event0001, Event0002, Event0003* and *Event0005*.

**Situation 5:** A cultural manager runs a dance school AND participates in a cultural event related to the Barranquilla Carnival.

**Rule 5:** A cultural manager runs the Sch0001 dance school that participates in a cultural event related to the Barranquilla Carnival.

*Cultural_managers (?man), Dance_schools (?sch), Directs (Sch0001, ?man), Dance_schools (?sch), Cultural_Event (?event), Has_participated (?event, Sch0001) -> Notify (?man), Notify (?event)*
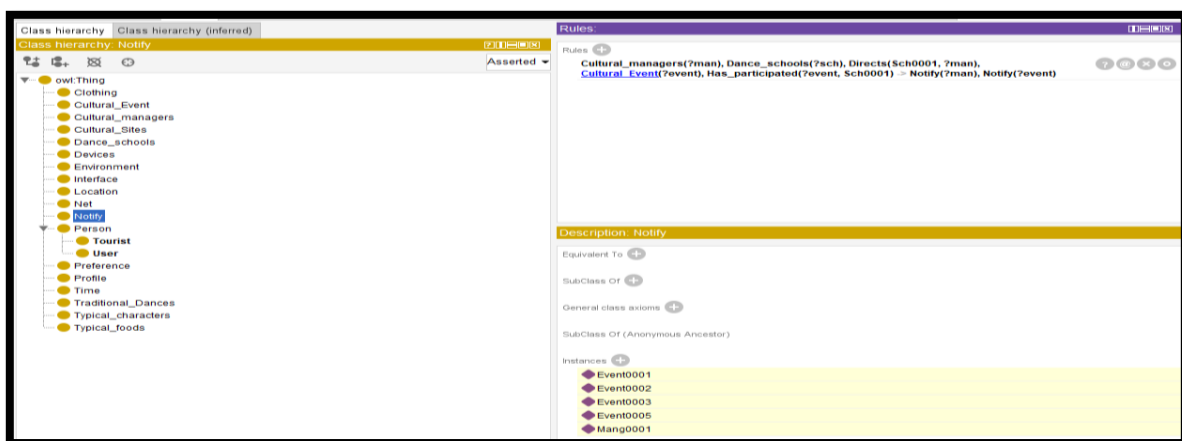


**Figure 9. Result Rule 5.**
**Source:** Obtained from the Protégé software.

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Figure 9 shows that the dance school *Sch0001* is presented in the events *Event0001, Event0002, Event0003* and *Event0005* and is managed by the cultural manager *Mang0001*.

**Situation 6:** Tourists and users visit the X cultural sites related to the Barranquilla carnival.

**Rule 6:** Tourists and users visit the cultural site Site0001 related to the Barranquilla Carnival.

*Tourist(?tou), Cultural_Sites(?site), Visited(Site0001, ?tou), User(?user), Visited(Site0001, ?user) -> Notify(?user), Notify(?tou)*
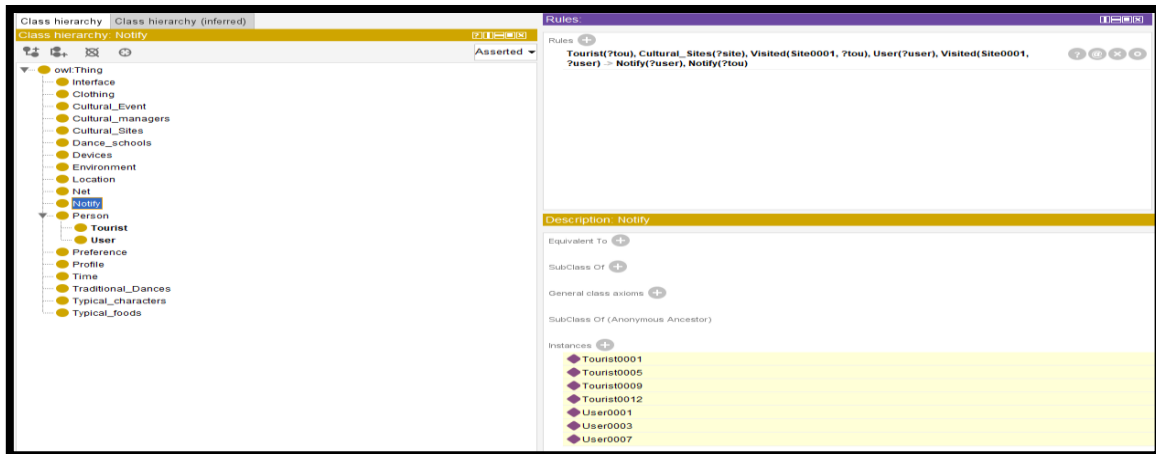


**Figure 10. Result Rule 6.**
**Source:** Obtained from the Protégé software.

Figure 10 shows that the cultural site *Site0001* is visited by Tourist: *Tourist0001, Tourist0005, Tourist0009* and *Tourist0012*, as well as Users: *User0001, User0003, User0007*.

**Situation 7:** People research information about the Barranquilla carnival from their devices by reading NFC tags, QR codes located in different cultural sites.

**Rule 7:** Tourists and users research information about the Barranquilla carnival from their devices by reading NFC tags, QR codes located in different cultural sites.

