

CrossRef DOI of original article:

# Semantic Web Model to Contact Music Bands in Bogotá, Colombia

Ana Maria Lopez Barrera

*Received: 1 January 1970 Accepted: 1 January 1970 Published: 1 January 1970*

---

## Abstract

This research shows the development of a semantic web model whose objective is to create a knowledge base of traditional groups and music genres of the city of Bogota, the method in which the information is transmitted to and from the knowledge base created is through the use of an API based on REST architecture, which uses the HTTP protocol, this information is presented in a web portal. Visitors and users who visit the portal can carry out searches that are based on SPARQL, to contact music groups according to a series of filters such as: geographical location, music genre, market background, rates among others, this project becomes a digital alternative for musical groups in the city of Bogota to promote their services and provide a virtual channel of contact quickly and safely, this aims to improve the quality of life of members of musical bands.

---

*Index terms*— semantic web, ontology, apache jena, SPARQL, ontological model.

## 1 I. Introduction

The Semantic Web's ability to organize information, ensuring more accurate searches by meaning and not by textual content, is one of the advantages of the Semantic Web. [1], this strength can be used to create a knowledge base of the traditional genres and groups of the city of Bogota from an Ontology, however, one of the biggest challenges in building it is the informal nature of this economic activity, since there is no website where the musical groups are registered, neither is there an official census by government entities of the groups, Although there are approximate data from 2006 [2] and 2012 [3] and a Colombian Popular and Artistic Movement (MOPAC) which attempted to bring together these artists, there are no exact information, considering that it is easy for a group of artists to create a new group just by inviting colleagues to be part of it, as it is also true that, as a result of discussions among their members, musical groups may disappear.

As a result of the informality previously described and that in the city of Bogotá, citizens frequently contact musical groups to celebrate special dates and events, it is in certain circumstances a complex task to contact them, given that most of these musical groups at the time of offering their services do so through traditional channels such as: business cards, advertising on billboards, posters in the streets, few have their own website, do not make efficient use of social networks and often have outdated contact information, these shortcomings were the ones that motivated the development of a semantic web model which creates a knowledge base on the genres and traditional musical groups in the city of Bogota, such information is displayed on a website, so that both users and musical groups can offer or take the service.

This paper is divided into the following parts: section 2 presents the theoretical framework where the main concepts of the research are presented, the methodology for the construction of the semantic model is presented in section 3, section 4 shows the results obtained, and finally, the conclusions of the research are shown in section 5.

## 2 II. Theoretical Framework

For the development of the Semantic Web model, it is relevant to show that it uses a set of protocols and components which make its implementation and use possible [4]. Figure 1 shows how these technologies work together, which is commonly called a Stack of protocols.

45 The main part in the construction of this model is the creation of the ontology, which is a fundamental piece  
 46 in the construction of the Semantic Web, since it allows to add semantics to concepts of a knowledge domain  
 47 and to create a hierarchy of concepts. Ontologies are defined as extensions of the RDF (Resource Description  
 48 Framework) branch, but mainly the OWL language (Ontology Web Language) is used. [4], in turn an ontology  
 49 has five types of components T © 2022 Global Journals Year 2022 ( ) J Fig. 1: Stack of Semantic Web protocols,  
 50 taken from [4] which are: classes, relations, formal axioms, instances and concepts. [5] Several methodologies  
 51 exist to design, develop and manage ontologies, some of the most widely used are SENSUS, which is a Top-Down  
 52 approach to derive domain-specific ontologies from large ontologies; in this methodology, a set of seed terms  
 53 that are relevant in a particular domain are identified. Such terms are manually linked to a broad coverage  
 54 ontology, users automatically select the relevant terms to describe the domain and narrow down the ontology,  
 55 this algorithm returns the set of hierarchically structured terms to describe a domain, which can be used as a  
 56 skeleton for the knowledge base [6].

57 The ACO methodology, is a methodology for automatic ontology construction supported by natural language  
 58 processing and machine learning techniques, which was inspired by existing manual methodologies for ontology  
 59 construction. [6] The Methontology methodology was developed by the Polytechnic University of Madrid and  
 60 is one of the most complete ontology methodologies, because it has its roots in the activities identified by the  
 61 software development process proposed by the IEEE [7]. it also allows creating new ontologies or reusing others.

62 Methontology is composed of activities for project planning, result quality, documentation, a life cycle based  
 63 on evolved prototypes and the methodology itself, which specifies the steps to be executed in each activity, the  
 64 techniques used, the results to be obtained and their form of evaluation, [8], this methodology proposes the  
 65 following stages: specification, conceptualization, formalization, implementation and maintenance.

66 There are many other existing methodologies for the design and construction of Ontologies, however, in the  
 67 present research it is decided to use Methontology given the large existing bibliographic material, in addition  
 68 it has been recommended as a methodology for the construction of ontologies by the Foundation of Intelligent  
 69 Physical Agents. [7]

### 70 3 a) Specification

71 In This first activity aims to find out why the ontology is being built, what its use will be and who will be the  
 72 end users. In response to these questions, we propose an ontology to create a knowledge base of the traditional  
 73 musical genres of the city of Bogota, in order to present them on a Web portal, so that the members of these  
 74 groups can offer their services and update their contact information constantly.

### 75 4 b) Conceptualization

76 This activity seeks to organize and build the informal perception of the domain in a semi-informal specification,  
 77 for this purpose the methodology proposes a series of 11 tasks, in a non-sequential order [7], the present research  
 78 shows the development of the most important tasks.

### 79 5 c) Formalization

80 This activity aims to transform the conceptual model previously developed to the formal model, to achieve this  
 81 goal we used the ontology editor Protégé version 5. 2, this is an open source editor, it was developed by Stanford  
 82 University, it provides the necessary tools for the development of ontologies on the web [10], the first step in the  
 83 construction of the ontology was the creation of hierarchical classes, as shown in figure ??, For example, it is  
 84 observed that mariachi is a subclass of a musical genre of Mexican origin, which is disjunct with its counterpart  
 85 of norteña type and in turn with those of Colombian origin, this means that if a musical group belongs to the  
 86 mariachi genre, it cannot belong to a vallenato group or any other.

87 Task 1 and 4, Glossary and dictionary of terms, are built by the terms of interest of the present research, Table  
 88 ?? shows the elements, concepts and essential attributes that are used as a basis for the construction of Source:  
 89 the author Fig. ??: Diagram of binary relationships Task 6, attributes of the instances, in Table 2 will describe  
 90 how each of the instances of the ontology will be defined and what their predefined values will be. Task 9, formal  
 91 axioms, a musical genre has a unique origin, moreover this origin is unique, this is to simplify the model and  
 92 make the relationships simpler.

### 93 6 d) Implementation

94 This activity aims to transform the conceptual model. This activity illustrates the final result of the formal  
 95 model developed. Fig. ??, shows the summary of the Ontology developed thanks to the OntoGraf tool, which is  
 96 included in the Protégé editor, version 5.2.

## 97 7 Fig. 5: Ontology Overview in OntoGraf

98 Once the ontology was developed, it was exported in OWL format, and deployed in the Apache Jena ontology  
 99 server, which allows the entry of instances to the ontology created, the advantages of using this server is that it  
 100 serves as an inference engine to reason about ontologies, provides compatibility of queries with different SPARQL

---

101 specification and allows to persist the data in a relational base [9], this server will be responsible for storing the  
102 information of each musical group that is registered in the web portal, which will be known as a new instance, it  
103 stores information of Year 2022 ( ) J the ontology and constitute the terms of interest of the domain.

## 104 **8 Table 1: Glossary and dictionary of terms**

105 Task 2, Taxonomy of concepts, Figure ?? shows the hierarchy of concepts that was defined and created from the  
106 glossary of terms of the domain.

## 107 **9 Source the author**

### 108 **10 Vallenato**

109 It is a Colombian musical genre; its main instrument is the accordion.

### 110 **11 Trio**

111 It is an unknown origin musical genre, its main instruments are the guitar and the voice, in the present  
112 investigation it will be assumed that it is originally from Colombia.

### 113 **12 Llanera**

114 It is a Colombian and Venezuelan musical genre, whose origin dates back to the 19th century, its main instruments  
115 are the harp and maracas.

116 the group such as: genre to which it belongs, description of the band, contact number, price of the service,  
117 geographic location and a manager. After creating the class hierarchy, the properties of the objects were created,  
118 which describe relationships between individuals, the next step was to describe the data properties, for fields  
119 such as price, contact number, description, manager and other data described in table 2.