*Tourist(?tou), Cultural_Sites(?site), Visited(Site0001, ?tou), User(?user), Visited(Site0001, ?user), Tourist(?tou), Devices(?devnfc_QRcode), Through(?devnfc_QRcode, ?tou), User(?user), Through(?devnfc_QRcode, ?user) -> Notify(?devnfc_QRcode), Notify(?user), Notify(?tou)*
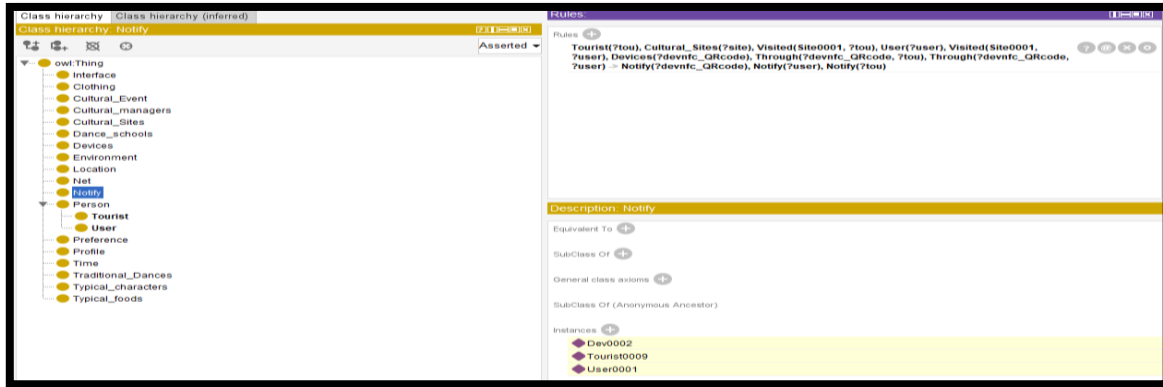
**Figure 11. Result Rule 7.**
**Source:** Obtained from the Protégé software.

**Comparison of the proposed ontology model with other ontologies**

This section presents a comparison of the proposed model with other ontologies previously proposed for the management of cultural heritage as is the case of the Carnival of Barranquilla.

The criteria used to perform the comparison of the classes in each context model are those used in[3] which constitute the following:

- Explicit definition of the class in the context model (✓).
- Explicit definition of the class through subclasses in the context model (✓/).
- Partial definition of the class through a single class or subclass contained in the model (P)
- Partial definition of the class through the different classes or subclasses contained in the model (P/)
- Class not explicitly or partially defined (X)

Table III shows the comparison of the proposed ontology model with other ontologies for cultural heritage.

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**Table III.** Comparison of the proposed ontology model with other ontologies.

| Ontological model | Purpose | Traditional Dances | Devices | Environme | Dance | Cultural | Cultural managers | Interface | Location | Profile | Person | Typical characters | Typical | Preference | Net | Cultural | Time | Clothing |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ArCo (Knowledge Architecture) [21] | Create a network of ontologies to represent cultural heritage data and publish the General Catalogue proposed by the Italian Ministry of Culture. | ✓ | X | ✓ | X | ✓ | P | ✓ | ✓ | X | P | X | ✓ | X | X | ✓ | X | X |
| MUM [22] | It is an ontology for the management of cultural heritage, it takes classes from the following Ontologies: CIDOC CRM, EDM, ORE[5], FOAF,[6] DC[7] and SKOS[8]. | ✓ | X | X | X | ✓ | P/ | X | ✓ | X | ✓ | X | X | X | X | ✓ | ✓/ | X |
| Curiocity (Cultural Heritage for Urban Tourism in Indoor/Outdoor Environments of the CITY) [19] | Designed to represent knowledge of cultural heritage based on UNESCO definitions. | X | P/ | P/ | X | P/ | X | X | ✓ | ✓/ | ✓ | X | X | X | X | ✓ | ✓/ | X |
| CIDOC CRM. [5] | It is the largest and most complex ontology in terms of cultural heritage, with 99 classes and 188 properties. | ✓ | X | ✓/ | X | P/ | X | P/ | P/ | P/ | ✓ | X | P/ | P/ | X | ✓ | P/ | ✓ |
| Vallenatic [3] | An ontological model for the representation of vallenato as cultural heritage in a context | X | ✓ | ✓ | X | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | X | X | ✓ | ✓ | ✓ | ✓ | X |
| Proposed model | An ontological model for the representation of the Carnival of Barranquilla as an oral and intangible heritage of humanity. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

Source: Authors

[5] https://www.openarchives.org/ore/1.0/datamodel
[6] http://www.foaf-project.org/
[7] https://www.dublincore.org/specifications/dublin-core/dces/
[8] https://www.w3.org/2004/02/skos/

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As shown in Table III, no ontological model was found in the literature review that includes the classes proposed in this model.

## Conclusions

This document contains an ontological model proposed for the preservation and dissemination of the Barranquilla Carnival as oral and intangible heritage of humanity. For its development, the NeOn methodology was implemented, specifically scenario I.

The model is composed of the following elements of the context: Traditional Dances, Device, Environment, Dance Schools, Cultural Event, Cultural Managers, Interface, Location, Profile, People, Typical Characters, Typical Food, Preference, Network, Cultural Sites, Time and Clothing.

The ontology was modeled using Protégé software version 5.6.1.
Rules were implemented for the validation of the model, which were tested using the Pellet reasoner of the Protégé application. In addition, a comparison was made with other models already implemented, where it could be seen that there is no ontological model like the one proposed in this work.

## Future Work

As future work, the authors propose to implement other means of ontology evaluation, such as a panel of experts. Likewise, it is proposed to continue with the execution of the rules that were not implemented in this document.

Finally, it is proposed that this model could be replicated for other cultural manifestations recognized by UNESCO as intangible cultural heritage of humanity, such as the Carnival of Binche in Belgium, the Carnival of Basel in Switzerland, the Carnival of Oruro in Bolivia, the Carnival of Recife in Brazil, the Carnival of Podence in Portugal, among others.

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