120 Finally, we validated that the Ontology created does not contain syntax or logic errors, for which we used a  
121 tool that is included in the Protégé editor called Reasoner.

## 122 **13 IV. Results**

123 In order to allow the members of the different traditional musical groups of the city of Bogota to offer their services,  
124 a Web portal was developed, using the framework developed by Google Angular, version 6, a registration form  
125 was designed requesting a description of the musical group, genre to which it belongs, years of career in the  
126 market, contact number and name of the manager of the band, the geographic location is taken using GPS either  
127 from the Web browser or the cell phone.

128 When the grouping finishes the registration in the Web Portal, the form data is sent using the HTTP protocol  
129 in the PUT operation, this information is inserted in the ontology previously created that is in the Apache Jena  
130 server, each band that is registered in the portal is a new instance in the ontology, this information is stored, in  
131 the same way when a user wants to perform a search a GET request is made which is processed by the server  
132 who performs a SPARQL query that returns the data which is displayed in the Web portal, ??ig 6, shows the  
133 architecture of the server which is always listening to requests via HTTP and depending on the operation a  
134 SPARQL CRUD is performed.

## 135 **14 V. Conclusion**

136 The use of an ontology instead of a traditional relational database allows the creation of inference rules in the  
137 portal, since the creation of concept relations and a hierarchy of classes generates explicit knowledge that can be  
138 processed by computers.

139 When using Protégé as a tool in the construction of the Ontology and apache Jena as a server, it is recommended  
140 to use Java technology to insert, update and read data since they are written in this language and could generate  
141 compatibility errors or make the software development even more complex.

142 The use of the ontology allows enriching and adding metadata which adds information that is presented in  
143 the portal, allows the information to be extensible, in the future new musical genres can be added, to enrich the  
144 information shown in the Web Portal.

145 The ontology created contains the existing relationships between the groups and the musical genres to which  
146 they belong; therefore, a musical group cannot belong to two different musical genres and each musical genre  
147 can only belong to one origin, thus simplifying the ontological model, although a musical genre may have one or  
148 several shared origins.

149 It is planned to develop a version of the portal in a productive environment so that it can be used by more  
150 users and musical groups in the city of Bogotá, since in the present research a functional prototype was developed  
151 in a local server.

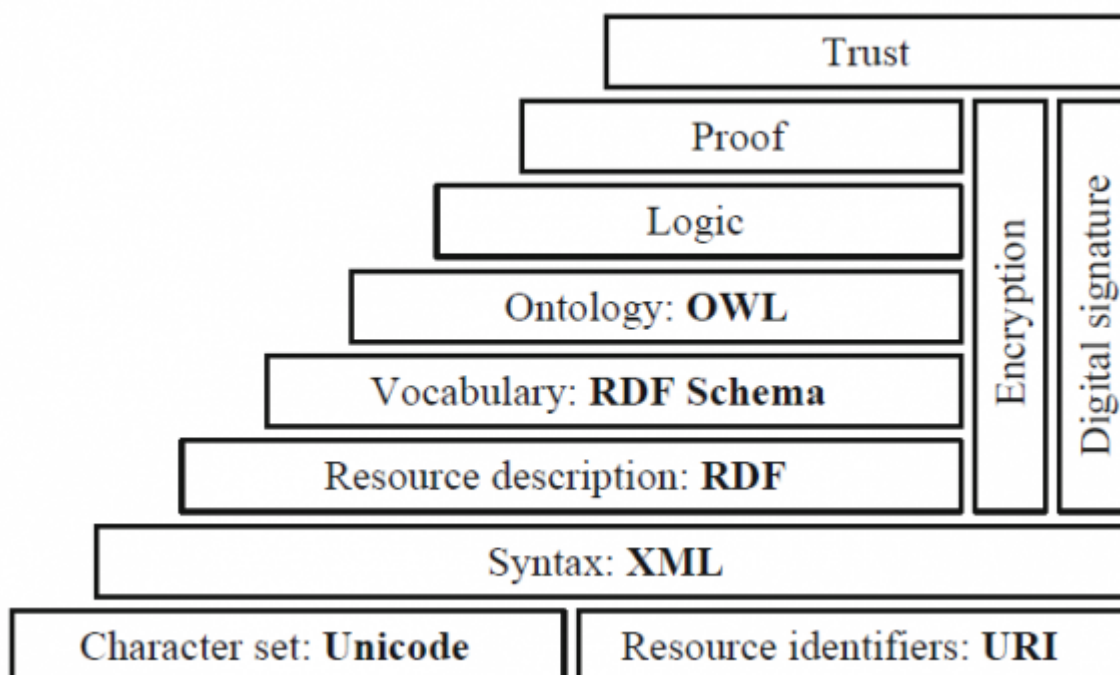
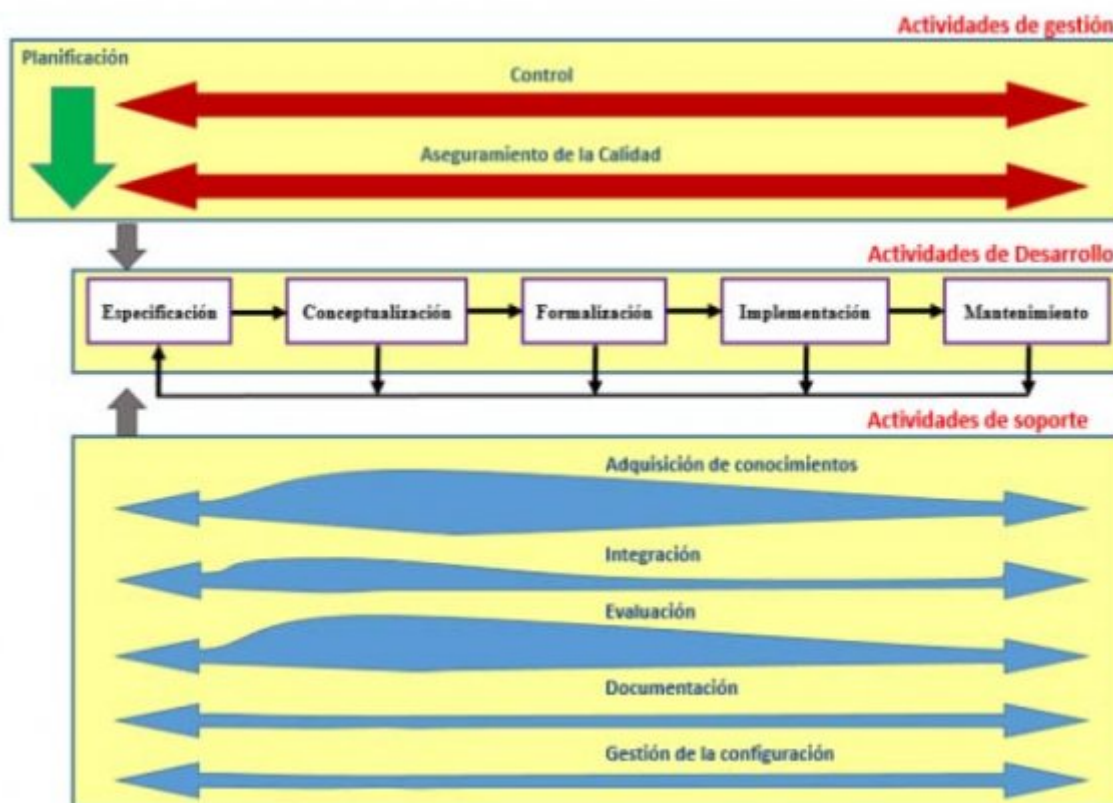
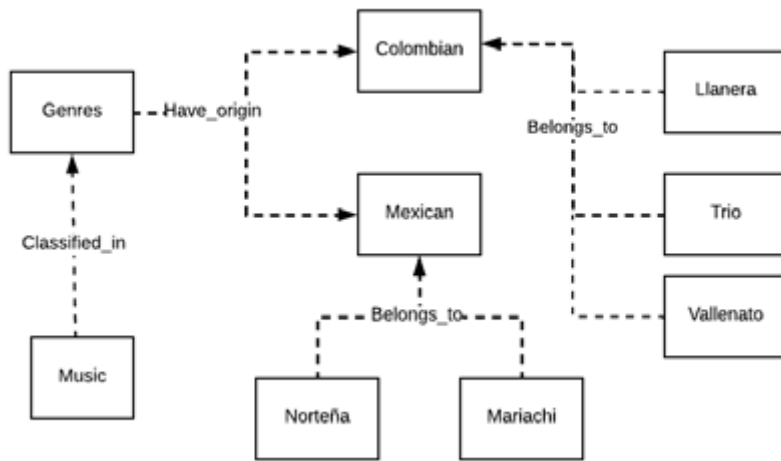


Figure 1:



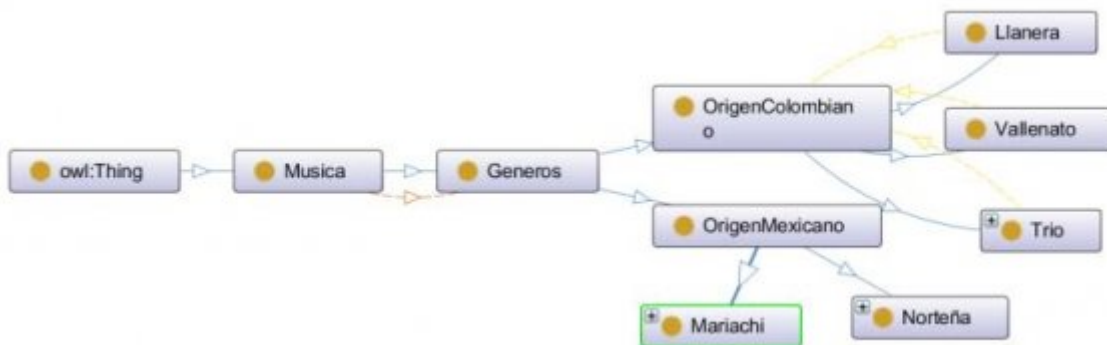
1

Figure 2: Fig. 1 :



2

Figure 3: Fig. 2 :



6

Figure 4: Fig. 6 :

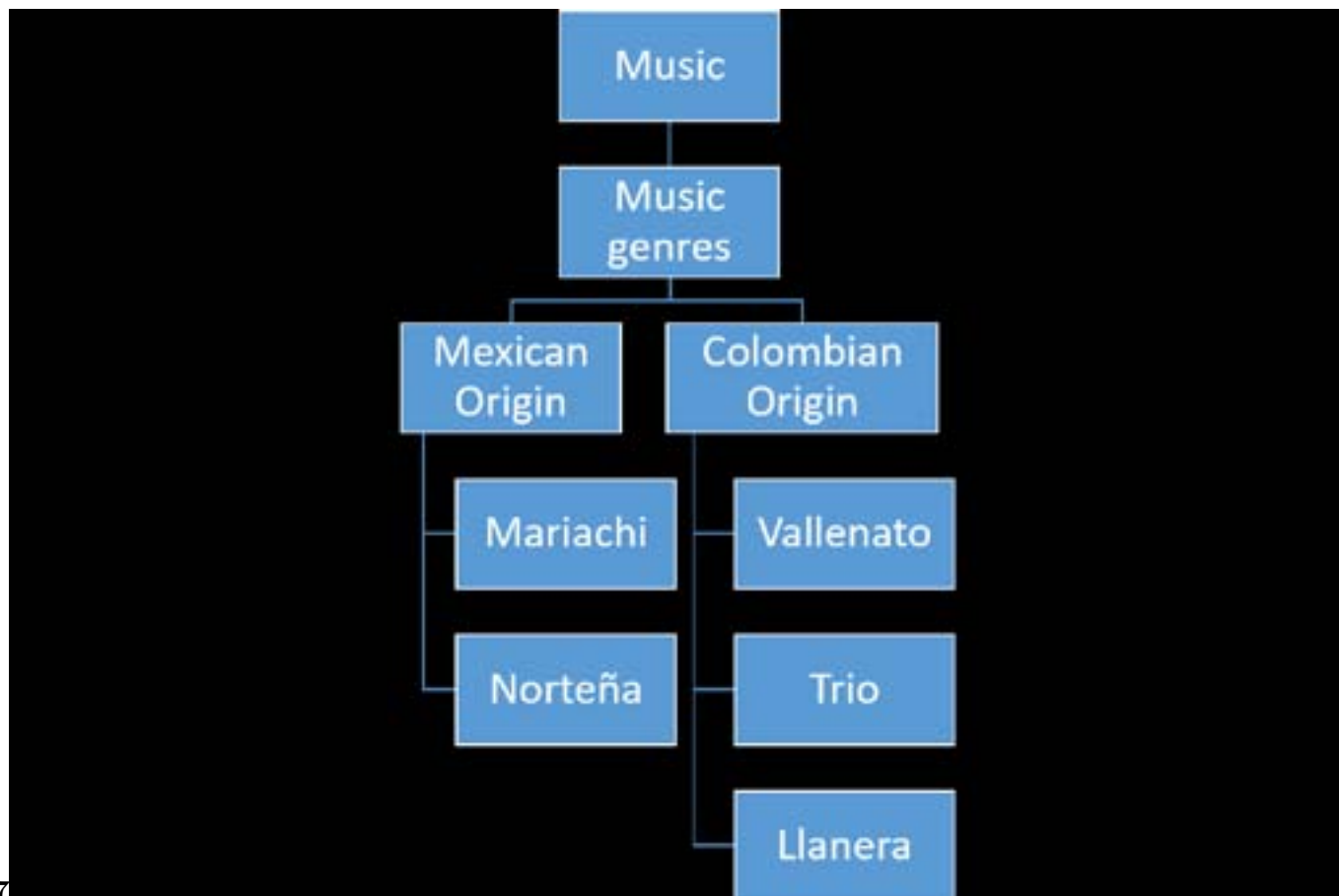


Figure 5: Fig. 7 :

2

	Attribute	Value
Musical genre	Description	String
	Origin	String
Musical group	Geographic zone	Integer
	Description	String
	Manager	String
	Price	Integer
	Contact number	String

Figure 6: Table 2 :

---

152 The present research intends to use technology at the service of the population to improve their quality of life  
153 and thus make digital contact allows them to attract, capture and retain new customers. Year 2022 ( ) J<sup>1 2</sup>

---

<sup>1</sup>© 2022 Global Journals  
<sup>2</sup>© 2022 Global Journals ( ) J





- 
- 154 [Mora et al.] , H Mora , J Azorín-López , A Jimeno-Morenilla , J Sánchez-Romero , F Pujol , J García-Rodríguez  
155 .
- 156 [Proégé and Acerca] , ” Proégé , Acerca . <https://protege.stanford.edu/about.php>
- 157 [Luna et al. ()] , J Luna , M Bonilla , I D Torres . 2012.
- 158 [Martinez Ante ()] *Bogotá, una ciudad mariachi y charra: hay aproximadamente 220 grupos*” *El Tiempo, sep-*  
159 *tiembre 30*, Martinez Ante . <https://www.eltiempo.com/archivo/documento/CMS-3265929> 2006.
- 160 [Corcho et al. ()] *Construcción de ontologías legales con la metodología METHONTOLOGY y la herramienta*  
161 *WebODE, ¿?*” Corcho , M Fernández-López , A Gómez-Pérez , A López-Cima . 2005.
- 162 [Apache] *Descripción general de la arquitectura Jena*, Fundación Apache . [https://jena.apache.org/](https://jena.apache.org/about_jena/architecture.html)  
163 [about\\_jena/architecture.html](https://jena.apache.org/about_jena/architecture.html)
- 164 [López and Castillo (2013)] ‘Esquema metodológico para la construcción automática de ontologías’. F B López ,  
165 J N P Castillo . *Revista vínculos* 2013. oct. 2013. 10 p. .
- 166 [Jakus et al. ()] G Jakus , V Milutinovic , S Omerovic , S Tomazic . *Concepts, Ontologies, and Knowledge*  
167 *Representation*, 2013.
- 168 [Pérez et al. ()] *La Web Semántica Como Herramienta para el Apoyo a la Docencia*, J A Pérez , V Morell , M F  
169 Pérez , M Saval-Calvo , A Garcia-Garcia , S Orts-Escolano . 2015.
- 170 [El País ()] *Mariachis en Bogotá*, El País . [https://elviajero.elpais.com/elviajero/2012/09/12/](https://elviajero.elpais.com/elviajero/2012/09/12/actualidad/1347472345_224984.html)  
171 [actualidad/1347472345\\_224984.html](https://elviajero.elpais.com/elviajero/2012/09/12/actualidad/1347472345_224984.html) 2012. 17. (El país)
- 172 [Metodologías y métodos para la construcción de ontologías] *Metodologías y métodos para la construcción de*  
173 *ontologías*,
- 174 [Gruber ()] ‘Toward principles for the design of ontologies used for knowledge sharing’. T Gruber . *Int. J. Hum.*  
175 *Comput. Stud* 1995. 43 p. .